

## Policy Development: Improving Air Quality

REPORT BY THE COMPTROLLER AND AUDITOR GENERAL HC 232 Session 2001-2002: 18 October 2001



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John Bourn **Comptroller and Auditor General**  **National Audit Office** 28 September 2001

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#### Front Cover:

Map showing emissions of nitrogen oxides across the United Kingdom. Red colouring indicates higher emission levels, blue lower levels.

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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.

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

<sup>2</sup> 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.

<sup>3</sup> 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>

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.



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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.

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.

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6 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.

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### IE UK NAQS (1997)

K National Air Quality Strategy<sup>1</sup> (NAQ5) ards for eight major pollutants and sets of tions in the concentrations of these polici ved by the year 2005 The standards and

e 1.1: Si	immary of Star	
Itant	Standard	dards and Ot
(BDB)	concentrations	measured
COLING	5 ppb	running
diene	1 ppb	running
oxide	10 ppm	running B-
d	0.5 µg/m <sup>3</sup>	annual me
ode	150 ppb	1 hour me
	21 ppb	annual m

#### Key stakeholders with an interest in air quality 1

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



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.

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

The proposals published by the Department on 17 September 2001 were the result of this review. See Appendix 3, Figure B. Cuidelines 2000 Scientific Advice and Policy Making, Office of Science and Technology 2000





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

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

Professional policy making competencies	Examples within the development of the strategy
Forward looking: taking a long-term view	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).
Outward looking: taking account of factors in the European and international situation	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).
Innovative and creative: open to the comments and suggestions of others	The Department made itself open to the comments and suggestions of others through the Interdepartmental Group and the Air Quality Forum (paragraph 3.30).
Using evidence: uses best available evidence from a wide range of sources	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).
Inclusive: taking account of the impact of the policy on different groups	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).
Joined up: looks beyond institutional boundaries	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).
Evaluates: builds systematic evaluation into the process	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).
Reviews: keeps established policy under review	The Department has started to review the Strategy again on a pollutant by pollutant basis (paragraph 4.22).
Learns lessons: learns from what works and what does not	The Department used pilot exercises to investigate the practical aspects of local air quality management before its full introduction (paragraph 4.7).



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- 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 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).



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- 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).

## Part 1

### Introduction

1.1 Policy-making has been defined as the process by which governments translate their political vision into programmes and actions to deliver outcomes<sup>12</sup>. Departments need to develop and operate good policy-making processes in support of Ministers. The quality of these processes can affect fundamentally the likelihood of policies achieving their intended outcomes. This report looks at the development of the second Air Quality Strategy<sup>13</sup>, published in January 2000, in order to examine the policy-making processes of the Department for Environment, Food and Rural Affairs (the Department).

#### The Air Quality Strategy

- 1.2 The Secretary of State for the Environment is required by the Environment Act 1995 to prepare, publish and keep under review a statement on air quality strategy including:
  - standards for air quality, which define the levels, based on scientific and health evidence, at which pollutants are thought to avoid significant risks to health;
  - air quality objectives, which specify the actual levels below which the Department is seeking to reduce the concentration of each pollutant by a particular date.
- 1.3 The 2000 Strategy was the result of a review of an earlier Strategy<sup>14</sup> published in March 1997, and is therefore the updating of an existing policy rather than a development of a new one. The 1997 Strategy contained standards and objectives for eight pollutants, which had been selected because they were identified by the Department's expert panel as being the most significant in terms of public health, they occurred throughout the United Kingdom (UK), and a reasonable amount was

known about their ambient levels and their sources. A review of that Strategy was originally planned to start in 1999, but it began a year earlier because new Ministers wanted earlier action to take into account new evidence on the impact of poor air quality on health. The review also needed to take account of the requirements of the first European Union Air Quality Daughter Directive<sup>15</sup>, on which the UK had achieved agreement during its Presidency in 1998. The Directive set legally binding minimum limit values to be achieved by 2005 and 2010 for four of the eight pollutants covered by the 1997 Strategy. The Directive came into force in 1999 and required Member states to incorporate these limits in domestic law by July 2001.

- 1.4 The Department is responsible for air quality policy in England and for liaising with the European Union for the UK. The review, however, leading to the second Strategy was carried out in conjunction with the Devolved Administrations in Scotland, Wales and Northern Ireland, since responsibility for air quality was only devolved during the period of the review. This Strategy has also been adopted by the Devolved Administrations, although they now have the authority to develop their own strategies should they wish to do so.
- The second Strategy was published in January 2000. Appendix 1 sets out its objectives for each pollutant<sup>16</sup>.

- 13 The Air Quality Strategy for England, Scotland, Wales, and Northern Ireland (Cm 4548).
- 14 The United Kingdom National Air Quality Strategy (Cm 3587).
- 15 Directive 99/30/EC.

<sup>12</sup> As defined in the 1999 White Paper Modernising Government (Cm 4310).

<sup>16</sup> The Department published proposals for updating the Strategy on 17 September 2001, following a review that drew on the preliminary findings of this report.

#### The Policy-Making Challenge

- 1.6 The Strategy's purpose is to seek to ensure that the public can enjoy a level of outdoor air quality which poses no significant risk to health or quality of life. Poor air quality has many sources (Figure 4) and can affect the health of people and ecosystems, damage buildings and cause smog. Appendix 2 summarises the health effects of each pollutant covered by the Strategy.
- 1.7 Measures to improve air quality (Figure 5) may also, however, involve a variety of different costs:
  - Financial costs: These may be both direct for the individual or indirect. For example, vehicle emissions testing as part of the annual MoT test costs motorists £100 million per year. And the two pence per litre reduction in fuel duty on ultra low sulphur petrol announced in the March 2001 Budget, intended to reduce pollutant emissions from road transport, is forecast to reduce duty receipts for the Exchequer by £445 million in 2001-02.

- Employment/competitiveness: For example, if costs are imposed on the manufacturers to improve air quality that are not borne by competitors in other countries, employment in the UK may be affected.
- Inconvenience/change of individual behaviour: There may be "personal" costs arising from changes in social behaviour. For example, the Department's "Are you doing your bit" campaign emphasises the important contributions that small changes in personal travel habits can make, for example walking rather than driving a car to the shops, taking children to school on the bus rather than in parents' cars.

#### 4 The main sources of poor air quality



#### Poor air quality is caused by a variety of everyday processes and activities.

Note: Ozone is also included in the Strategy, but is primarily formed by chemical reactions in the air caused by a combination of sunlight and other pollutants such as nitrogen oxides; the predominate source is therefore likely to be from road transport.

Source: National Audit Office

#### 5 Examples of policy measures to improve air quality

A variety of different policy instruments working in different sectors of the economy impact on the key pollutant sources.

Pollution Source	Examples of measures to reduce emissions
Road Transport	European Union vehicle emission and fuel standards
	Emissions testing as part of the MoT annual test of roadworthiness
	Local authority traffic management measures, e.g., Low Emission Zones
	Local Transport Plans
Industry	Integrated Pollution Control regulations
	Adoption of technological improvements
	Adoption of environmental management standards
Power Stations	Use of Flue Gas Desulphurisation
	Encouraging consumers to buy more energy efficient products and conserve energy, e.g., the "Are you doing your bit" advertising campaign
Domestic Heating	The Clean Air Acts
	Helping consumers improve energy efficiency, e.g., the Home Energy Efficiency Scheme
Source: National Audit Office	

- 1.8 In seeking to strike a balance between these various factors, the Department adopted the following guiding principles in developing the 2000 Strategy:
  - it should provide the best practicable protection to human health, based on the best expert advice available;
  - it should allow compliance with the European Union Air Quality Daughter Directive;
- its objectives should reflect the practicability of the measures required to reduce pollution (including their costs and benefits, and economic and social factors);
- it should take account of legislative, technological and scientific advances, improved modelling techniques, and increased understanding of economic and social issues.

1.9 Many different policy instruments affect air quality and many stakeholders are involved with air quality issues. The Department therefore established two bodies to consult and liaise with other stakeholders (Figure 6): an Air Quality Forum to consult key stakeholders within and beyond government; and an Interdepartmental Group for liaising with other government departments and the Devolved Administrations.

#### The National Audit Office examination

1.10 We examined how the Department updated their 1997 Strategy and developed the 2000 Strategy, rather than the merits of the Strategy itself. The Department's work in preparing the 2000 Strategy can be characterised as having three stages (Figure 7) and the rest of our report is structured around these three stages. Our examination focused on how the Department:

- marshalled the evidence on the health effects of poor air quality, and set air quality standards (Part 2);
- assessed the options for setting and delivering air quality objectives (Part 3);
- planned the implementation of the Strategy, to ensure the achievement of these objectives (Part 4).

#### 6 The Department's relationships during the policy-making process

In reviewing the Strategy, the Air and Environment Quality Division developed relationships with other Divisions of the Department, other government bodies, key stakeholders and technical contractors.





#### Three stages can be characterised in the development of the Strategy

#### The Department's approach to developing the Strategy consisted of three stages.



Source: National Audit Office

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- 1.11 We carried out our examination against the background of the expectations of improved policy-making set out in the Modernising Government White Paper (1999) and subsequently developed by the Cabinet Office's report Professional Policy Making for the Twenty First Century (1999) and other material. The Cabinet Office publication set out nine core competencies to describe a fully effective policy-making process - these are set out in Appendix 3. Some of these developments have occurred since the Strategy was published, but they nonetheless provided a good basis for considering the processes used to develop the Strategy in light of modern best practice. We also took account of the Cabinet Office's Performance and Innovation Unit's report Adding It Up -Improving Analysis and Modelling in Central Government (2000), which examined the use of data analysis and modelling in the policy-making process, including a case study which featured the Strategy.
- 1.12 We addressed these issues through file examination and a series of interviews. These included interviews with officials responsible for developing the Strategy, other officials within the Department and elsewhere in government who contributed to the development of the policy, key stakeholders, and the technical contractors. We also conducted a survey of the members of the Air Quality Forum and were assisted by an expert panel of academics in the policy-making field:
  - Professor Martin Smith, Professor of Politics, University of Sheffield.
  - Professor John Chesshire, Honorary Professor, Science Policy Research Unit, University of Sussex
  - We also consulted the Cabinet Office. Our methodology is set out in more detail in Appendix 4.

## Part 2

### Marshalling the evidence

- 2.1 Before assessing the options, the Department first needed to collect evidence on the nature of the problem posed by poor air quality. Modernising Government stresses the importance of policy-making being based on the best evidence available, which may be from a variety of sources, as does the Cabinet Office's Professional Policy Making (see Appendix 3). This part of the report examines, therefore, how the Department marshalled the evidence necessary to assess the impact of poor air quality on public health, focusing on whether:
  - the Department adopted air quality standards based on the best evidence available:
  - the Department assessed the health effects of current levels of air quality, where these levels fall short of the standards.

#### Did the Department adopt air quality standards based on the best evidence available?

- 2.2 The Department's staff included a number of scientists with an understanding of the effects of poor air quality on health, but to ensure that air quality standards were adopted on the basis of the best evidence available the Department also took advice from external experts. Accordingly, we examined:
  - how the Department used expert advice in adopting air quality standards;
  - whether the Department ensured that the advice it received was the best available;
  - the extent to which the experts' work on health effects has been conclusive.

How did the Department use expert advice in adopting air quality standards?

- 2.3 One of the guiding principles of the Department in reviewing the Strategy was that air quality standards should be set on the basis of the best expert advice. To do this, the Department drew on the work of its Expert Panel on Air Quality Standards. The Panel is made up of experts in air quality health research (see Appendix 5 for a list of members). The Department established the Panel in 1991 to provide independent advice on air quality issues, in particular the levels of pollution at which no or minimal health effects were likely to occur.
- 2.4 At the time of the first Strategy in 1997, the Panel had produced reports and recommended standards for seven pollutants (Figure 8) and the Department adopted its recommendations for these pollutants. The order in which the Panel examined pollutants had been determined by the availability of data and the relative effect each was thought to have on public health. As the Panel had not at the time made a recommendation on lead, the Department adopted a standard based on a World Health Organisation guideline.

#### 8 Expert Panel Reports on Air Quality Standards

Since 1994 the Panel has reported on Air Quality Standards for all eight pollutants covered by the Strategy.

Pollutant	Date of Panel Report
Benzene	February 1994
Ozone	May 1994
1,3-butadiene	December 1994
Carbon monoxide	December 1994
Sulphur dioxide	September 1995
Particles	November 1995
Nitrogen dioxide	December 1996
Lead	May 1998

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2.5 In developing the 2000 Strategy the Department needed to consider whether to retain or revise the standards adopted in 1997. In the case of lead, the Department adopted the standard recommended by the Panel in May 1998, which was more stringent than the World Health Organisation guideline adopted in the 1997 Strategy. For the other pollutants the standards adopted in 1997 were retained. Appendix 1 summarises the air guality standards adopted by the Department in the 2000 Strategy.

Did the Department ensure that the advice it received was the best available?

- 2.6 The Office of Science and Technology advises departments to keep the membership of their advisory groups under review to ensure that an appropriate range of scientific opinion is represented. In addition, the Phillips report on Bovine Spongiform Encephalopathy (BSE)<sup>17</sup>, published in October 2000, highlighted the need for departments to be able to understand and critically assimilate advice from expert scientific committees. The report said that, to be effective, advisory committees need clear remits, an appropriate and balanced membership, an effective chair, and proper secretariat support.
- 2.7 The Department provided the Panel with a clear remit in the Panel's terms of reference (Appendix 5) and used several mechanisms to ensure that it had made best use of the Panel's advice. First, it provided the Panel with a secretariat (shared with Department of Health representatives), both to provide scientific and administrative support, for example by conducting literature searches, and to help the Department understand and guide the Panel's work. Second, the Department's Air and Environment Quality Division included a number of scientists to assist with assessing and assimilating the Panel's work into the policy-making process - for which the Department was commended by the Cabinet Office's Performance and Innovation Unit in its January 2000 report on analysis and modelling in departments.<sup>18</sup>
- 2.8 To produce its reports, the Panel reviewed a wide range of published and peer-reviewed evidence from the UK and abroad, including clinical evidence of the health effects of exposure to pollutants in the workplace and statistical evidence on the effect of exposures on the general population. It also drew on the Department's research programme and the work of the Department of Health's Committee on the Medical Effects of Air Pollutants, which includes eight members of the Panel.



The Expert Panel's report on an air quality standard for particles

2.9 In 1998 the Department reviewed the operation of the Panel, and concluded that it had provided clear advice on health-based air quality standards and that it should continue to do so. The review recommended some changes, however, including that the Panel should issue interim reports for comment before drafting its final reports: its advice was not at that time subject to public consultation. The review also recommended that vacancies on the Panel should be advertised and that future appointments should be for fixed terms. The Panel's reports are now circulated in draft for peer review before the final report is published, but the Department has not yet made any new appointments to the Panel. The Department are currently reviewing the Panel's terms of reference and membership and we recommend that in doing so they should seek to implement the changes recommended in 1998. In addition, because the Panel is currently composed entirely of relevant experts, the Department will also need to take into account revised guidelines on scientific advice and policy-making published in July 2000 by the Office of Science and Technology, which recommend that advisory groups should include lay members.<sup>19</sup>

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The BSE Inquiry, HC 887-I, 1999-2000. 17 18 Adding It Up - Improving Analysis and Modelling in Central Government, Cabinet Office, 2000. 19

Guidelines 2000 - Scientific Advice and Policy Making, Office of Science and Technology, 2000.

2.10 The Panel's work has been driven by the need to set air quality standards for the UK, sometimes in advance of European work and directives. However, limit values are being set for an increasing number of pollutants by the European Union. We therefore recommend that, during its review of the Panel's terms of reference and membership in 2001, the Department should 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. We also recommend that in view of the close links with the work of the Department of Health's Committee on the Medical Effects of Air Pollutants, the Department should explore with the Department of Health the scope to amalgamate these two bodies.

To what extent has the experts' work on health effects been conclusive?

- 2.11 The Panel's advice on air quality standards was based on the scientific evidence available at the time. However, this evidence was not wholly conclusive in every case and, in the light of some uncertainties, the Panel adopted the "precautionary principle", erring on the side of caution in their assessments. In addition, although the Department has retained seven of the eight standards used in the first strategy, some of these standards were set nearly seven years ago and scientific knowledge does not stand still. Accordingly, the standards need to be kept under review as knowledge of the health effects of pollutants improves. The Department has identified the following areas to be of particular importance in improving the evidence on the health effects of pollution:
  - Including additional pollutants. Whereas the Strategy encompasses eight pollutants, the European Union Air Quality Framework Directive<sup>20</sup> establishes a framework for twelve pollutants seven of the eight included in the Strategy (apart from 1,3-butadiene) plus polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury. The Department is currently considering a Panel report, published in July 1999, recommending a standard for polycyclic aromatic hydrocarbons, which are produced mainly by motor vehicles and can cause cancer. It is also funding the monitoring of arsenic, nickel, cadmium and mercury at 30 industrial sites to improve knowledge of the levels of these pollutants.

- Taking account of new information. The Panel is currently re-examining the standard for 1,3-butadiene. They had recommended in their 1994 Report, which established the current standard, that it be reviewed within five years, particularly because insufficient data had been available at the time and several (precautionary) assumptions were used to set the standard.
- The chronic effects of pollutants. Pollutants differ in the time scale over which they have an effect on health. For some, such as sulphur dioxide, short-term (acute) effects predominate, while for others, such as benzene and particles, long-term (chronic) effects can be more important. The Panel's advice has been based on evidence of both acute and chronic effects where it has been available, but for particles only limited information on chronic effects was available when the Panel recommended a standard. The Department recognises the need for more work and the Department of Health's Committee on the Medical Effects of Air Pollutants has recently produced new evidence on the chronic effects of particles. The Department is now reviewing its strategy for particles in the light of this work.<sup>21</sup>

20 Directive 96/62/EC.

<sup>21</sup> 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.

## Did the Department consider the health effects of current air quality?

2.12 To consider the effect on health of current levels of air quality, the Department needed to assess the extent to which people are exposed to levels of pollutants in excess of the standards. The Department operates a network of sites to monitor air quality. Monitoring in 1998 (the most recent year for which data was available when the Strategy was completed) showed that levels of seven of the eight pollutants exceeded the air quality standards at least once in the year at one or more sites (Figure 9). Particles, for example, exceeded the standards at 76 per cent of the sites and nitrogen dioxide at 48 per cent. This evidence showed that poor air quality was a risk to health in many areas.



Note: 1. The Department's monitoring of breaches of the standards for particles, ozone and sulphur dioxide excluded sites at which the numbers of breaches were within the limits allowed in the air quality objectives set in the 1997 Strategy.

Source: National Audit Office

- 2.13 At the time that the 1997 Strategy was being developed, only limited information was available on the size of the effect of air pollution on health in the UK. To assist the development of air quality policy, the Committee on the Medical Effects of Air Pollutants established in July 1996 a sub-group to quantify these effects. The sub-group reviewed the available information, and drew on reports already published by the Department of Health's Committee and by an earlier Department of Health advisory group on the Medical Aspects of Air Pollution Episodes.
- 2.14 The sub-group published its findings in January 1998 in a report Quantification of the Effects of Air Pollution on Health in the UK. The sub-group focused on the acute (short-term) effects of pollutants (there was a lack of reliable data on chronic (long-term) effects). It identified statistical associations between air pollution levels and hospital admissions and brought forward deaths. While the biological mechanism for a causal link between the two had yet to be determined in any detail, it advised that it would be prudent to assume that these associations reflect a causal link. On this presumption, using pollution data mainly from 1996<sup>22</sup> it estimated that air pollution from ozone, sulphur dioxide and particles brought forward in that year up to 24,000 deaths<sup>23</sup> and contributed to the causes of a similar number of additional or brought-forward respiratory hospital admissions (Figure 10). However, it also concluded that information on the health effects of exposure to nitrogen dioxide and carbon monoxide was insufficiently reliable to be quantified.

These estimates were calculated by applying dose-response coefficients to the background death and respiratory admissions rates from 1994-95 and pollution concentrations from 1995 and 1996. The absolute numbers quoted will therefore change depending upon the year in question. The Report was not able to quantify the degree to which deaths had been brought forward, and noted that, from these acute effects, it was more likely to only be by a few days or weeks rather than months or years.

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### 10 The estimated contribution of air pollution to deaths and hospital admissions for respiratory diseases based mainly on data for 1996

The Committee estimated that air pollution from three pollutants, using pollution data mainly from 1996, brought forward in that year between 12,000 and 24,000 deaths and contributed to the causes of similar numbers of hospital admissions in that year.<sup>1</sup>



- Notes: 1. The figures are estimates based on a combination of data from 1994-1996, and so the actual figures in any other year would be slightly different. In particular, 1996 was characterised by unusually high levels of particle pollution.
  - (i) Represents the likely impact if there are no effects below 100 μg/m<sup>3</sup> for ozone, the current recommended standard. The Committee also calculated, at (ii), a worst-case scenario based on the possibility that ozone may have adverse health effects at all levels.
  - 3. It is not known to what degree deaths are brought forward. From these acute effects, it is more likely to be by days or weeks rather than months or years.
  - 4. These figures are estimates for 1996 of the number of respiratory hospital admissions contributed to by air pollution.
  - 5. In addition, current levels of these pollutants are close to the standards recommended by the Expert Panel.

Source: Quantification of the Effects of Air Pollution on Health in the UK (Committee on the Medical Effects of Air Pollutants, January 1998).

2.15 Although the 1998 Report left significant gaps in the quantification of health effects, and there were considerable uncertainties within this work, the majority of the Committee's work since then has focused on examining the chronic effects of one pollutant particles. This is because the Department regards particles as probably the most serious pollutant, and the risk to health from their chronic effects may be significantly greater than from their acute effects. In addition, the general approach adopted by the Committee has been to avoid quantifying health effects where it considered the health evidence to be uncertain. This is partly due to a fear that, once given, a figure for impacts on health may be treated as certain in some quarters even if the Committee stated that it is not. The Committee has therefore recognised that an area for urgent study is the nature of these uncertainties and how to deal with them in the policy-making process. We also recommend, however, that the Department develops a

strategy for improving its knowledge of the health effects of poor air quality. The Department needs up to date and comprehensive information on the health effects of pollutants 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 these matters, 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.

2.16 For the longer term, the Committee has recently decided to refocus its work. Rather than attempt to produce regular reports on the effects of air pollution on health, which would effectively duplicate work being carried out and published in the United States, it has decided that a more efficient use of its time would be to respond as required to more specific issues put to it by the air quality policy-makers.

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## Part 3

### Assessing options

- 3.1 Having adopted air quality standards, the Department moved to setting air quality objectives. Air quality standards are a scientific judgement of the levels of air quality required to protect health. However, these standards simply reflect the benefits for human health from improving air quality to that level; they do not take into account the costs that may be incurred in so doing. These costs may be significant and variously and unevenly affect different parts of society dependent upon the way in which improvements are achieved.
- 3.2 Air quality **objectives** therefore reflect a policy choice about the levels of air quality to be achieved in practice, and this involves a complex choice between, and assessment of, options - both about the level at which objectives are set and about the policy measures to achieve those levels. While assessing such factors, the Department also needed to consider the way in which air quality was likely to be affected in future by, first, ongoing policies to control emissions of pollutants, and second, other trends that influence air quality but are not directly related to controlling emissions. For example, the overall production of sulphur dioxide from coal-fired power stations has been restrained by the increase in the use of gas-fired power stations over recent years, and this change has been largely to do with the economics of energy markets.
- 3.3 The Cabinet Office's *Professional Policy Making* highlights the importance of a wide-ranging and rigorous assessment of potential solutions. In particular, that it should be:
  - forward-looking, taking a long-term view: for example, through forecasting;
  - outward-looking, taking account of external factors: for instance, the extent to which pollution from abroad, and the international action to control it, may be relevant;
  - innovative and creative, open to the suggestions and comments of others;
  - inclusive, taking account of the impact of policy.

We examined, therefore, whether the Department:

- established arrangements for forecasting the effects of current policies on air quality (paragraphs 3.4 to 3.16);
- assessed the costs and benefits of meeting potential air quality objectives (paragraphs 3.17 to 3.25);
- consulted key stakeholders on the options for setting objectives (paragraphs 3.26 to 3.36);
- used its findings to determine its policy proposals for the setting of air quality objectives (paragraphs 3.37 to 3.41).

### Did the Department establish reliable forecasts of air quality?

- 3.4 In order to assess the practicality and the incremental costs and benefits of any objectives that it might set, the Department needed to assess likely trends in air quality. The Department's forecasts were based primarily on "current policies" modelling of the impact of current economic and technological trends and existing and planned policies. The Department used these forecasts to assess whether air quality was likely to improve sufficiently to meet proposed air quality objectives or whether additional measures would be needed.
- 3.5 The Department contracted AEA Technology to develop and maintain computer models to carry out this forecasting. Figure 11 summarises the results of the modelling done in 1999 to assess how far the objectives set in 1997 would be achieved.
- 3.6 The development and use of such modelling needs, however, to recognise and address the scope for future levels of air quality to be different from those forecast because of:
  - mistakes in computer programmes or misunderstanding of the physical and chemical processes involved;
  - the complexity of the physical and chemical processes that affect air quality which is difficult to represent in a manageable mathematical model;

- the impact of causal variables that cannot be identified or whose exact impact cannot be predicted in advance, for example the state of the weather or the economy.
- 3.7 A failure by policy-making processes to address properly these issues could put at risk the achievement of the aims of the Strategy. It might lead, for example, to either too much or too little being done to improve air quality, depending on the direction in which air quality turned out to be different from the levels forecast. Accordingly, we examined how the Department sought to ensure that:
  - its forecasts were as reliable as possible;
  - the scope for future air quality to differ from the forecasts was communicated to policy-makers and set out in the published Strategy, and fully incorporated into the option-assessment process.

How did the Department and AEA Technology seek to improve the reliability of the forecasts?

- 3.8 AEA Technology's modelling consisted of two distinct processes:
- Estimating and mapping emissions of pollutants. AEA Technology estimated future quantities of emissions on the basis of forecast trends in, for example, technology, economic activity and the amount of road traffic. The estimated emissions were mapped onto a grid covering the country, based upon the estimated location of these emissions.

- Translating emissions maps into air quality maps. Once the emissions maps have been produced, further modelling was used to transform these maps into pollutant concentration maps by taking account of the effects of weather and atmospheric chemistry, both of which can significantly alter the amount and type of pollution at a given point and time.
- 3.9 Both processes present difficulties in forecasting. In particular, the chemical and atmospheric relationships can be extremely complex and unpredictable and are not yet fully understood. In addition, most data was necessarily estimated, for example because it was not practicable to measure actual emissions from many emission sources, such as motor vehicles. And forecasts of future emissions of all pollutants were subject to some uncertainty because of the potential effect of factors such as the future state of the economy. For some pollutants, such as ozone, the formation of which is promoted by sunlight and which can be carried from other countries on the wind, the weather is an important source of uncertainty.
- 3.10 AEA Technology estimates that its forecasts of emissions, prior to the translation of emissions maps into air quality maps, are currently subject to uncertainties up to 40 per cent (Figure 12). Whilst AEA Technology has sought to improve the reliability of its forecasts, the size of this range illustrates the scope for the forecast assessment of meeting the 1997 objectives by their target date as per Figure 11 to be uncertain.
- 11 The Department's 1999 assessment of likely trends in air quality under current policies and economic, social and technological trends

The Department's modelling suggested that some of the objectives of the 1997 Strategy would be achieved under current policies, but not all.

Pollutant	Expectation of the likelihood of achieving the 1997 air quality objective	
Benzene	All of country to meet the objective by the end of 2003, i.e., two years early.	
1,3-butadiene	All of country to meet the objective "well before" 2005.	
Carbon monoxide	All of country to meet the objective by the end of 2003, i.e., two years early.	
Lead	All of country, with the possible exception of two very localised sites (both in Walsall), to meet the objective (0.5µg/m <sup>3</sup> ) by the end of 2004, i.e., one year early. Concentrations should also generally be well below the Panel's recommended standard of 0.25µg/m <sup>3</sup> by 2004.	
Nitrogen dioxide	Levels in London and a few other large urban areas expected to breach the 1997 objective.	
Ozone	Levels in large areas of the country expected to breach the 1997 objective.	
Particles	Levels in many areas expected to breach the 1997 objective. In some years with unfavourable weather, the objective could be breached just from the effects of fireworks on and around Bonfire Night.	
Sulphur dioxide	Majority of country expected to meet the 1997 objective but some breaches possible in very localised areas surrounding small combustion plants and in a few areas where coal is used extensively for heating.	

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#### 12 Estimated reliability of emissions forecasts

It is estimated that forecasts of emissions are subject to uncertainties of up to 40 per cent.

Pollutant	Estimated range within which emissions may lie
Benzene	Not estimated
1,3-butadiene	Large, but not yet quantified
Carbon monoxide	Plus or minus 40 per cent
Lead	Plus or minus 14 per cent
Nitrogen dioxide <sup>1</sup>	Plus or minus 30 per cent
Ozone <sup>2</sup>	Plus or minus 30 per cent
Particles	Large, but not yet quantified
Sulphur dioxide	Plus or minus 10-15 per cent
Notes: 1. Range is for all nitrogen oxides, of which nitrogen dioxide is the main component.	
<ol> <li>Range is for volatile of which are a signi formation.</li> </ol>	e organic compounds, emissions ficant contributor to ozone

Source: AEA Technology

3.11 To help improve the reliability of its forecasts, AEA Technology has published details of its modelling methods in peer-reviewed journals for expert scrutiny. It further compares the model's output with actual monitoring data to calibrate and improve it. AEA Technology also liaises with international bodies, notably the European Environment Agency and the United Nations Economic Commission for Europe's task force on emissions modelling, to ensure that its information on emissions sources and modelling techniques is as complete as possible. And in order to evaluate the potential for uncertainty caused by the weather, the Department asked AEA Technology to produce forecasts of the level of particles under three different types of weather conditions.

- 3.12 Nonetheless, a review of vehicle emissions models by the Transport Research Laboratory in July 2000<sup>24</sup> indicated several areas where the models' reliability could be improved. And the European Union has identified scope to improve the way national models of vehicle emissions, including the UK's, treat emissions from vehicles before engines and catalysts have warmed up, the methods used to estimate the location of emissions and the impact of congestion on emissions from vehicles.
- 3.13 As noted earlier, AEA Technology has estimated the extent of uncertainty in its emissions forecasts. However, AEA Technology has not done so with regard to its forecasts of air quality. We recommend, therefore, that the Department consider commissioning a review of AEA Technology's modelling to assess the extent to which future air quality could differ from its forecasts.

Did the Department ensure that the scope for future air quality to differ from forecast levels was communicated to policy-makers, set out within the published Strategy, and incorporated into the optionassessment process?

- 3.14 Both AEA Technology and the Department appreciated that the forecasts of air quality upon which the options were assessed (Figure 11) were subject to uncertainty. For example, annual reports on emissions published by AEA Technology during the period in which the Strategy was being prepared indicated the nature of key uncertainties and imprecisions within the emissions estimates for each pollutant. The published Strategy also indicated in some places that air quality forecasts were subject to uncertainty and imprecision.
- 3.15 However, the Department's assessment of options, and the forecasts of air quality in the published Strategy, considered only AEA Technology's "best-estimate" of future air quality. The published Strategy did not indicate the extent to which actual levels of air quality might be significantly different from those forecast, and the Department did not undertake any sensitivity analysis or risk assessment to consider and respond to the potential uncertainty of the forecasts.

- 3.16 Accordingly, we recommend that in future reviews of the Strategy, the Department work with AEA Technology to:
  - Do more to communicate the key assumptions and uncertainties in the air quality forecasts to its policymakers and the public; some degree of uncertainty and imprecision is inevitable within any model, and it is important that the implicit and explicit assumptions made, and potential uncertainties, are clearly indicated.
  - Grade emissions estimates to indicate their reliability; the United States Environmental Protection Agency and the European Union have both graded their emissions estimates in this way, which helps to convey to policy-makers the main areas of uncertainty, and highlights where extra research is necessary.
  - Carry out sensitivity analysis to evaluate the potential impact on the achievement of the air quality objectives if key estimates and assumptions are wrong.
  - Develop a range of scenarios for future air quality, to help assess the range within which actual air quality could diverge from the levels forecast; the Modernising Government agenda recommends the use of scenarios in order to make the policy as forward-looking as possible and the Government's "Foresight" programme<sup>25</sup> commends scenarios as a useful tool in managing an uncertain future; since the publication of the Strategy in January 2000, AEA Technology has begun some limited scenario analysis at the Department's request and we recommend that this work should continue and be expanded; in particular, we recommend that the Department seek to produce forecasts for a range of scenarios to show the effect of key variables being at different values from the best-estimate.
  - Include in its policy proposals contingency plans for responding to differences between future air quality and the levels forecast.

## Did the Department assess the costs and benefits of meeting potential air quality objectives?

- 3.17 Some measures to improve air quality can be self-financing, such as improvements in the efficiency of the use of fuels. But most entail some costs, for example from the installation of equipment to reduce pollution. The Department is committed to ensuring that the costs of all policies are justifiable in terms of potential benefits. The Department therefore needed to establish evidence on the costs in addition to the benefits of improving air quality, to ensure that the policy took a balanced account of all interests.
- 3.18 The Cabinet Office's Professional Policy Making encourages policy-makers to base their decisions on the best available evidence from a wide variety of sources. The 1997 Strategy included two appendices that looked at the costs and benefits of reducing air pollution, but this work did not specifically relate to the Strategy and did not help determine the air quality objectives for each pollutant. The Department made a commitment, at the time of the publication of the 1997 Strategy, to undertake a formal economic analysis of the costs and benefits of the additional measures required to meet the Strategy's objectives. This work was also necessary to inform the development of the 2000 Strategy.
- 3.19 In late 1997, the Department established a sub-group of the Interdepartmental Group, the Interdepartmental Group on Costs and Benefits, to fulfil this commitment. To simplify the Group's work, the Department assumed that the policies affecting air quality already in place or embodied in existing legislation had been justified in terms of costs and benefits when they were introduced, and that it was not the purpose of the Strategy, or of the review, to reopen debate on the justification for these measures. The Group's remit focused mainly, therefore, on the costs and benefits of the additional action that might be required to achieve the objectives set in the 1997 Strategy, although it also sought to gather information on the costs and benefits of existing measures where it could.

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The UK Foresight programme is managed by the Office of Science and Technology in the Department of Trade and Industry, and brings people, knowledge and ideas together to look ahead and prepare for the future.

- 3.20 As a result of this assumption, the Group did not examine the costs and benefits of achieving the air quality objectives for benzene, 1,3-butadiene, and carbon monoxide because the Department's modelling indicated that the 1997 objectives for these pollutants would be achieved without the need for additional measures (Figure 11). The modelling indicated that the objective for lead was also likely to be achieved in all but a very few areas. The Group therefore focused on the remaining four pollutants - particles, nitrogen dioxide, ozone, and sulphur dioxide - as the Department's assessment was that, for these pollutants, additional measures could be necessary to achieve the objectives.
- 3.21 In January 1999, the Group published an interim report An Economic Analysis of the National Air Quality Strategy Objectives to explain how it had conducted its economic analysis and to present its preliminary results. The report concluded that:
  - existing and proposed measures (i.e., the "current policies" scenario) were expected to generate significant health and non-health benefits, although they were unable to put the health benefits in monetary terms;
  - whilst the cost of implementing these measures was clearly large, they were unable to estimate it fully;
  - additional measures, where they could be costed, were found to be insufficient to eliminate exceedences in all places.
- 3.22 The Group sought to put a monetary value on the health benefits of improving air quality using information from the Department of Health's *ad hoc* Group on the Economic Appraisal of the Health Effects of Air Pollution but it was unable to do so. The *ad hoc* Group estimated that the value of reducing the risk of a death brought forward was between £2,600 to £1.4 million a year, depending on the circumstance of the premature death, and Ministers at the Department of Health concluded that the uncertainty and potential range surrounding this figure prevented the health benefits of improving air quality being presented in monetary terms.
- 3.23 In terms of the additional costs of reducing or eliminating predicted exceedences (forecast failures to achieve the air quality objectives), due to limitations in the information available these were only examined for nitrogen dioxide and particles. For these two pollutants, the Interdepartmental Group on Costs and Benefits estimated the cost of two options for reducing levels of these pollutants in London through restrictions on traffic. However although both options would have entailed costs of more than £100 million a year, neither

reduced emissions sufficiently to meet the proposed air quality objectives for these pollutants in London. Nonetheless, the Department thought it worthwhile to set the objectives at the proposed levels because these were achievable in many areas and setting the objectives at a less demanding level might result in air quality improvements in other areas being lost.

- 3.24 As a result of the limitations in its analysis, the Group's work had limited influence on the setting of air quality objectives in the 2000 Strategy. The Group's interim report concluded that further work was required before a full cost-benefit analysis of the Strategy could be undertaken. Areas suggested for further examination included, amongst other things, a more comprehensive examination of the costs of different transport measures.
- 3.25 The Department has commissioned work to fill the gaps identified by the Group. The Group will, in future, publish reports on a pollutant by pollutant basis, in line with the Department's intention to review the Strategy on the same basis. The Department expects to consult on proposals to amend the particles objective later in 2001, which will include a report on the costs and benefits of measures needed to achieve a revised objective. The Department is also currently undertaking work to estimate the value individuals place on the benefits of improved air quality, with the intention of producing a sounder basis for valuing the health benefits of improving air quality. However, the Department should also consider using multi-criteria analysis to help inform the setting of objectives. 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>26</sup> and in view of the Department's difficulties in valuing benefits it may offer a more conclusive basis for setting air quality objectives.

## Did the Department consult key stakeholders on the options for setting objectives?

3.26 Air pollution derives from a wide range of sources, and affects many stakeholders. Many policies currently affect air quality, operated by central and local government and the Devolved Administrations in Scotland, Wales and Northern Ireland. Policy affecting air quality therefore attracts the interest of a wide range of stakeholders, and the Department used several methods to consult them about the Strategy.

- 3.27 First, the Department consulted publicly on its proposals for the Strategy in January 1999, as it was required to by the Environment Act 1995, inviting comments from stakeholders and the public. The Department received just over 100 responses, the largest number being from local authorities. Most of the responses supported the proposals in general, although there were some critical comments, mainly regarding the proposal to relax the particles objective. The Department did not produce a detailed response to each of the comments received, but the subsequent draft Strategy included a summary of the comments received (Annex C of the draft Strategy)27 and the Strategy was revised in some places. For example, views were expressed that a consistent unit of measurement should be used for all pollutants, and that the concept of percentile compliance for exceedences the number of times when pollutant levels are allowed to be above the concentration stated in the objectives should be replaced by stating the number of days per year where exceedences were permitted.
- 3.28 We recommend, however, that in future public consultation exercises, the Department should report publicly how it has responded to comments received, and why. This should help improve the transparency and inclusivity of the consultation process and would also ensure that the Department complies with the sixth principle of the Cabinet Office's *Code of Practice on Written Consultation*, issued after the Strategy was published in January 2001. This states that not only should there be an account of the views expressed, but also the reasons for decisions finally taken.
- 3.29 The Department conducted a second round of consultation, on its revised draft strategy, in August 1999. However all the stakeholders we spoke to about this aspect of the consultation process commented that particularly since the Strategy had changed little since the first round of consultation, they felt this second round added very little to the policymaking process. Although the Environment Act requires this second round of consultation, the Environment Agency commented, for example, that it could have been conducted more efficiently if the Department had only circulated those parts of the Strategy that it had changed subsequent to the first consultation, rather than providing the whole Strategy again. We recommend that the Department considers how the consultation process can be organised to minimise the burden on consultees, for example by highlighting changes in documents, and only consulting on issues when there is a specific decision to be made.

- 3.30 The Department also established two mechanisms for regular consultation with stakeholders during and since its review: an Interdepartmental Group for consulting with other government departments and agencies, and an Air Quality Forum for consulting with key stakeholders, both inside and outside of government departments.
- 3.31 The Group included representatives from key departments and regulators, such as the Departments of Health, and of Trade and Industry, the Environment Agency, and the Devolved Administrations. The purpose of the Group was to agree within government on the main features of the Strategy. Departments to whom we spoke found the Group a useful mechanism to bring departments together in developing a policy which will affect various parts of the economy and society.
- 3.32 The Group played a significant part in shaping the policy, in particular in helping to balance the costs and benefits of improving air quality. Two examples are as follows:
  - **Small boilers.** The Department of Trade and Industry produced modelling evidence that suggested that emissions from small coal and oil-fired industrial boilers (less than 20 megawatts thermal capacity) might occasionally cause very localised exceedences of the proposed 15-minute objective for sulphur dioxide. The Department of Trade and Industry argued that the operators of such plant might come under regulatory pressures disproportionate to potentially small risks, and which would not be faced under the current European Union air quality directives. The Department argued however that there was no basis for weakening the objective given that their monitoring sites had not detected this problem in practice. The Department did, however, stress to the Group that if future monitoring work did indicate that these boilers were causing local exceedences, no decision would be taken to enforce alteration or potential closure of these boilers without future interdepartmental agreement.
  - Indicative targets. Several departments expressed concerns over the proposed use of "indicative" targets. These were intended to be included in the Strategy at tighter levels than the main objectives to act as pointers as to the future direction policy was expected to take. However, the Environment Agency and the Department of Health felt that they would lead to a confusing number of targets. The Department of Trade and Industry also felt that there would be a danger of Environment Agency regulators being obliged to give undue weight to these aspirational targets when determining the level of acceptable emissions from industry. They felt that industry might therefore incur disproportionate costs before the costs and benefits of these tighter targets

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had been formally assessed. The Department agreed on the balance of these arguments to drop the indicative targets from the Strategy.

- 3.33 The Air Quality Forum consisted of the members of the Group together with representatives of local government, business and industry, and transport, environmental and health pressure groups. The membership and terms of reference of the Forum are set out in Appendix 5. Members of the Forum were selected through internal discussion within the Department. We recommend that in order to ensure views and expertise are drawn from as wide a range of sources as possible, the Department uses advertisements to identify potential members of consultative bodies, to help identify any potential interested parties that it may have overlooked.
- 3.34 Our survey of the Forum's members found that nearly all members who replied had found the Forum worthwhile
  from a total of 43 members, 27 responses were received from a broad cross-section of the Forum's members but there were some reservations. The results of the survey are summarised in Figure 13.
- 3.35 The Department found the Forum valuable in helping them to assess the reasonableness and practicality of their proposals, which was particularly important because the co-operation of stakeholders would be important during the implementation of the Strategy. However, our survey indicated that whilst stakeholders generally found the Forum a useful mechanism to engage with the policy-makers, there was some dissatisfaction that members did not have a greater opportunity directly to inform policy, for example through setting up sub-groups to examine evidence and come to a consensus on the policy option to be taken.
- 3.36 After the publication of the Strategy, the Department announced that it considered the Forum still had a role to play as a part of a wider ongoing review of the Strategy, and that it intended to ensure that future meetings of the Forum were more focused, by having more specific topics for discussion and circulating briefing papers well in advance of the meeting. As a part of this, we recommend that the Department should set up sub-groups to support the Forum on specific issues, to enable stakeholders to make a more effective contribution to the Department's work. Whilst maintaining the involvement of a wide range of stakeholders, these steps should allow more detailed and informed debate, providing greater opportunity for members to draw on their specific experience and potentially allow for a more productive use of members' time.

#### 13 Key themes from 27 respondents to our survey of the Air Quality Forum

Several themes emerged from our survey of Forum members

Issue	Responses
Did the Forum make a worthwhile contribution to the development of the 2000 Strategy?	20 respondents felt that it was either partially or fully worthwhile, but five respondents felt that their impact on policy development was limited.
Did the Forum contain the right number of stakeholders?	Five stakeholders commented that they felt that the large size of Forum meeting (typically 30 to 40 people) restricted their ability to make much more than superficial contributions.
Was the correct range and type of interests represented?	17 considered that all relevant groups and stakeholders were represented on the Forum, although a few respondents felt that, in various ways, the balance of sectional interests was not correct, that there was, for example, too much governmental representation.
Were the terms of reference suitable?	All thought that the Forum's terms of reference were either suitable or completely suitable.
Did the Forum make good use of members' experience and expertise?	Seven members felt that more use could be made of their expertise. In particular, five emphasised that a useful rôle now would be in providing an independent overview of strategy implementation and progress.

Source: National Audit Office survey of the members of the Air Quality Forum.

## Did the Department use its findings to determine its policy proposals for the setting of air quality objectives?

- 3.37 The Department took the objectives set in the 1997 Strategy as its starting point from which to seek further progress. The review of the health evidence had not cast any doubt on the health benefits of improving air quality to the level of the air quality standards, and many of the policy mechanisms that were currently helping to improve air quality were already well-established.
- 3.38 However, the Department had not been able to establish conclusive cost-benefit evidence that additional measures to speed up improvements in air quality could be justified. And in some cases, such as for nitrogen dioxide in London, it had not been able to identify practical measures sufficient to achieve the health-based air quality standard. Furthermore, in the absence of conclusive cost-benefit evidence, the Department was constrained from adopting additional measures under a precautionary approach by the need to take account of the potential adverse impact of improving air quality on consumers and industry.
- 3.39 The Department also needed to incorporate the requirements of European Union law on air guality, although, partly because the Department already had in place the first Strategy, the practical implications of this were limited. The 1996 Air Quality Framework Directive<sup>28</sup> established a framework for setting limit values (equivalent to air quality objectives) for twelve pollutants.<sup>29</sup> The first Air Quality Daughter Directive<sup>30</sup>, agreed in 1998, established limit values for lead, nitrogen dioxide, particles, and sulphur dioxide to be achieved by 2005 and 2010. Member states were required to incorporate the Directive into domestic law by July 2001. A second Daughter Directive will require limits for benzene and carbon monoxide to be incorporated in domestic law by the end of 2002; further Directives are planned to set limits for the other pollutants covered by the Framework Directive.

- 3.40 The Department needed to set several additional objectives to reflect the requirements of the Air Quality Directive:
  - For lead, the Directive required the Department's objective set in 1997 to be met a year early, by 1 January 2005, but the Department's modelling indicated that the objective should be achieved by this date.
  - For nitrogen dioxide, the Directive set two limit values which corresponded to the two objectives set for nitrogen dioxide in the 1997 Strategy. One of these limits was less demanding than the corresponding objective in the 1997 Strategy, which was retained. The other was broadly equivalent to the corresponding Strategy objective, but was expressed differently in technical terms. Since the Directive's limit value would have to be incorporated in the Strategy eventually, the Department decided to replace the 1997 objective with it immediately.
  - For sulphur dioxide, the Directive set limit values for two different methods of measuring sulphur dioxide levels. The Department's modelling indicated that both would be achieved if the 1997 objective were achieved.
  - For **particles**, the Directive set two limit values: one was less demanding than the 1997 objective, another was new, based on a different method of measurement.
- 3.41 The outcome of this process was that the Department concluded that there was scope to tighten the objectives for benzene, 1,3-butadiene, carbon monoxide and lead by bringing forward the target dates for achieving the levels of pollutants set in the 1997 Strategy. The 1997 objectives for nitrogen dioxide and sulphur dioxide were challenging, however, and those for ozone and particles 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 - by adopting the European Union limit value - 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 14 summarises how the 2000 Strategy changed the air quality objectives from the 1997 Strategy and how these changes were related to the outcome of the Department's policy-making process.

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Directive 96/62/EC on ambient air quality assessment and management.

29 Seven of the eight (not 1,3-butadiene) in the Strategy plus polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury.

30 Directive 99/30/EC.

#### 14 Changes in air quality objectives between the 1997 and 2000 Strategies

#### Changes between the 1997 and 2000 Strategies can be linked to the Department's policy-making process.

Pollutant	Change between 1997 and 2000 Strategies	Rationale for the change
Benzene, 1,3-butadiene, carbon monoxide	Strengthened - objectives brought forward by two years	Air quality modelling showed that ongoing measures to improve air quality were having an earlier effect than expected in the 1997 Strategy and so these objectives - which are the same as the air quality standards for these pollutants - could be brought forward.
Lead	(i) 1997 objective brought forward by one year	Air quality modelling showed that ongoing measures to improve air quality would mean that the 1997 objective would be met one year earlier, as required by the European Union.
	(ii) More demanding Panel recommended standard incorporated as a longer term objective	The improvements being brought about by the ongoing measures also meant that the Department felt able to adopt the air quality standard as an objective for the longer term.
Nitrogen dioxide (two objectives in 1997 Strategy)	(i) One objective replaced and slightly tightened by new European Union target	A European Union objective replaced the 1997 objective for the purpose of clarity; the European objective had to be adopted, and there was little purpose in having two very similar objectives.
	(ii) Second objective unchanged	Modelling suggested that the levels in some urban areas would not meet the second 1997 objective, but the Department wanted to maintain a "challenging" objective, given the health evidence, that would be achieved in most areas of the country.
Ozone	No change	No change even though the modelling suggested that the objective would not be achieved in most areas of the country. However, the Department did not see any merit in changing the objective in advance of the European Union setting their own objective. The objective in any case is provisional due to the significant uncertainties attached to future projections of ozone.
		Also, importantly, local authorities are not required to take steps towards the achievement of this objective. Ozone is formed generally at some distance from the areas where it worsens air quality and much of it comes from the Continent, so it is not readily amenable to local action. Therefore retaining the objective would not require local authorities to take what might be significant additional - and potentially unjustifiably costly - action.
Particles <sup>1</sup>	Replaced by weaker new European Union objective Additional European Union objective included	Less demanding European Union objective adopted because modelling evidence showed that the 1997 objective would not be met in the majority of the country. Further, unlike ozone, local authorities are required to help in the pursuit of the particles objective, and so to have kept the old objective may have forced some local authorities to take significant additional action - for example significantly restricting traffic in towns - where the cost-benefit case for this was unproven.
Sulphur dioxide	No change to existing objective, but two new European Union objectives introduced	Projections showed that the majority of the country would meet the existing air quality objective.

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

Source: National Audit Office

## Part 4

### Planning Implementation

- 4.1 Once policy options had been considered and objectives determined, the Department needed to ensure the effective implementation of the Strategy. This is a particularly critical area for the air quality Strategy since the Department has limited direct control over the delivery of improvements in air quality; delivery will largely occur through other bodies and agencies. This is for three principal reasons:
  - Many policy instruments affecting air quality are the responsibilities of other departments - for example, decisions on the level of duty on less polluting fuels are a matter for the Treasury. Action at European Union level is also important, for example with regard to the composition of fuel and motor vehicle engine standards.
  - Improvements depend to some degree on behavioural and technological changes whose success will depend very much upon people's willingness to change aspects of their behaviour.
  - A particularly important mechanism for delivering improvements in localised poor air quality areas is through local authority action. Local authorities have discretion over how they do this, and are likely to have to work with other agencies to secure improvements rather than attempting to meet the air quality objectives wholly through their own actions.
- 4.2 The Department's lack of direct control over delivery means that successful implementation is likely to require the Department to build and maintain effective relationships with other bodies and agencies, particularly local authorities<sup>31</sup>. In addition, the Cabinet Office's *Professional Policy Making* highlights several attributes particularly relevant during the policy implementation phase that the policy-makers learn lessons about what works, that they take account of relationships with and between various bodies, and that they review and evaluate policy. We therefore examined whether the Department:

- Gave sufficient guidance, direction and supervision to those bodies responsible for the policies which will help deliver the Strategy, and managed the risks to successful implementation.
- Established mechanisms to measure and monitor progress, and to keep the Strategy under review.

#### Did the Department give sufficient guidance, direction and supervision to bodies delivering the Strategy?

Action by local authorities

- 4.3 The most severe air quality problems are often very local. Vehicles and industry are both important sources of pollutants and can lead to poor air quality in areas with heavy traffic or concentrations of industry.
- 4.4 Under the Environment Act 1995, local authorities are required to review and assess air quality in their areas against prescribed air quality objectives. Seven of the eight pollutants covered by the 2000 Strategy have been prescribed in regulations, the exception being ozone which can travel long distances and is therefore not readily amenable to local action. Similar requirements had been imposed under the 1997 Strategy.

4.5 Where a local authority considers that the air quality objectives are unlikely to be achieved without additional local action, the local authority is required to designate the area concerned as an "Air Quality Management Area". It must then also develop and implement an action plan to improve air quality in the area, for example by managing local traffic flows, promoting public transport, and using its planning powers to influence the siting of industry. Where necessary, local authorities will have to work with other bodies, such as the Highways Agency and Environment Agency, to develop their action plans.



An Air Quality Management Area sign on the Victoria Embankment, London

- 4.6 The 2000 Strategy confirmed that local authority action would be required to help achieve the national air quality objectives. The Department believes it is likely that authorities will declare around 100 Air Quality Management Areas, relating primarily to high levels of nitrogen dioxide and particles. Road transport is a significant source of these pollutants and the Department expects that most local authority action to improve air quality will relate to traffic management and planning in city and town centres. This could involve, for example, the adoption of Low Emission Zones where only certain "clean" vehicles will be allowed. Authorities may also test emissions from exhausts, and regulations have been proposed which would allow authorities with Air Quality Management Areas to issue fixed penalties to offenders. Some local authorities are likely to find it necessary to work with the Highways Agency to help curb emissions from the motorway and trunk road network.
- 4.7 Local authorities have long been involved with air quality, under, for example, the Clean Air Acts and their role in licensing industrial installations. Local air quality management extended their responsibilities, however, and local authorities needed guidance to ensure that they carried out their rôle effectively and efficiently. A survey of local authorities in 1999 carried out by the University of the West of England found that local authorities considered that lack of expertise was potentially their single biggest problem in terms of

improving air quality. The Department therefore sought to assist authorities by:

- Using piloting to highlight the important practical issues. Twelve local authorities were used in a pilot project to investigate the practical aspects of local air quality management in conjunction with the 1997 Strategy.
- Producing guidance notes based on initial pilot experience. Both general and technical guidance notes were developed, covering both the assessment of air quality and the action that might be taken to manage it. Guidance notes were initially developed for the implementation of the 1997 Strategy; revised guidance notes for the 2000 Strategy were issued in March and May 2000.
- Designing a review and assessment process to ensure that the action taken by each authority, and therefore its costs, would be proportionate to the size of the air quality problem in its area. The Department devised a staged process designed so that an authority would only need to carry out a detailed assessment if poor air quality was likely to be a significant problem in its area.
- Providing financial support. Resources through the Revenue Support grant are made available on a yearon-year basis to support the local air quality management process in an ongoing manner. Capital funds are also available through supplementary credit approvals but the Department is keen to emphasise that, with transport being the main contributor to air pollution in many areas, local authorities should seek to join-up their air quality management activities with their development of Local Transport Plans and the funding associated with these.
- Providing technical support. Technical support has been provided through a website run by one of the Department's technical contractors, and both the National Society for Clean Air and the University of the West of England have been funded to prepare additional guidance and support. The Department also plans to appoint consultants later in 2001 to run a helpdesk to advise local authorities in the development of their action plans.
- 4.8 Local authorities were advised to complete their assessments initiated under the first Strategy by June 2000 in the *Framework for Review and Assessment of Air Quality* guidance published in March 2000. However, this date was put back to the end of December 2000, during the process of developing this second Strategy, after it became clear that many authorities would have difficulties in achieving it. By the end of December 2000, around 70 per cent of local authorities had submitted their assessments. The Local Government Association told us that local authorities had been hindered in completing their assessments because

revised technical guidance notes had not been issued until May 2000 and by shortages of monitoring equipment.

- 4.9 The authorities submitting assessments by the end of December 2000, however, included most authorities in areas of likely poor air quality, and included the majority of authorities in Greater Manchester and the West Midlands and over 80 per cent of London boroughs. The Department has been reluctant to press authorities too strongly to complete their assessments because there are no statutory deadlines by when the review and assessment process has to be completed. The Department also acknowledges that authorities will wish to feel sufficiently confident of their data before they decide whether or not to declare an Air Quality Management Area. In addition, the Department recognised that it was important to maintain constructive relationships with authorities, being key delivery agents.
- 4.10 The Department contracted the University of the West of England and Air Quality Consultants to audit all assessments to ensure that the conclusions reached could be supported. These audits found that around a third of the assessments submitted by the end of December 2000 could not be initially accepted and these local authorities have been required to submit further information to support their assessments.
- 4.11 Authorities are advised to produce their air quality action plans within a year after the designation of an Air Quality Management Area. As at the end of December 2000 only one action plan had been received, from Westminster City Council, and the Department expects to receive the majority of action plans in mid-2002. The Department plans to appoint consultants to check the quality of the action plans.
- 4.12 Although authorities have made generally good progress in completing air quality assessments, several risks remain that could hamper the implementation of local authorities' action plans. For example, achieving the air quality objectives will be very challenging for some authorities. The Strategy recognises that achieving the nitrogen dioxide objective when measured at the roadside is likely to be very challenging in London and may be difficult in other major conurbations. Some authorities may also be concerned at the impact of actions to control emissions on local employment and economic activity, and they may regard these as of a higher priority than improving the quality of air. It is therefore important that the Department should monitor local authorities' progress in implementing action plans to improve local air quality, and should make plans to review local authorities' achievements in improving air quality.

#### Action at the national level

4.13 The Strategy did not develop proposals for additional national action to improve air quality, but the Strategy was developed on the basis that existing policies would stay in place and continue to be effective. Little of this action is the responsibility of the Department's Air and Environment Quality Division, the policy-makers for the Strategy (Figure 15). Implementation of the Strategy therefore involves other areas within the Department, and other departments and agencies with responsibility for the various existing policies which underpin the Strategy.

#### **15** Bodies responsible for policies affecting air quality

### Many different bodies are responsible for action affecting air quality.

The Strategy identifies some 38 policy instruments affecting air quality, policy responsibility for which is held by a wide range of bodies:

- Regulatory action by international bodies: the Strategy identifies three such bodies taking such action, including the European Union. European Union activity may be the single most important delivery mechanisms for some pollutants. For instance, tighter Union vehicle emission and fuel standards for new cars, combined with phasing out of old cars, are expected to reduce emissions of nitrogen dioxide and particles by around 60 per cent between 1995-2005.
- Private sector environmental self-regulation: the Strategy identifies nine bodies or schemes working in this area, some with government support.
- Changes in consumer preferences: the Strategy identifies such changes in six areas, some prompted by government action, such as tax changes to encourage consumers to switch to less polluting fuels.
- Technological change: the Strategy identifies such changes in four areas, some prompted by government action.
- Action by local authorities: the Strategy identifies five areas in which authorities are taking relevant action.
- Action by the Department: the Strategy identifies relevant action in four areas, for example regarding transport and planning policies.
- Action by other government departments/agencies: the Strategy identifies relevant action in six areas.
- Cross-government initiatives: the Strategy identifies one such initiative.

Source: National Audit Office

4.14 Aside from the specific steps detailed earlier for local authorities, the Department has few formal mechanisms in place to guide or influence these other delivery bodies or agencies, and it does not have the authority to direct other departments (though it can direct its own Executive Agencies or Non-Departmental Public Bodies, for example, the Environment Agency) to take action to achieve the air quality objectives. However, the Department intends to retain the Interdepartmental Group in order to influence and monitor action by other departments, and expects them to ensure their policies help, if possible, towards the achievement of the objectives and to consult it on matters affecting the Strategy. The Department's Air and Environment Quality Division also plays a leading role in European Union policy development for air quality issues.

#### Did the Department establish mechanisms to measure and monitor progress, and to keep the Strategy under review?

- 4.15 In addition to ensuring that planned action to improve air quality is taken, the Department needs to manage two further risks to the achievement of the Strategy's aims. One is that the Department does not monitor air quality and may be unaware of emerging air quality trends and factors affecting progress towards the objectives. The other is that new information, or other developments, may affect the continued soundness of the Strategy or the air quality standards and objectives. We examined, therefore, whether the Department:
  - has ensured that it monitors air quality comprehensively and accurately;



- plans to review the Strategy, including the air quality standards and objectives.
- 4.16 The Department needed to ensure that its monitoring network will produce accurate and reliable information to allow assessment of compliance with the air quality objectives. The Department therefore needed to:
  - define objectives in ways which would permit outturns to be measured against them in practice;
  - have sufficient appropriately located monitoring sites;
  - ensure that the data collected from these sites was reliable.
- 4.17 Most work on the practicalities of measurement has been undertaken collaboratively at a European level. The Department and a technical contractor, the National Physical Laboratory, are represented on European working groups, and they told us that they were satisfied that the European Union limit values and their own objectives had both been defined in ways that could be measured by the UK's air quality monitoring network. However, the equipment currently used in the UK to monitor particles uses a different method of measurement from that specified in the Directive, with the result that the levels reported by this equipment are not directly comparable with the limit values in the Directive. The Department has commissioned AEA Technology to undertake a correlation exercise, which it believes will allow UK measurements to be compared with European limit values. The Department believes that several other European Union countries have a similar problem.
- 4.18 The Department uses 112 monitoring sites to monitor air quality across the UK. The location of these can be found on the AEA Technology website<sup>32</sup>. However, relatively few of the Department's sites monitor all or even most of the pollutants within the strategy. For example, whilst 83 sites monitor nitrogen dioxide, 61 sites monitor carbon monoxide, and only 23 monitor lead. And the density of monitoring sites per square kilometre is lower than in some other European countries, such as France and Germany.

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- 4.19 However, the ideal number and location of monitoring sites is determined by several complex scientific factors. The principles are set out in the first Air Quality Daughter Directive, and the Department commissioned AEA Technology to audit their monitoring network structure in 2000 against the requirements of the Directive. AEA Technology concluded that 14 additional sites were needed across the UK, and these have now been installed<sup>33</sup>. They also recommended that additional rural monitoring sites be provided, to improve the number of rural measurements available for the purpose of calibrating and validating its air quality models. The Department is considering what action to take in response to this.
- 4.20 Responsibility for managing the national monitoring network and controlling the quality of its output is split between several different bodies (Figure 16). Three organisations are responsible for the management and co-ordination of the network, including supervising the operation of monitoring stations by sub-contractors. The Department also employs AEA Technology and the National Physical Laboratory to check the quality of the monitoring data and ensure that monitoring results are accurate and reliable. The key procedures employed are:

#### 16 Organisational arrangements for monitoring air quality

Air quality is monitored by four different contractors.



Source: National Audit Office

Outside of the Department's national network, local authorities operate around 1,500 sites used for local purposes.

- Procurement of accurate and reliable measuring equipment. The central management and coordination units competitively procure new equipment and AEA Technology approves for scientific quality any equipment intended to be purchased.
- Maintenance of equipment quality and consistency. Local site operators are required to check the equipment every two weeks. Quality assurance and control teams undertake a secondary check by visiting sites every three to six months to check both the equipment and the manner in which the local site operators are operating the equipment. All equipment is calibrated using reference gases supplied by the National Physical Laboratory.
- Quality control of data produced. Every three months, the management and co-ordination contractors feed the data from the monitoring sites to the quality assurance and control teams, who review them for anomalies. The Directive requires that the total useable quality-assured data must be above 90 per cent of the number of measurements required by the Directive. The Department is currently achieving 92 to 93 per cent.
- 4.21 Data on air quality is published through the media and the Internet as it becomes available, though before it has been subject to quality control. AEA Technology also provides the Department with quarterly reports of quality-controlled information. The Department uses this information primarily for the purpose of reviewing and improving its modelling of air quality, and does not use it to assess on a regular basis whether, or by how much, policies affecting air quality might need to be adjusted to achieve the air quality objectives. This is because it considers that assessments of progress are best dealt with through its planned reviews of the Strategy. In addition, it considers that its models for

predicting future air quality are not yet reliable enough to allow "fine-tuning" of policy mechanisms in response to short term trends.

Does the Department plan to review the Strategy?

- 4.22 The Department is obliged under the Environment Act 1995 to keep the Strategy under review. It intends to carry out future reviews of the Strategy on a pollutantby-pollutant basis. The first such review, which is currently ongoing, is of the objectives for particles, benzene and carbon monoxide. The Department plans other future reviews covering nitrogen dioxide and objectives for the protection of ecosystems to be undertaken during 2002. The Department is also currently considering setting an objective for a further pollutant, polycyclic aromatic hydrocarbons.<sup>34</sup>
- 4.23 The Department has a five-year programme of policy and programme evaluations, and the Strategy is one of the evaluations being taken forward in 2001. The Department states that this will consider, amongst other things, how reliable the assessments made of costs and benefits and the efficacy of different policy mechanisms - in particular those mechanisms factored into the air quality forecasts, for example the impact of catalysts on car exhausts - have been in practice. Through addressing these issues, the Department should be able to build up a picture of the extent to which options have been selected on a sound base and the extent to which the Strategy has improved air quality. Such evaluations are commended by the Treasury's guidance on appraisal and evaluation<sup>35</sup> as leading to better decisions by policy makers, and have been carried out by other countries. The Dutch Environment Agency, for example, has constructed a model to show, and hence evaluate, the cumulative impact of various policies in improving air quality as compared to the "business-as-usual" position.

The Department published proposals for updating the Strategy on 17 September 2001.
 Appraisal and Evaluation in Central Government "The Green Book", 1997.

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## Appendix 1

### The air quality standards and objectives

Pollutant	Standards recommended by the Department's expert panel	Objective in 1997 Strategy	Objective in 2000 Strategy
Benzene	16.25µg/m <sup>3</sup> : annual mean	16.25µg/m <sup>3</sup> : running annual mean by end 31/12/2005	16.25µg/m <sup>3</sup> : running annual mean by end 31/12/2003
1,3-butadiene	2.25µg/m <sup>3</sup> : annual mean	2.25µg/m <sup>3</sup> : running annual mean by end 31/12/2005	2.25µg/m <sup>3</sup> : running annual mean by end 31/12/2003
Carbon monoxide	11.6mg/m <sup>3</sup> : 8-hour mean	11.6mg/m <sup>3</sup> : running 8-hour mean by end 31/12/2005	11.6mg/m <sup>3</sup> : running 8-hour mean by end 31/12/2003
Lead	0.25µg/m <sup>3</sup> : annual mean	0.5µg/m <sup>3</sup> : annual mean by end 31/12/2005	0.5µg/m <sup>3</sup> : annual mean by end 31/12/2004. 0.25µg/m <sup>3</sup> : annual mean by end 31/12/2008
Nitrogen dioxide	287µg/m <sup>3</sup> : 1-hour mean	287µg/m <sup>3</sup> : 1-hour mean by end 31/12/2005 (provisional)	200µg/m <sup>3</sup> : 1-hour mean; 18 exceedences <sup>36</sup> allowed by end 31/12/2005 (provisional)
		40µg/m <sup>3</sup> : annual mean by end 31/12/2005 (provisional)	40µg/m <sup>3</sup> : annual mean by end 31/12/2005 (provisional) 30µg/m <sup>3:</sup> annual mean by end
			31/12/2000
Ozone	100µg/m <sup>3</sup> : running 8-hour mean	100µg/m <sup>3</sup> : running 8-hour mean; 10 exceedences allowed by end 31/12/2005 (provisional)	100µg/m <sup>3</sup> : daily maximum of running 8-hour mean; 10 exceedences allowed by end 31/12/2005 (provisional)
Particles	50µg/m <sup>3</sup> : 24-hour mean	50µg/m <sup>3</sup> : running 24-hour mean; 4 days exceedences allowed by end 31/12/2005 (provisional)	50µg/m <sup>3</sup> : running 24-hour mean; 35 days exceedences allowed by end 31/12/2004
			end 31/12/2004
Sulphur dioxide	266µg/m <sup>3</sup> : 15-minute mean	266µg/m <sup>3</sup> : 15-minute mean; 35 exceedences allowed by end 31/12/2005 (provisional)	266µg/m <sup>3</sup> : 15 minute mean; 35 exceedences allowed by end 31/12/2005
			350µg/m <sup>3</sup> : 1-hour mean; 24 exceedences allowed by end 31/12/2004
			125µg/m <sup>3</sup> : 24 hour mean; 3 exceedences allowed by end 31/12/2004
			20µg/m <sup>3</sup> : annual mean and winter average by end 31/12/2000

## Appendix 2 The sources and health effects of the main pollutants

Pollutant	Main Sources	Principal health effects
Benzene	The combustion and distribution of petrol.	Studies of industrial workers exposed to high levels of benzene have demonstrated a higher risk of leukaemia.
1, 3-butadiene	The combustion of petrol.	The health effect of most concern is cancer of the lymphoid system and blood-forming tissues, lymphomas and leukaemias.
Carbon monoxide	Incomplete combustion of carbon- containing fuels. The main outdoor source is road transport.	The main effects are the formation of carboxyhaemoglobin, which reduces the capacity of the blood to carry oxygen and deliver it to the tissues, and blockage of important biochemical reactions in cells.
Lead	Most airborne lead comes from petrol- engined vehicles. Industry, and in particular non-ferrous metal smelters, may contribute to lead emissions in some areas.	Exposure to high levels of lead may cause problems in the synthesis of haemoglobin, effects on the kidneys, gastrointestinal tract, joints and reproductive system, and damage to the nervous system.
Nitrogen dioxide	All combustion processes produce nitrogen oxides. Road transport accounts for around half of total UK emissions of nitrogen oxides.	High levels of nitrogen dioxide can inflame the airways. Long-term exposure may affect lung function. In addition, exposure enhances the response to allergens in sensitised individuals.
Ozone <sup>1</sup>	Chemical reactions in the air caused by a combination of sunlight and other emissions, such as emissions from motor vehicles.	High levels of ozone may irritate the eyes and nose. At very high concentrations, the lining of the airways may become damaged and an inflammatory reaction may occur.
Particles	The sources of airborne particles include vehicle exhausts, sulphate and nitrate emissions and construction work.	Particle air pollution is associated with a range of health effects including effects on the respiratory systems, asthma, and mortality.
Sulphur dioxide	The burning of coal and heavy oils.	Sulphur dioxide may cause constriction of the airways, particularly in those suffering from asthma and chronic lung disease.

Note: 1. The Strategy is concerned only with ozone found at ground level. Protection of ozone in the upper atmosphere is the subject of a separate strand of environmental policy.

National Air Quality Strategy Source:

## Appendix 3

- 1 The past 20 years have seen many reforms in the work of government - for example, the creation of agencies, the privatisation of the nationalised industries, extensive contracting out and a greater focus on the delivery of services to the citizen. These reforms have, however, largely been confined to policy implementation rather than policy development, and the process of policymaking has not been subject to the same level of scrutiny or change.
- 2 The March 1999 White Paper Modernising Government identified an aim to develop a new and more creative approach to policy-making. The White Paper set out a number of key principles of modern policy-making (Figure A). The government established the Centre for Management and Policy Studies within the Cabinet Office to provide civil servants with training in better policy-making and to identify and disseminate best practice. The Centre has also launched a rolling programme of departmental peer reviews to provide an external perspective on progress being made in taking forward improvement opportunities identified through self-assessment. Peer review offers insights and possible solutions to particular problems in implementing Modernising Government.

### A The key principles of a modernised policy-making process

There are several expectations of the nature of a modern policy-making process

- Designing policy around shared goals and carefully defined results, not around organisational structures or existing functions
- Making sure policies are inclusive
- Avoiding unnecessary burdens
- Involving others in policy-making
- Improving the way risk is managed
- Becoming more forward- and outward-looking
- Learning from experience

Source: Modernising Government White Paper (March 1999)

## Policy-making and the Modernising Government agenda

B The nine core competencies for effective policymaking

A modern policy-making process has several key attributes

- Forward looking takes a long-term view, based on statistical trends and informed predictions, of the likely impact of policy
- Outward looking takes account of factors in the national, European and international situation and communicates policy effectively
- Innovative and creative questions established ways of dealing with things and encourages new ideas; open to comments and suggestions of others
- Using evidence uses best available evidence from a wide range of sources and involves key stakeholders at an early stage
- Inclusive takes account of the impact on the needs of all those directly or indirectly affected by the policy
- Joined-up looks beyond institutional boundaries to the Government's strategic objectives; establishes the ethical and legal base for policy
- Evaluates builds systematic evaluation of early outcomes into the policy process
- Reviews keeps established policy under review to ensure it continues to deal with the problems it was designed to tackle, taking account of associated effects elsewhere
- Learns lessons learns from experience of what works and what does not

Source: Professional Policy Making for the Twenty First Century, Cabinet Office, September 1999

# 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. The report's project team developed a model of policy-making with the assistance of policy makers from a number of departments, and used the model to undertake an audit of good practice. The Cabinet Office model identified nine core competencies of a fully effective policy-making process (Figure B).

- 4 In response to the White Paper, the Department of the Environment, Transport and the Regions established an Action Plan summarising the action already taken to improve its policy-making and outlining future initiatives to build on the work already completed. The key targets identified by the Department for "better policy-making" are shown in Figure C.
- 5 The Modernising Government White Paper stresses the importance of evidence-based policy-making, and the Department needed to make considerable use of scientific evidence in developing the Strategy. Two important sources of guidance on the use of such evidence have been developed in 2000. First, the Office of Science and Technology updated guidelines on the use of scientific advice in the policy-making process<sup>37</sup>. The revised guidelines emphasise the need for the Department to clearly identify the issues on which they need scientific advice: to then obtain a wide range of advice from the best sources - which may mean including either lay-persons or experts in non-scientific areas; and to then transparently publish the scientific advice, including the uncertainties and assumptions therein. Second, the Phillips report into Bovine Spongiform Encephalopathy (BSE) and variant Creutzfeldt-Jacob Disease<sup>38</sup> examined the use of scientific evidence in policy-making and highlighted several lessons to be learnt on the way departments obtain and use such evidence. These stressed the need for advisory committees to have appropriate members, for the scope and limitations of their advice to be transparently presented, and for departments to ensure that the advice is properly understood.

#### C The Department's key targets for better policy-making

The Department has set up several initiatives to respond to the challenge of modern policy-making

- By April 2001, to have introduced consolidated guidance on best practice for policy development and completed training for key personnel (30 per cent of front line policy jobs).
- By December 2002, to have reviewed three major areas of the Department's regulations in order to remove or minimise impacts on small business and the voluntary sector. This is in addition to a review being undertaken by the Driver, Vehicle & Operator Group.
- By March 2004, to have delivered the agreed programme of policy evaluation covering all of the Department's major policies.
- To reach agreement with other European countries to pursue at least two joint policy initiatives each year.
- Source: The Department of the Environment, Transport and the Regions' Modernising Government action plan

## Appendix 4

#### Interviews

We conducted a range of semi-structured interviews with the Department's staff and key stakeholders. Those interviewed included the Air and Environmental Quality Division of the Department; the Department of Trade and Industry; the Department of Health; HM Treasury; the UK Petroleum Industries Association; the National Society for Clean Air and the Local Government Association.

#### Document examination

Our examination included an examination of documents held by the Department as they related to the development of the Strategy, and of the following published documents:

- The National Air Quality Strategy (Department of the Environment, Transport and the Regions, 1997, Cm 3587).
- Quantification of the Effects of Air Pollution on Health in the UK (Committee on the Medical Effects of Air Pollutants, 1998).
- The Review of the National Air Quality Strategy (Department of the Environment, Transport and the Regions, 1999)
- An Economic Analysis of the National Air Quality Strategy objectives (Interdepartmental Group on Costs and Benefits, 1999).
- Source Apportionment of Airborne Particulate Matter in the UK (The Airborne Particles Expert Group, 1999).
- The Air Quality Strategy for England, Scotland, Wales, and Northern Ireland (Department of the Environment, Transport and the Regions, 2000, Cm 4548).
- Reports of the Department's Expert Panel on Air Quality Standards (various dates between 1994 and 1999).

#### Study methodology

#### Expert panel

We established a small expert panel to advise us on the study:

The members of the expert group:

Professor Martin Smith	Professor of Politics, University of Sheffield
Professor John Chesshire	Honorary Professor, Science Policy Research Unit, University of Sussex

### Survey of the members of the Air Quality Forum

A postal survey on the work of the Air Quality Forum was sent to all 43 of its members on 3 November 2000. We received responses from 27 members (63 per cent), though 4 of these felt that they had not attended sufficient Forum meetings to be able to complete the survey in full.

The survey was organised into four parts:

- Part 1: membership of the Air Quality Forum
- Part 2: the terms of reference of the Air Quality Forum
- Part 3: the consultation process
- Part 4: the impact of the Air Quality Forum

A list of the members of the Forum is reproduced at Appendix 5.

## Appendix 5

## Membership and terms of reference of key committees and advisory groups

#### The Department's Expert Panel on Air Quality Standards (EPAQS)

#### Terms of reference

To advise the Secretary of State for the Environment, Transport and the Regions, Scottish Ministers, the National Assembly for Wales and Department of the Environment (Northern Ireland) as required, on non-occupational ambient air quality standards, with particular reference to the levels of airborne pollutants at which no or minimal effects on human health are likely to occur:

- taking account of the best available evidence of the effects of air pollution on human health and of progressive development of the air quality monitoring network; but
- without reference to the practicality of abatement or mitigation measures, the economic costs and economic benefits of pollution control measures or other factors pertinent to the management rather than the assessment of risk;
- to identify gaps in the knowledge needed for standard setting and suggest potential priority areas for future research;
- to advise on other aspects of air quality and air pollution referred to it;
- for the purpose of informing the development of policy on the improvement of air quality and increasing public knowledge and understanding of air quality issues.

#### Membership

Professor A Seaton, CBE, MD, FRCP, FRCPE, FFOM, FMedSci (Chairman).	Professor and Head of Department, Environmental and Occupational Medicine, Aberdeen University. Consultant physician to Aberdeen Royal Hospitals.
Professor J G Ayres, BSc, MD, FRCP, FRSA.	Consultant Physician in Respiratory and General Medicine, Birmingham Heartlands Solihull NHS Trust. Professor of Respiratory Medicine at the University of Warwick.
Professor H R Anderson, MD, MSc, FRCP, FFPHM.	Professor of Epidemiology and Public Health at St. George's Hospital Medical School, London.
Dr P J Baxter, MD, MSc, FRCP, FFOM.	Consultant Physician in occupational and environmental medicine at Cambridge University and Addenbrooke's Trust Hospital, Cambridge.
Professor P G Blain, MB, BS, PhD, FRCP, FFOM.	Professor of Environmental and Occupational Medicine, University of Newcastle.
Professor P G J Burney, MA, MD, FRCP, FFPHM.	Professor of Public Health Medicine and Chairman of the Division of Primary Care and Public Health Sciences at King's College London.
Dr J W Cherrie, BSc, PhD, FBIOH.	Senior Lecturer in Occupational Hygiene in the Department of Environmental and Occupational Medicine at Aberdeen University.
Dr A E Cockcroft, MD, FRCP, DIH, FFOM.	Consultant/Senior Lecturer in Occupational Medicine at the Royal Free Hospital and the Royal Free and University College Medical School of University College London.
Professor D N M Coggon, MA, PhD, DM, FRCP, FFOM, FMedSci.	Professor of Occupational and Environmental Medicine at the Medical Research Council Environmental Epidemiology Unit, University of Southampton. Consultant in Occupational Medicine with Southampton University Hospitals Trust.

Dr D G Derwent, MA, PhD, OBE.	UK Meteorological Office.
Professor R M Harrison, PhD, DSc, FRSC, FRSH, FRMetS, Hon MFPHM, Hon FFOM.	Professor of Environmental Health, University of Birmingham.
Professor S T Holgate, BSc, MD, DSc, FRCP, FRCPE, CBiol, FIBiol, FRSA, FMedSci.	MRC Clinical Professor of Immunopharmacology and Honorary Consultant Physician at Southampton General and Royal Bournemouth Hospitals.
Mr J F Hurley, MA.	Director of Research at the Institute of Occupational Medicine, Edinburgh.

#### Department of Health's Committee on the Health Effects of Air Pollution (COMEAP)

#### Terms of reference

At the request of the Department of Health:

- To assess, and advise Government on, the effects upon health of air pollutants of both indoor and outdoor air, and to assess the adequacy of the available data and the need for further research.
- To co-ordinate with other bodies concerned with the assessment of the effects of exposure to air pollutants and the associated risks to health and to advise on new scientific discoveries relevant to the effects of air pollutants upon health.

#### Membership

There is a degree of commonality between the membership of COMEAP and EPAQS. Eight out of the thirteen EPAQS members are also present on COMEAP.

Professor S T Holgate, BSc, MD, DSc, FRCP, CBiol, FIBiol, FRCP, FRCPE, FRSA, FMedSci, (Chairman).	MRC Clinical Professor of Immunopharmacology and Honorary Consultant Physician at Southampton General and Royal Bournemouth Hospitals.
Professor P G J Burney, MA, MD, FRCP, FFPHM, (Deputy Chairman).	Professor of Public Health Medicine and Chairman of the Division of Primary Care and Public Health Sciences at King's College London.
Professor H R Anderson, MD, MSc, FRCP, FFPHM.	Professor of Epidemiology and Public Health at St. George's Hospital Medical School, London.
Dr B Armstrong, BA, MSc, PhD.	Lecturer, London School of Hygiene and Tropical Medicine.
Professor J G Ayres, BSc, MD, FRCP, FRSA.	Consultant Physician in Respiratory and General Medicine, Birmingham Heartlands Solihull NHS Trust. Professor of Respiratory Medicine at University of Warwick.
Professor P G Blain, MB, BS, PhD, FRCP, FFOM.	Department of Environmental and Occupational Medicine, University of Newcastle.
Professor K Donaldson, BSc, PhD, DSc, FIBiol, FRCPath.	Head of Biomedicine Research Group/Professor, School of Life Sciences, Napier University.
Dr A Gavin, MB, BCh, BAO, FFPHM.	Director, NI Cancer Registry, Institute of Clinical Science, Belfast.
Lord Harris, MA.	House of Lords.

Professor R M Harrison, PhD, DSc, FRSC, FRMetS, FRSH, Hon MFPHM, Hon FFOM.	Professor of Environmental Health, University of Birmingham.
Mr J F Hurley, MA.	Director of Research at the Institute of Occupational Medicine, Edinburgh.
Professor W McNee, MB, ChB, MD, FRCP (G), FRCP (E).	Respiratory Physician, ELEGI, Colt Research Laboratories, Edinburgh.
Dr J Pritchard, BSc, PhD.	Glaxo Wellcome R & D.
Professor P Poole-Wilson, MB, BChir, BA, MA (Camb), MD, FRCP, FACC.	National Heart and Lung Institute, Imperial College School of Medicine, London.
Professor R Richards, BSc, PhD, DSc.	School of Molecular and Medical Biosciences, University of Cardiff.
Professor A Seaton, CBE, MD, FRCP, FRCPE, FFOM, FMedSci.	Professor and Head of Department, Environmental and Occupational Medicine, Aberdeen University. Consultant physician to Aberdeen Royal Hospitals.
Professor D Strachan, BA, MB, ChB, MD, MSc, MRCGP, FRCP, FFPHM.	Department of Public Health Medicine, St George's Hospital Medical School, London.
Professor D Walters, BSc, MB, BS, FRCP, FRCPCH.	Professor of Paediatrics, Department of Child Health, St George's Hospital Medical School, London.
Dr S Walters, BSc, MRCP, FFPHM.	Senior Lecturer in Public Health, Medical School, University of Birmingham.

#### The Air Quality Forum (the Forum)

#### Terms of reference

To provide a mechanism by which stakeholders can put views to Government on the review of the Air Quality Strategy and the implementation of local air quality management. This will involve:

- exchanging ideas and information
- maintaining an independent overview of the implementation of the Strategy and progress towards achieving its objectives
- identifying additional policy measures or voluntary action necessary to achieve those objectives
- providing feedback on progress on local air quality management

#### Membership

Government Departments and Agencies	Department of Trade and Industry <sup>*39</sup> , Department of Health <sup>*</sup> , Number 10 Policy Unit, HM Treasury <sup>*</sup> , Cabinet Office, Health and Safety Executive <sup>*</sup> , Ministry of Agriculture Fisheries and Food, Ministry of Defence, Environment Agency <sup>*</sup>
Devolved Administrations	Scottish Executive*, National Assembly for Wales*, Scottish Environmental Protection Agency*, Department of the Environment (Northern Ireland)*, Northern Ireland Industrial Pollution Inspectorate*
Local Government	Local Government Association, Convention of Scottish Local Authorities*, Welsh Local Government Association*, Association of London Government, Greater London Authority
Business and Industry	Confederation of British Industry, UK Petroleum Industry Association*, Chemical Industries Association*, Environment Industries Commission, Federation of Small Businesses, Scottish Federation of Small Businesses, Electricity Association*
Transport groups	The Freight Transport Association <sup>*</sup> , Passenger Transport Executive Group, Confederation of Passenger Transport (UK) <sup>*</sup> , Society of Motor Manufacturers and Traders, Transport 2000 <sup>*</sup> , The Automobile Association <sup>*</sup> , RAC Motoring Services <sup>*</sup>
Health groups	British Medical Association*, The British Lung Foundation*, National Asthma Campaign*, British Heart Foundation
Environmental groups	National Society for Clean Air*, Chartered Institute of Environmental Health*, Royal Environmental Health Institute of Scotland*, Friends of the Earth*, National Trust, Royal Society for the Protection of Birds

## Appendix 6 Key dates in the development of the 1997 and 2000 Air Quality Strategies

July 1995	The Environment Act 1995 becomes law
March 1997	The Air Quality Strategy for England, Scotland, Wales and Northern Ireland published
January 1998	The Department of Health's Committee on the Medical Effects of Air Pollutants publishes its report, Quantification of the Effects of Air Pollution on Health in the UK
	Remit of the review of the Strategy established
July 1998	Timetable setting out the main drivers of the review established
December 1998	Target date for completion of the review of the first Strategy
January 1999	Interim report of the Interdepartmental Group on Costs and Benefits is published
	Department of Health's ad-hoc group on the Economic Appraisal of the Health Effects of Air Pollution publishes its report
	Airborne Particles Group publishes a report on the sources of particles
	The review of the Air Quality Strategy is published
July 1999	The European Union Air Quality Daughter Directive was adopted
August 1999	The Department publishes the draft revised Air Quality Strategy
January 2000	The Department publishes the second Strategy
March 2000	The Department publishes a Local Air Quality Management framework
May 2000	The Department publishes technical Local Air Quality Management guidance
31 December 2000	All local authority assessments due to be submitted