AIR QUALITY: PLANNING FOR ACTION

Part 2 of the NSCA's Guidance on the Development of Air Quality Action Plans and Local Air Quality Strategies

National Society for Clean Air and Environmental Protection

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Section 1: Introduction

This guidance is designed to be used in conjunction with the *Air Quality Action Plans: Interim Guidance for Local Authorities* published by NSCA in November 2000. This document aims to help implement the *Interim Guidance* by concentrating on the *process* of Air Quality Action Planning. The *Interim Guidance* outlined some of the options available to local authorities (mainly through a wall chart) for improving areas of poor air quality and began to identify the local authority and wider functions that might need to be involved. It also gave a methodology relating to the identification of sources, estimating the air quality improvement required to achieve the air quality objectives, and how to consider the cost effectiveness, non-air quality impacts and take account of some of the likely perceptions of both the public and politicians.

This volume of guidance will not reiterate any of these necessary steps, but instead attempt to place these discrete elements into context through case study scenarios, which will illustrate the *process* of Air Quality Action Planning. A guidance document could not be produced to be prescriptive for all situations, instead this document is designed to give authorities one means of undertaking the challenge of successfully producing, and more importantly, *implementing* their Air Quality Action Plan or local/regional air quality strategy.

Since the *Interim Guidance* has been produced, a number of workshops have been held both relating to consultation and participation, and to the prioritisation of options for an Air Quality Action Plan. Outcomes from both sets of workshops have been incorporated into this guidance providing ideas about how to encourage participation from relevant bodies and individuals and also providing some initial methodologies for prioritisation.

This document will not only provide an overview of one approach to the Action Planning process, but will also act as a starting point for other sources of assistance. Section 2 which outlines the step by step process, underlies all the case study scenarios, and includes further reading sections. As authorities embark on the Action Planning process, it is anticipated that their experiences and more literature resources will emerge. This evolving information will be available on www.uwe.ac.uk/aqm/centre/AQMAs/aqaps.html. Application of action planning in a wider context, including its application for non-statutory plans and generally to multi-professional problems is one of the key focuses of this guidance.

Useful references of literature available are provided within individual sections. Some specific references will apply to more than one section of the guidance, but are referenced just once.

MAIN POINT

This guidance is to be used in conjunction with the earlier Interim Guidance for Air Quality Action Plans, and does not simply replace it, but instead illustrates Air Quality Action Planning through a step by step guide to the process and a series of case study scenarios.

Objectives and Layout of this Guidance

In *Air Quality Action Plans: Interim Guidance for Local Authorities*, NSCA set out a theoretical approach to the development of Action Plans (AQAPs), primarily following the declaration of an Air Quality Management Area. However, as will be shown later on in this document, the guidance can equally be applied to help steer the development of non-statutory local and regional Air Quality Strategies and policies.

When the *Interim Guidance* was published, NSCA gave a commitment to producing further guidance, which would elaborate on the content of the first document. It was decided, following discussion with some local authorities, that this document should not simply provide greater detail on the elements of the *Interim Guidance*, as this would:

- simply replicate work already carried out by others, for which references could be provided;
- result in a much longer document, which would take longer to produce and which would go against the expressed wish of local authorities for short, snappy guidance;
- become less generally applicable as there was a shift of emphasis away from *process* towards *detail* which would be relevant to fewer situations the finer it became.

Therefore, this document attempts to illustrate how the *Interim Guidance* can be applied in practice, and it develops the ideas initiated in the earlier document on the process for developing Air Quality Action Plans and Strategies.

There are two main parts to this document. The first deals with the step by step process for action planning (Section 2) and air quality strategies (Section 3), and includes a series of suggested process and organisational flow charts. The second part explores the ways in which this process can be applied in real, or near real, situations, through a series of Case Study Scenarios (CSS). Each of these attempts to map out different air quality problems and draw out both their common and individual issues, and to suggest a process for action plan development. The scenarios are based on emerging outcomes from the results of the first round of UK air quality review and assessments, for which the involvement of the University of the West of England, Bristol and Air Quality Consultants Ltd. has been invaluable.

The five scenarios therefore reflect the following types of authority:

- rural borough with large trunk road running through;
- traditional market town;
- mainly rural authority with industrial areas;
- large metropolitan area, highly urbanised; and
- rural borough, not requiring an air quality management area.

They also address a number of different air quality problems, reflecting the emerging outcomes of the first phase of review and assessment, for example:

- exceedance affecting a very small number of properties, where the source is a motorway or major trunk road (or junction);
- exceedance is confined to one or two narrow, congested streets, typically the main shopping street (High Street);
- exceedance due to widespread urban congestion, in town centre and along arterial routes;
- exceedance in part due to groups of small industrial processes; and
- exceedances due to large, Part A regulated industrial process.

It is not expected that every local authority with an air quality problem will fit into one of the categories represented by the scenarios, or that local authorities follow the suggested processes to the letter. It may be that parts of one or more scenarios are used or that the guidance simply provides some helpful hints for a local authority to develop their own process. Some further issues relevant to some local authorities, which have not been included in the scenarios are included in Appendix 2, for example, fugitive and uncontrolled sources such as quarries, and issues relating to airports and large retail centres.

It is important that before setting in place an entirely new process to deal with air quality management, a survey or audit of the authority's current activities is undertaken. It may well be that a process exists, with which officers are already familiar and comfortable, for example Chief Officers working groups, Agenda 21 groups, or liaison committees, that could be adapted for the purpose of air quality action planning. Where possible, air quality management should be associated with other initiatives such as development plans, community strategies, Best Value plans, etc. This will help to raise the profile of air quality, assist in developing and making links to other non-environment focused professions, and help engender corporate responsibility and political support.

Devolved Administrations within the UK

As with the *Interim Guidance*, this document is intended for use by all local authorities across the UK with a responsibility for air quality management under the Environment Act 1995.

The statutory bodies responsible for undertaking various functions that will be necessary as part of the action planning process are identified in Table 1. Where reference is made to all of the UK government administrations, this will be referenced in the document as DETR* and devolved administrations, meaning the Scottish Executive, National Assembly for Wales, Greater London Authority and Department of Environment Northern Ireland.

Table 1. Regional administrations and agencies

Function	Administrations and Agencies
Government	Department of Environment, Transport and the Regions Scottish Executive National Assembly for Wales Greater London Authority Department of Environment, Northern Ireland
Regional Government and Governmental Agencies	English Regional Development Agencies Scottish Enterprise/Highlands & Islands Enterprise Welsh Development Agency Greater London Authority Department for Regional Development (DRD) and Department for Enterprise, Trade and Investment (DETI) (Northern Ireland)
Highways	Highways Agency Scottish Executive National Assembly for Wales Transport for London Road Services, Executive Agency of the Department for Regional Development (DRD) (Northern Ireland)
Environmental Protection	Environment Agency (Wales, England and London) Scottish Environment Protection Agency Environment and Heritage Service, Executive Agency of the Department of Environment (DoE) (Northern Ireland)

MAIN POINT

Local authorities need to develop a well defined process for action planning, preferably based on existing processes and activities. It is important to associate the process of Action Planning with other activities and functions.

* At the time of writing, Government responsibilities in England for environmental issues, transport, land use planning and local government affairs lay with the Department of the Environment, Transport and the Regions (DETR). On 8 June, 2001, restructuring meant that air quality and noise were vested in the Department of Environment, Food and Rural Affairs (DEFRA), with transport and planning moving to the Department of Transport, Local Government and the Regions (DTLR). Responsibility for Government Offices lies with the Cabinet Office.

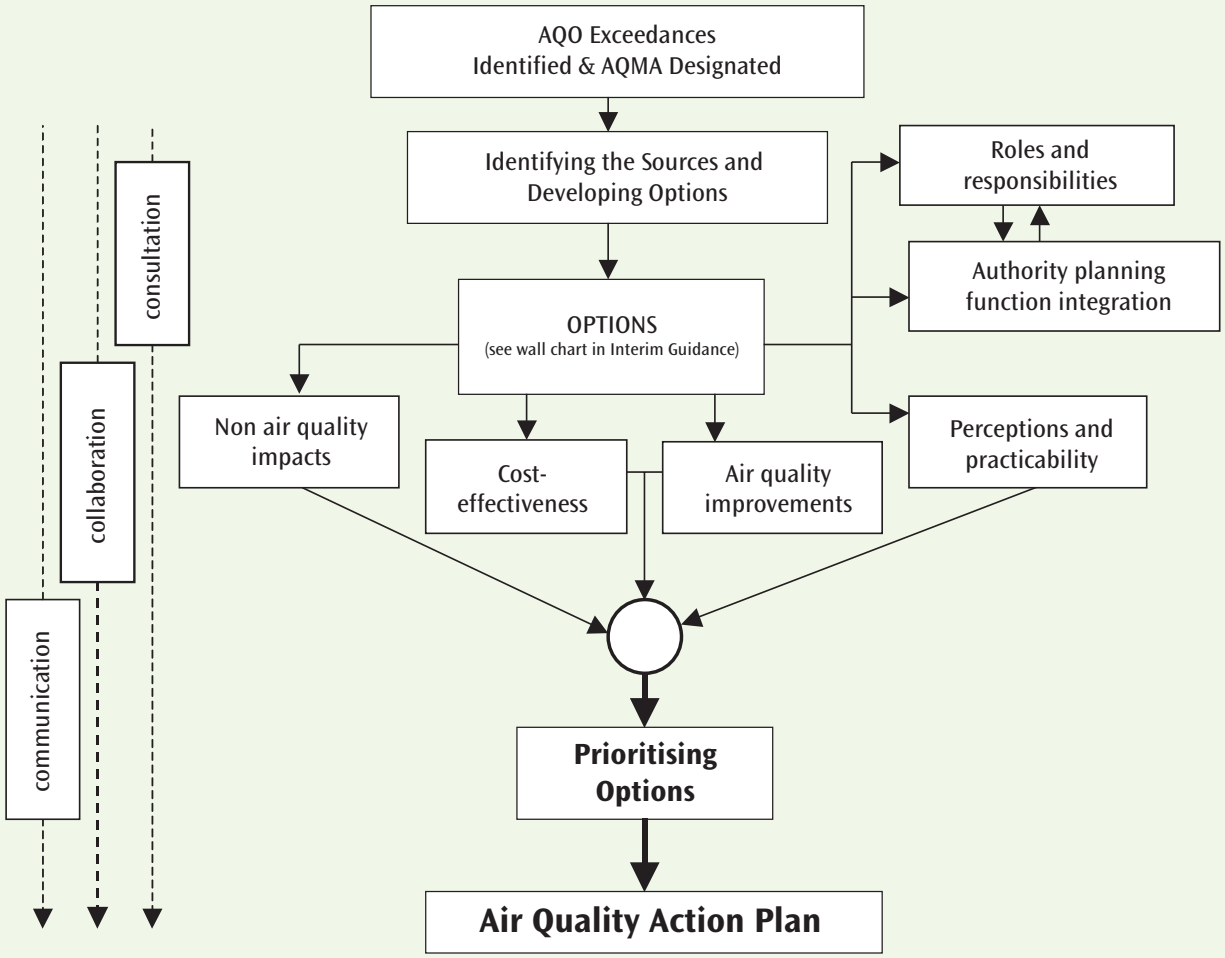
Functional arrangements for Scotland, Wales and Northern Ireland are not affected.

Section 2: Step by Step Process

Introduction

In the *Interim Guidance*, the process set out in Figure 1, below, was suggested as a way forward for the development of Air Quality Action Plans. This was, in part, modelled on the Royal Commission on Environmental Pollution's 21st Report, *Setting Environmental Standards*. While this process remains the focus of NSCA's guidance, it is more useful through simplification, to draw out the main elements, and to elaborate on key areas. It is worth noting that whilst the *Interim Guidance* was aimed primarily at the development of Air Quality Action Plans as required by Section 84 of the Environment Act 1995, the general principles can be applied more widely. Specifically, the generic process set out in this section can be applied to the development of local air quality strategies, although these are likely to consider wider issues than statutory action plans. In recognition of this, a separate process diagram has been developed for local air quality strategies (Figure 7, page 29).

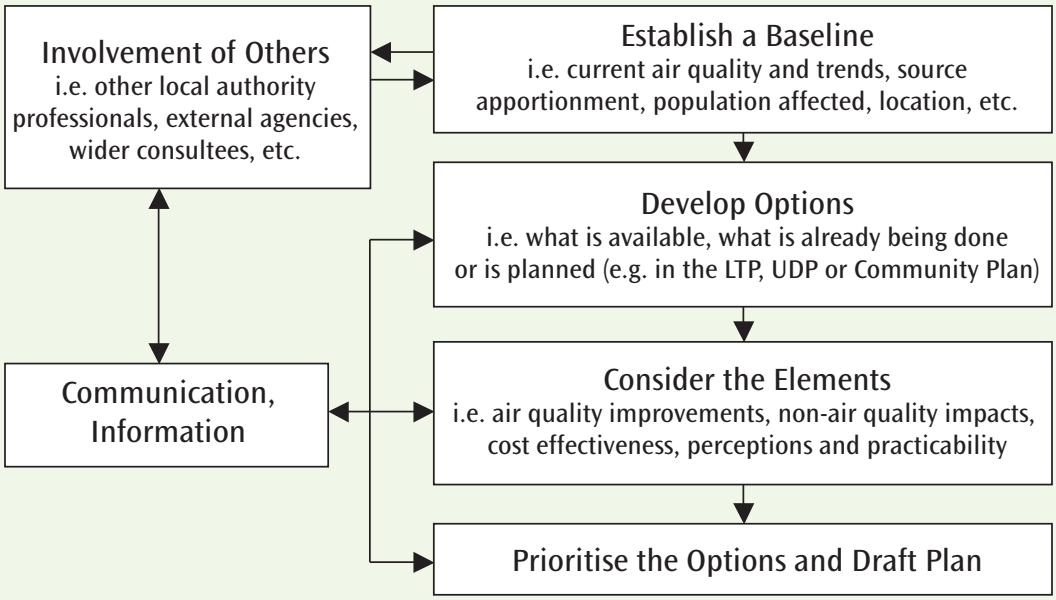
Figure 1. The process for developing Air Quality Action Plans



The *Interim Guidance* considered each component or element of the action planning process (e.g. consideration of non-air quality impacts), as identified in Figure 1, where there was a focus on the development of potential options. This second guidance document does not seek to re-address these components, but rather their importance in the overall prioritisation and process of delivering an action plan. It is therefore important that this document is used in conjunction with the *Interim Guidance* (from NSCA or www.uwe.ac.uk/aqm/centre/AQMAs/aqaps.html).

Figure 2 demonstrates the basic elements for the development of any air quality action plan or strategy. There are, however, other essential elements and components not expressed on the diagram, relating to consultation, participation and feedback mechanisms, all of which are important to the initial success and long term effectiveness of the plan or strategy being developed.

Figure 2. The basic stages in action planning



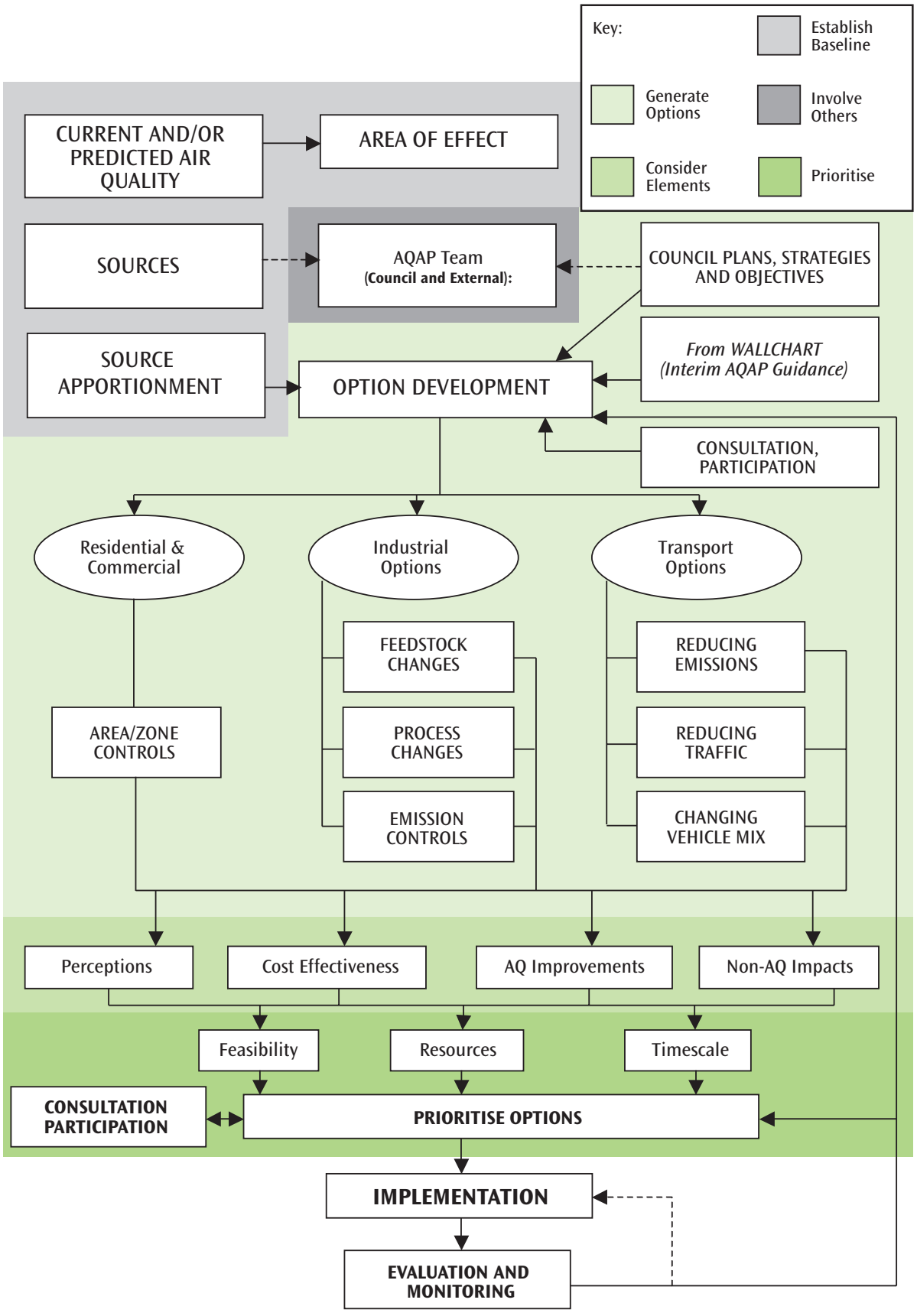
Using the elements set out in Figure 2, above, a more detailed process diagram has been developed, shown in Figure 3 on page 8. This flow diagram forms the basis of the worked scenarios used later in this guidance (see Section 4). This section will focus on each of the main stages in the process and covers the following broad headings:

- Principles of air quality action planning;
- Establishing the baseline;
- Involving other stakeholders;
- Generating options;
- Considering the elements;
- Prioritising options;
- Implementation and monitoring;
- Consultation and participation.

MAIN POINT

Establish a baseline, develop your options, consider the necessary elements (air quality improvements, wider impacts, cost effectiveness, perceptions and practicability) then prioritise the options and draft the Action Plan, involving colleagues, agencies and wider stakeholders.

Figure 3. The action planning process



Principles of Action Planning

In general terms, the following principles should be applied to the process of air quality action planning:

i The Action Plan should be based on the best available data.

ii The Action Plan should be developed by a consensus-based approach, and the principles of consultation, as set out in the 1999 NSCA publication *Consultation for Local Air Quality Management: The How To Guide*, should apply.

iii The objectives of the Action Plan should be clearly defined.

iv The Action Plan should have a clearly defined development process.

v The Action Plan should consider the short, medium and long term (up to 10 years) and should not reject options simply because their implementation and/or effect timescale extends beyond the relevant air quality objective compliance date.

vi Those responsible for implementing and/or undertaking any proposed action should be involved in the development of the Action Plan at the earliest stage possible.

vii The Action Plan should not consider air quality in isolation, but should take into account the wider social, economic and environmental considerations of the proposed actions, and should attempt to integrate these with the wider plans and strategies to be carried out by the local authority and others.

viii The Action Plan should consider the cost of the actions, both in terms of capital and revenue, and provide a basic assessment of cost effectiveness.

ix The content of the Action Plan should be clearly communicated to the general public, across the whole of the local authority's area, or beyond.

General advice and information on action planning is contained in DETR and Scottish Executive Guidance and is listed below, along with examples in practice and more academic discussion of emerging ideas.

Legislative Framework and Guidance

The following DETR and Scottish Executive Guidance Notes provide both an introduction to air quality issues and put into a UK context the legislative and existing guidance. Chapter 3 of LAQM.G2(00)/LAQM.G2(S)(00) for example, devotes three pages (7-9) to action plans for management areas and includes a bullet pointed listing of key considerations. Available from:
www.environment.detr.gov.uk/airq/laqm.htm and
www.scotland.gov.uk/environment/airquality/laqm.asp

- LAQM.G1(00)/LAQM.G1(S)(00) Framework for Review and Assessment of Air Quality, Part IV, Environment Act 1995.
- LAQM.G.2(00)/LAQM.G.2(S)(00) Developing Local Air Quality Strategies and Action Plans: the Main Considerations, Part IV, Environment Act 1995.
- LAQM.G3(00)/LAQM.G3(S)(00) Air Quality & Traffic Management, Part IV, Environment Act 1995.
- LAQM.G4(00)/LAQM.G4(S)(00) Air Quality and Land Use Planning, Part IV, Environment Act 1995.

The State of the Environment – Air Quality Report, published by the Scottish Environment Protection Agency (SEPA) (2000) provides an introduction to the air quality issues in Scotland, including legislative issues, and clearly defines the roles and responsibilities of the various bodies in Scotland (which are slightly different to that in England and Wales). This Report is considered appropriate to areas bordering on Scotland, in addition to those within Scotland. www.sepa.org.uk/publications/environmental_reports/index.htm)

Reference should also be made to guidelines for the preparation of Development Plans and Local Transport Plans (LTPs):
- DoE (1992) Development Plans – *A Good Practice Guide*, DoE, HMSO, London
- LTP guidance at www.detr.gov.uk/ (search for *Local Transport Plans*)
- DETR has issued guidance on the appraisal of road schemes, including air quality and other environmental issues. www.detr.gov.uk/itwp/appraisal/guidance/index.htm

Examples in Practice

- The Victoria Transport Policy Institute can assist with: identifying better transportational solutions; identify cost and benefits and equity impacts of alternative transportation policies; compare and evaluate alternatives and create a bridge between theory and practice. (www.vtpi.org/tdm/)
- Bond, A.J. and Brooks, D.J. (1997) *A Strategic Framework to Determine the Best Practicable Environmental Option (BPEO) for Proposed Transport Schemes*, Journal of Environmental Management (1997) 51, p305-321; includes useful methods which could be transposed to the development of AQAPs.
- Bridgman, H. (2000) *Air Pollution Management in Australia: The Example of Newcastle, NSW*, Air Quality Management p159-260; Longhurst, J.W.S., Elsom, D.M. and Power, H. (Eds) WIT Press, Southampton; provides a detailed description of air pollution management in Australia, including tables of AQAP options.
- Daly, M. (Ed) (1998) *Good Practice in European Urban Air Quality Management*, EC Project Ref: 96/760/3060/PVE/A3/MM, Sheffield City Council on behalf of DGXI, Sheffield, UK; based on a series of seminars and workshops. (euronet.uwe.ac.uk/aqm/projects.htm)

- Ecotech Research and Consulting Ltd. (1993) *Reducing Transport Emissions Through Planning*, Report Prepared for the Departments of Environment and Transport, HMSO, London; provides practical examples of reducing transport emissions through planning.
- The World Bank includes guidance on assessment, policy and management, industrial process descriptions, and examples of good practice, available via its Pollution Prevention and Abatement Handbook (wbln0018.worldbank.org/essd/essd.nsf/Docs/TOC)

Some Useful Academic References

- Beattie C.I., Longhurst, J.W.S. and Woodfield, N.K. (2001). *Air Quality Management: Evolution of Policy and Practice in the UK as Exemplified by the Experience of English Local Government.* Atmospheric Environment, 35 (2001) p1479-1490. Provides a useful discussion of the current models for air quality management in the UK and how it is expected to change under the EC Framework Directive regime.
- Beattie C.I., Longhurst, J.W.S. & Woodfield, N.K. (2000). Air Quality Management: Challenges and Solutions in Delivering Air Quality Action Plans. *Energy and the Environment*. 11(6) p729-747.
- Elsom, D.M. (1992). *Air Pollution Control Strategies*; Chapter 7: Atmospheric Pollution: A Global Problem (2nd Edition). Blackwell Publishers, London; includes examples of management approaches.
- Bruff, G.E. and Wood, A.P. (2000). *Local Sustainable Development: Land Use Planning's Contribution to Modern Local Government*. Journal of Environmental Planning and Management, 43(4), p519-539.
- Gibbs, D., Longhurst. J.W.S. and Braithwaite, C. (1996). *Moving Towards Sustainable Development? Integrating Economic Development and the Environment in Local Authorities*. Journal of Environmental Planning and Management 39(3) p317-332.
- Hales, R. (2000). *Land Use Development Planning and the Notion of Sustainable Development: Exploring Constraint and Facilitation within the English Planning System*. Journal of Environmental Planning and Management, 43(1), p99-121.
- Jones, P., Williams, J. and Lannon, S. (2000). *Planning for a Sustainable City: An Energy and Environmental Prediction Model*. Journal of Environmental Planning and Management, 43(6), p855-872.

Establishing a Baseline

As with any action planning process, it is important to have a well-defined data baseline upon which to base the Action Plan and against which its success can be measured. In this context, the most important information will relate directly to air quality, and will include the following:

- Current air quality status, identified by pollutant and objective;
- Likely future trends, and known developments, over the next five to ten years, under a *business as usual* scenario;
- The sources of air pollution and their relative contribution to air quality (source apportionment);
- Annual, weekly and diurnal variations for both emissions and air quality;
- The specific locations affected by poor and impoverished air quality;
- The extent to which the public, and particular sensitive groups within it, are exposed to predicted air quality objective exceedances.

Most of this information should arise from the air quality review and assessment process, particularly Stage 3 assessments, undertaken prior to the declaration of an Air Quality Management Area, under Section 82 of the Environment Act 1995. This will be supplemented by the "further review", or Stage 4 assessment, required by the Act when an AQMA is declared, and more specifically through source apportionment. The DETR is currently developing guidance on Stage 4 Assessments. Stage 4 should be used to fill data gaps in order that the action planning process should be fully informed, as well as to confirm that the original AQMA designation was correct. The DETR draft guidance on Stage 4 assessments can be found at www.uwe.ac.uk/aqm/review

The deadline for reporting on the Stage 4 Assessment is 12 months following the declaration of an AQMA, this being one of the only statutory deadlines included in Part IV of the Environment Act 1995. However, local authorities have been advised by government that they should not wait for the conclusion of Stage 4 before commencing work on the Action Plan, and that the two processes should run contiguously, for the first 12 months at least. Stage 4 will therefore inform the action planning process as it develops, and, to a certain extent, the action planning process will help define what should be covered within the Stage 4 assessment. However, the action planning process should be flexible enough to include new or updated information whenever it becomes available, whether or not it is part of the Stage 4 Assessment.

MAIN POINT

Baseline information will be enhanced by the "Stage 4" further review of air quality following an AQMA designation and this will inform the development of Action Plans. The Stage 4 review and the development of the Action Plan must be progressed together.

Advice and information on the review and assessment of baseline air quality (current and future) are listed below in terms of DETR and Scottish Executive Guidance, examples in practice and more academic discussion of emerging ideas.

Government Guidance

The following DETR and Scottish Executive Guidance Notes provide specific information relating to monitoring, compilation of emission inventories and modelling for all stages of review and assessment. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland provides the best summary of national trends in air quality although the Environment Agency and Scottish Environment Protection Agency and the Highways Agency provide more specific data.

The following documentation is available from
www.environment.detr.gov.uk/airq/laqm.htm and
www.scotland.gov.uk/environment/airquality/laqm.asp

- The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Cm4548, The Stationery Office, London
- UK Air Quality (England / Scotland / Wales) Regulations 2000
- The United Kingdom National Air Quality Strategy and Local Air Quality Management, Environment Circular 15/97, The Stationery Office, London
- LAQM.TG1(00) Monitoring for Air Quality Reviews and Assessments, Part IV, Environment Act 1995
- LAQM.TG2(00) Preparation and Use of Atmospheric Emission Inventories, Part IV, Environment Act 1995
- LAQM.TG3(00) Selection and Use of Dispersion Models, Part IV, Environment Act 1995
- LAQM.TG4(00) Review and Assessment Pollutant Specific Guidance, Part IV, Environment Act 1995
- Draft Guidance to Local Authorities on the Further ("Stage 4") Assessments of Air Quality Required under Section 84, Environment Act 1995, available at www.uwe.ac.uk/aqm/review/index.html
- Assistance with the review and assessment of PM_{10} concentrations in relation to the proposed EU Stage 1 Limit Values is available at www.aeat.co.uk/netcen/airqual/reports/stanpm/spmain.html

Further guidance on monitoring, inventory compilation and dispersion modelling is available at the following sites:

- Design Manual for Roads and Bridges (for vehicular emission factors) at www.official-documents.co.uk/document/ha/dmrb/index.htm
- Guidance for Estimating the AQ impact of Stationary Sources (GN24). National Centre for Risk Analysis and Options Appraisal, Environment Agency. November 1998.
- DETR emissions factor database www.london-research.gov.uk/emission/efdmain.htm
- The Mineral Planning Guidance Note 11 (draft) Controlling and Mitigating the Environmental Effects of Minerals Extraction in England, provides useful data on fugitive dust sources, means of assessment and control, at www.planning.detr.gov.uk/consult/mpg11/index.htm
- The Airborne Particles Expert Group (APEG) report, providing details of sources, emissions and trends, ambient levels and management of particulates at www.environment.detr.go.uk/airq/airbornepm/index.html

Further information on air quality criteria is available:

- The Expert Panel on Air Quality Standards (EPAQS) reports at www.environment.detr.gov.uk/airq/aqs/index.htm
- Consultation on the proposed regulations transposing the EC Air Quality Framework Directive and 1st Daughter Directive at www.environment.detr.gov.uk/consult/aqframe/index.htm
- World Health Organisation air quality guidelines and background information available at www.who.int/peh/air/Airqualitygd.htm
- The effects of air pollution on health are evaluated by the Department of Health at www.doh.gov.uk/hef/airpol/airpolh.htm This site includes a link to the Committee on the Medical Effects of Air Pollutants (COMEAP) web site with reports available for downloading.

Assessment data from neighbouring authorities should be taken into consideration for shared issues such as motorways and fugitive emissions at district/city boundaries. Further information on ambient air quality is available:

- Ambient air quality data for the UK are available at www.aeat.co.uk/netcen/airqual/
- The Welsh Air Quality Forum also provides details of ambient air quality at whoweb.uwic.ac.uk/airquality/
- The European Environment Agency provides reports on baseline trends across Europe and a series of guidelines at themes.eea.eu.int/state/air
- Some useful examples of AQ review and assessments and links to local authority AQ work and wider initiatives at www.uwe.ac.uk/aqm/review/examples/index.html

- The UK Government reports through Advisory Scientific Committees and provides regular updates as the state of knowledge advances. These can be accessed via www.aeat.co.uk/netcen/airqual/reports/home.html

Examples in Practice

A number of local authority air quality review and assessment reports are available on the web at www.uwe.ac.uk/aqm/review/examples/index.html

Some Useful Academic References

- Stead, D. (1997). *Environmental Targets in Land Use Planning*, in Evaluating Local Environmental Policy p65-77, Farthing, S.M. (Ed) Avebury, Aldershot.
- DoE (1996). *Indicators of Sustainable Development for the United Kingdom*, Department of the Environment, HMSO, London.
- Commission of the European Communities (1996). *Communication from the Commission to the European Parliament and the Council on a Future Strategy for the Control of Atmospheric Emissions from Road Transport Taking into Account the Results from the Auto Oil II Programme*, COM(96) 248 Final, Brussels.
- Jones, P., Williams, J. and Lannon, S. (2000). *Planning for a Sustainable City: An Energy and Environmental Prediction Model*, Journal of Environmental Planning and Management, 43(6), p855-872.

Involving Other Stakeholders

The process of air quality review and assessment and the establishment of baseline data has largely been undertaken by local authority environmental health professionals in the UK. As a result, there has been little incentive or requirement to closely involve other professions, external agencies and bodies, beyond the provision of raw data such as traffic flow data or industrial process information. However, a simple analysis of the options available to address air quality indicates that most will require implementation by professionals external to environmental health departments, and indeed many are outside the direct control of local authorities altogether.

Moreover, successful implementation of Action Plans will require the consensus and co-operation of a large number of stakeholders, businesses, organisations and communities, as well as those bodies with whom powers relating to actions to be implemented rests. The need for wider engagement, consensus, ownership and involvement is therefore self-evident, and consideration of potential wider community impact will help address some of the key concerns arising from proposed actions, and complement efforts to develop community and sustainable planning within local authorities.

The Action Planning Process diagram shown in Figure 3 offers a route map for the tasks involved in air quality action planning. It does not indicate how these tasks should be performed, or by whom and in what structure. It does however, suggest that the process should be steered by an *Action Planning* or *AQAP Team*, consisting of local authorities, external agencies and wider interested parties. Members of the team are not specifically defined, as the team structure will depend largely on local circumstance and authority structure.

The most appropriate structure for action planning will be driven by the extent and complexity of the problem, as well as actions and plans already undertaken or considered by the authority and the extent to which wider consensus and ownership is required. When considering the structure, those already in place or which have been used successfully in the past should be considered first. This has the key advantage of being familiar to more people with whom air quality professionals may wish to engage. Examples of other structures may include development plans (Local, Structure or Unitary Plans), Local Transport Plans, Agenda 21 Plans, Community Strategies and Local Environment Action Plans (by the Environment Agency and the Scottish Environment Protection Agency).

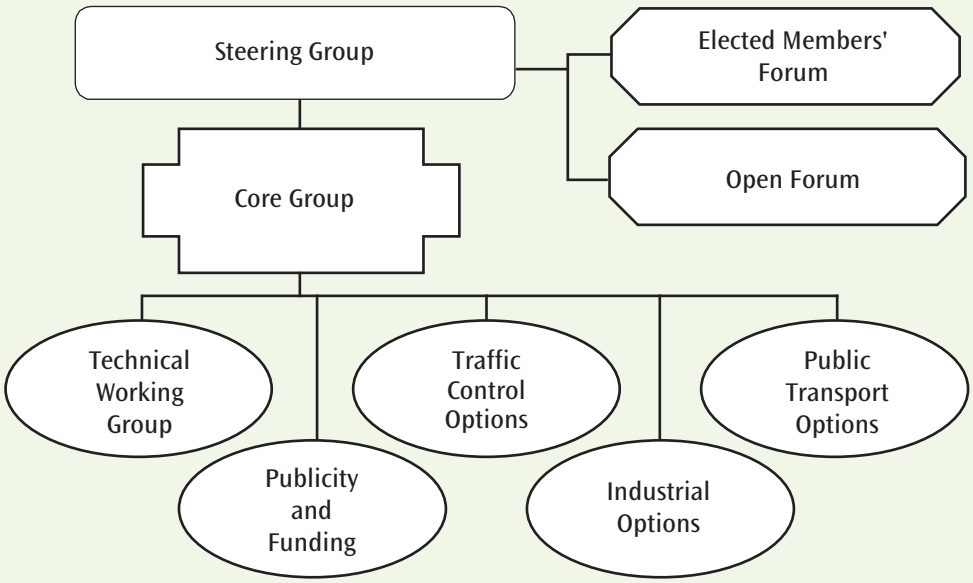
If no suitable precedent can be found, a new structure must be developed. The simplest structure is a single group with relevant interests and bodies represented, which undertakes the work of developing the Action Plan. This type of approach is probably more suitable for smaller-scale problems, where for example a small number of residential properties are exposed to predicted exceedances, and where the scope for action is limited by the scale of the problem. However, for more complex situations, if representation is wide, this approach may become unwieldy and unworkable. An alternative approach is the formation of a core group to direct the work closely, a steering group with a wider representation, and a series of working groups to undertake specific tasks. The core group may consist of working group leaders.

The steering group might identify tasks and take final decisions, whilst a wider core group manages these tasks and reports to the steering group. Individual working groups may undertake the tasks and report to the core group. The work of the steering group may require a process of scrutiny, which might be undertaken by, for example, elected members or a wider Open Forum.

Figures 4 and 5 provide two examples of structures based upon an AQMA due mainly to traffic emissions, although with some industrial emission contribution. In the first example (Figure

4), the provision of baseline data, from the Stage 4 assessment, is given over to a technical working group; and a Publicity and Funding working group has been formed to progress these two areas, along with the formation of a communications strategy. There are also multi-disciplinary groups tasked with developing options in different areas.

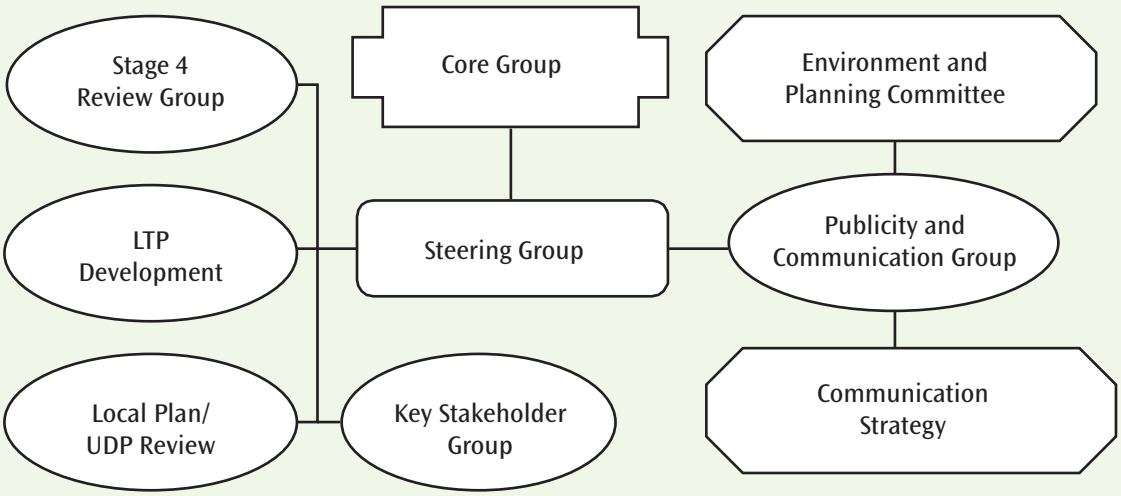
Figure 4. Example 1 of an AQAP development structure



The second example (Figure 5) uses groups already in place as *de facto* working groups, in this case the groups responsible for the development of the Stage 4 review, and those set up to develop the authority's Local Transport Plan and Unitary Development Plan. Liaison with elected members is carried out by a Publicity and Communication group, who are also responsible for the development and implementation of a communications strategy.

This structure may also be modified to fit into existing groups and organisational arrangements, where for example, a number of authorities are working in partnership. The Steering Group role may be taken on by a regional Chief Officers' group and the Core Group functions provided by the air quality sub group of the regional pollution advisory body. In this case, separate working groups for each district could be added, to look at issues specific to each authority.

Figure 5. Example 2 of an AQAP development structure



MAIN POINT

Effective Action Plans require consensus and co-operation of a large number of stakeholders, businesses, organisations and communities, as well as those bodies responsible for implementing solutions.

Organisational structures should be pragmatic and based on local circumstances, and, where possible, should also be based on existing structures.

Generating Options

It is not the intention of this guidance document to provide methodologies for selecting and deriving options, or providing lists of possible options. The *Interim Guidance* provides this information, and the wall chart within the guidance is particularly useful for highlighting various options, together with their potential impact on local air quality, wider impacts and their practicability for implementation.

Advice and information on generating options has been grouped in terms of source apportionment, affected areas and option development.

Source Apportionment

- LAQM.TG4(00) – Review and Assessment: Pollutant Specific Guidance *(as previously referenced)*.
- Guidance for Estimating the AQ impact of Stationary Sources (GN24). National Centre for Risk Analysis and Options Appraisal, Environment Agency. November 1998.
- The Mineral Planning Guidance Note 11 (Draft) *(as previously referenced)*.
- For PM_{10} in general, *Assistance with the review and assessment of PM_{10} concentrations in relation to the proposed EU Stage 1 Limit Values* includes a table of distance to risk targets for quarrying and extraction processes (table 3). An excellent worked example in Annex 1 provides '*how to*' calculations of 2004 background PM_{10}, assessment of road traffic emissions, assessment of industrial emissions, assessment of combined source impacts.
  www.aeat.co.uk/netcen/airqual/reports/stanpm/spmain.html
- Kukadia, V., Upton, S.L. and Hall, D.J (2000). *Developing a Code of Practice on Controlling Particles from Construction and Demolition – A Review of Current Position*, BRE Report No. 81244 provides a useful checklist.
- Source apportionment for particles (all sources) is covered in, *'Source Apportionment of Airborne Particulate Matter in the United Kingdom*'
  www.environment.detr.go.uk/airq/airbornepm/index.html

Affected Areas

Whilst inputs from **Current and/or Predicted Air Quality** feed into affected areas, traffic emissions research will assist in this regard. For example, work by the Transport Research Laboratory on: Methodologies for Estimating Air Pollutant Emissions from Transport (MEET): Deliverable No 4, *Road Traffic Characteristics for Estimating Pollutant Emissions*, January 1997.

Option Development

- Wall chart in NSCA Guide; *Air Quality Action Plans: Interim Guidance for Local Authorities* (2000).
- Bridgman, H. (2000). *Air Pollution Management in Australia: The Example of Newcastle, NSW* provides a detailed description of air pollution management in Australia, including tables of AQAP options (as referenced previously).
- Oduyemi, K.O.K. and Davidson, B. (1998). *The Impacts of Road Traffic Management on Urban Air Quality*, The Science of the Total Environment 218, p59-66; provides an international review of traffic management schemes with emphasis on balancing supply side measures off set by demand side management.

A general review of traffic management schemes includes:

- Abbott, P.G., Hartley, S., Hickman, A.J., Layfield, R.E., McCrae, I.S., Nelson, P.M., Phillips, S.M. and Wilson, J.L. (1995). *The Environmental Assessment of Traffic Management Schemes: A Literature Review*, TRL Report 174, Transport Research Laboratory, Crowthorne, Berkshire.
- Crabbe, H. and Elsom D.M. (1998). *Air Quality Effectiveness of Traffic Management Schemes: UK and European Case Studies*, Journal of Environmental Monitoring and Assessment.
- Longhurst, J.W.S., Rayfield, D. and Conlan, D.E. (1994). *The Impacts of Road Transport on Urban Air Quality – A Case Study of the Greater Manchester Region*, Air Pollution II (1), p333-340, Computer Simulation.

- Pargel, S. and Heil, M. (2000). *Reducing air pollution from urban passenger transport; a framework for policy analysis*. Journal of Environmental Planning and Management 43 (5) p665-688.

Examples of traffic calming and safer city project schemes are covered in the following references:

- TRL Report: The Impacts of Traffic Calming Measures on Vehicle Exhaust Emissions, September 2000.
- TRL Report: The Impacts of the Safer City Project on Road Traffic Emissions in Gloucester: 1996 – 1998, report no: 444.
- NSCA: Cleaner Air: the Role for Cleaner Fuels – Report, February 1998.
- DETR: The Report of the Alternative Fuels Group of the Cleaner Vehicles Task Force – An Assessment of the Emissions Performance of Alternative and Conventional Fuels, 2000.

The following give a good overview of alternative transport fuels and cleaner fuels technology:

- ETSU: Alternative Road Transport Fuels – A Preliminary Life-cycle Study for the UK, Volume 1. A study co-funded by the DTI and DETR, March 1996.
- ETSU: Alternative Road Transport Fuels – A Preliminary Life-cycle Study for the UK, Volume 2. A study co-funded by the DTI and DETR, March 1996.

Examples of schemes to reduce traffic emissions include low emission zones and improving vehicular emissions control:

- Implementation of Low Emission Zones (LEZs) and examples are given in the NSCA LEZ report which includes an annex on the health effects of pollutants: benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide, particulates (PM_{10}) and sulphur dioxide.
- Low Emissions Zones – Reducing the Environmental Impact of vehicles in Urban Areas, NSCA 1999, 105pp.

Additionally, traffic emissions models with calculations, impacts of older vehicles and work on possible reductions of emissions are covered in:

- TRL Report: A Review of Available Road Traffic Emission Models, TRL Report 457.
- DETR: Vehicle Inspectorate – In-Service Exhaust Emission Standards for Road Vehicles, Fifth Edition, August 1999.
- European Commission: Transport Research 4th Framework Programme Strategic Research DG VII-99 – MEET Methodology for calculating transport emissions and energy consumption, 1999.
- DTI: Technology and Testing: Working-Group Report – Technical Solutions for Reducing Emissions from In-Use Vehicles, 2000.
- Pollution from Older Vehicles, Report by the Commission for Integrated Transport, March 2000.
- DETR: Environmental Impacts of Road Vehicles in Use – Air Quality, Climate Change and Noise Pollution, July 1999.
- Millbrook Proving Ground Ltd: Trucks & Buses: The Results of Real-World Emissions Testing, Seminar Proceedings, December 2nd 1997.

The life cycle of vehicles cradle to grave and responsive applications to transport effects are covered in:

- DETR: The Environmental Impacts of Motor Manufacturing and Disposal of End of Life Vehicles – Moving Towards Sustainability, 2000.
- Pollution-Responsive Applications of Transport Telematics, An Application Guide, Transport and Travel Research Ltd, (1998).

Considering the Elements

The four main elements which must be considered, both for individual options and Action Plans as a whole, were identified in the *Interim Guidance* as air quality improvement, non-air quality impacts, perceptions and practicability, and cost effectiveness. Beyond the general considerations given in the *Interim Guidance*, local circumstances and decision making will be the most important factor for the first three of these. It is difficult, for instance to give guidance in a generic document such as this, on the air quality impact of traffic schemes, when their scope, intent and context can vary so widely. There may also be variations in the effect of, and reaction to, the same action in different areas; what is accepted and welcomed in one area may produce very negative reactions in another.

However, the issue of cost effectiveness still causes some confusion, not least the extent to which DETR and devolved administrations will expect local authorities to provide analysis of their Action Plans. The following section attempts to provide some clarity in this area.

MAIN POINT

The four main elements which must be considered, both for individual options and Action Plans, are air quality improvement, non-air quality impacts, perceptions and practicability, and cost effectiveness.

Cost Effectiveness

In its strictest sense, an assessment of cost effectiveness involves the calculation of the cost of a given action per unit pollution abated, i.e. how much it costs to reduce emissions by a tonne, or improve air quality by 1 $\mu g/m^3$, through the implementation of a particular action. Alternatively, this could

be expressed as the amount of pollution abated per unit cost, e.g. the reduction in ambient concentration per £1,000 spent. By applying this to all proposed actions, comparisons can be made and those with the highest cost effectiveness given priority. However, for the majority of actions likely to appear in air quality action plans, it will be extremely problematic to calculate the full costs and assess the full benefits and impacts, as discussed in the *Interim Guidance*.

The guidance published in March 2000 (LAQM.G1(00)) and, in Scotland, LAQM.G1(S)(00)) requires that, in developing Action Plans, local authorities should "include, in particular, an estimate of the costs and feasibility of different abatement options to allow for the development of proportionate and effective action plans". However, it is worth remembering that the costs and benefits of achieving the air quality objectives at a national level have already been taken into account and that, if a local authority attempted to do so as part of its action plan, this would in fact be "double counting".

Local authorities are not expected to undertake a full cost and benefit analysis of options, or to attempt to calculate for themselves, for example, the monetary value of deaths brought forward due to poor air quality. It is, however, important that authorities consider the costs and feasibility of different abatement options. **The main purpose of the cost-effectiveness evaluation is to ensure that an authority is pursuing a balanced and realistic approach.**

Nor are local authorities expected to undertake a detailed analysis of the cost-effectiveness of every conceivable policy option for improving air quality within an AQMA. This would take too long and prove far too costly for most authorities. For some policy options (such as, for example, providing better information on air quality to local people through the local media, or encouraging local employers to adopt transport plans for their staff) it will be all but impossible to estimate the effectiveness in any scientific way.

What will need to be shown is an indication that the authority has considered a range of options and has tried to quantify, in however crude a way, their relative cost effectiveness. Where a particular option is not considered to be cost-effective or feasible – for example, imposing such tight constraints on an industrial process that it has to close down – a local authority is under no obligation to implement it. Section 84(2)(b) of the 1995 Act makes clear that authorities are required to act "in pursuit of the achievement of air quality…objectives in the designated area". **Local authorities are not under a legal obligation to achieve the objectives**, although they are required to show that they are doing all they reasonably can to work towards them.

The estimate of costs should include not only direct costs (such as the costs to the local highways authority of pedestrianising a particular high street, or the costs to an operator of fitting emissions reduction equipment to an industrial process), but also indirect costs. These might include the potential short-term reduction in income for a retail outlet on a newly pedestrianised street. It is worth noting here that pedestrianisation will generally result in an increase in retail revenue over the medium to long term, although short-term reductions may be apparent. It is also important to factor in both initial capital costs and ongoing revenue costs. For example, the installation of a computerised traffic management scheme will attract ongoing service and maintenance costs and may need specialist training for operators. This process will help authorities to reach an informed decision on the most cost-effective package of measures to deliver the necessary local improvements.

In summary, an assessment of cost effectiveness should take in the following points:

- How much of an improvement in ambient air quality is likely to result from a particular action or policy measure;
- How much this is likely to cost, both directly and indirectly, and where the costs are likely to fall;
- Whether there might have been other policy options for delivering the same result, and, if so, whether they are considered to be more or less cost-effective.

MAIN POINT

Local authorities are not expected to undertake a full cost and benefit analysis of options, or to attempt to calculate the monetary value of deaths brought forward due to poor air quality. Local authorities should, however, consider the costs and feasibility of different abatement options.

Advice and information on considering the elements have been grouped in terms of air quality improvement, non-air quality impacts, perceptions and practicability, and cost effectiveness.

Air Quality Improvement

Derwent and Middleton's 1996 Clean Air article devising a conversion of NO_x to NO_2 and this approach is further discussed in DETR's LAQM.TG4(00).The six year duration TRAMAQ programme researches the effects of traffic management schemes on air quality and/or vehicle emissions and will be of increasing assistance.

- Although TRAMAQ is still running (1998-2004/5), AEA Technology has produced a Literature and Data Review UG219 for TRAMAQ Cold Start Emissions which is readily available (May 1999) and provides data on fleets, patterns of emissions and anticipated changes in technology. Modelling approaches to cold starts and fleet composition data for 2005 are predicted. It also lists a good set of references and 'FANTASIE' web site.
- The WS Atkins 1999 Report *An Evaluation of Transport Measures to Meet NAQS Objectives* gives guidance on the potential reduction options where road transport is seen as a significant contributor to poor air quality.
- The European Commission Auto-Oil Programme now contains an extensive body of information on transport and associated environmental issues. In particular, The AOPII Cost-effectiveness Study Part III: The Transport Base Case Annex B.9 from the draft Final Report August 1999 provides valuable data on traffic, costs and prices, vehicle stock, fuels and emissions from road traffic for Great Britain. A list of selected references upon which much of this information is distilled includes DETR, European and United Nations sources.

Information is available on the effects of speeds and consequent emissions of different pollutants and sources and how changes in speed may impact on different pollutants in different ways (both positively and negatively). The DMRB web sites at www.official-documents.co.uk/document/ha/dmrb/index.htm (volume 11) or the RSK www.rsk.co.uk/ukefd/roads.htm both contain up to date information. This is a complex area, of course, and issues specific to each LA will need to be assessed but this information will assist in providing a starting point. On traffic calming, an environmental assessment of the Leigh Park Safety Scheme provides a good case study as an example.

Key stages for dust assessment are boxed in Mineral Planning Guidance Note 11 p53, with mitigation measures boxed in Table 3 p54.

Non-Air Quality Impacts

- Cairns, 'Traffic Impact of Highway Capacity Reductions – Assessment of the Evidence, Carmen Hass-Klau, Phil Goodwin, Landor Publishing 1 899650 10 5'; includes reference to the six towns study. Additionally, the following give valuable information and/or provide checklists on non-air quality impact issues:
- Local Air Quality Management Guidance (LAQM.G2(00)). *Developing Action Plans and Strategies.*
- Local Air Quality Management Guidance (LAQM.G3(00)). *Air Quality and Transport.*
- National Society of Clean Air and Environmental Protection (NSCA) (1999) The How To Guide: Consultation for Local Air Quality Management. NSCA, Brighton.
- Mineral Planning Guidance II – Fugitive Dusts from Mines and Quarries.
- Kukadia, V. Upton, S.L. and Hall, D.J. – Developing a Code of Practice on Controlling Particles from Construction and Demolition – A Review of Current Position – BRE Report No. 81244. Provides guidance on dust control measures p23-35 including black smoke from tar laying, and monitoring and assessment p35-39.
- Morris, P. and Therivel, R. (Eds) (1995). Methods of Environmental Impact Assessment. UCL press, London. ISBN 1-85728-215-9
- John Stewart's, 'The Nature of British Local Government' (McMillan 2000) and, Michael Clarke and John Stewart's, 'Handling Wicked Issues' (Birmingham University, School of Public Policy, 1997).

Perceptions and Practicability

- The NSCA document Consultation for Local Air Quality Management: The How to Guide (1999) gives practical guidance for local authorities on public consultation, consensus building and links with other consultative processes. It includes case studies to reinforce the key issues.
- Mineral Planning Guidance Note 11 calls for pre-planning discussions (p17).
- DETR's own guidance on consultation is framed in LAQM.G1(00) p26-28 and includes liaison with County Councils, Environment Agency and the Public with time scales. School travel strategy and plans are discussed in LAQMG2(00) p18.
- Relating to the public is well aired in the DETR 2001 consultation paper 'Proposals to improve the air pollution public information bulletin.' It covers how air pollution is described as well as the teletext approach to dissemination with examples.

Cost Effectiveness

Assuming the DETR LAQM.G2(00) guidance principle of local authorities needing to ensure the relative contributions by industry, transport and other sectors to improving air quality are cost effective and proportionate, the following deal (or will deal directly with costing the process with reference to NOx, SOx, CO, benzene and PM_{10}).

- AEA Technology Environment. A Cost Compliance of the Proposed Air Quality Standards for Nitrogen Dioxide (NOx) and Fine Particulates (PM_{10}) UK DETR 1998.
- AEA Technology, 'The Cost of PM_{10} and NO_2 abatement 2001'.
- Analysis of the National Air Quality Strategy Objectives. Report of the Interdepartmental Group on Costs and Benefits. DETR.
- IVM 1999. Economic Evaluation of Air Quality Targets for SO_2, NO_x and Particles. Report prepared for European Commission, DGXI by IVM.
- AEA Technology 1999. Economic evaluation of air quality targets for CO and Benzene. Report prepared for European Commission, DGXI by AEA Technology Environment.
- ORNL: A Comparison of Estimates of Cost-Effectiveness of Alternative Fuels and Vehicles for Reducing Emissions, November 1995.
- EEA. Guidelines for defining and documenting data on costs of possible environmental protection measures.
- The European Environment Agency gives advice on how cost data should be expressed and interpreted for stationary abatement technologies. Access is via the internet under *Environmental Themes* on the EEA web site where guidelines can be readily found at www.eea.eu.int/
- Research reports, such as *Cost of PM_{10} and NO_2 abatement 2001* (forthcoming), can be found at – www.aeat.co.uk/netcen/airqual/welcome.html

Prioritising Options

One of the major challenges facing a local authority in effective action planning is prioritising the possible options identified. Actually arriving at a list of possible and potential options may be relatively straightforward following the recognition of the pollution sources and their potential local impact, but determining which of the solutions are to be implemented and in what order is potentially far more problematic. Prioritisation is the end point for all the information collated, such as that relating to likely air quality improvement, cost effectiveness, non air quality impacts and the perceptions of local communities and politicians.

Once a list of options has been generated, an authority may wish to take a *matrix* approach in determining a prioritised list, whereby various criteria are considered for each individual option, or indeed package of options, alongside all the other possible options. For example, when considering the improvement of air quality afforded by a specific option, an authority may choose to apply a qualitative or quantitative value for a particular option's impact on this criterion. Table 2 illustrates how a matrix may be used for a qualitative approach with respect to a number of different criteria, which will in practice include far more than the three criteria listed here.

Table 3 illustrates a more quantitative approach using the same criteria. The two examples illustrated are highly simplistic, but demonstrate how an overall ranking and prioritisation might be approached.

Detailed consideration of the likely implications for a package of measures will require a complex matrix approach, and a more sophisticated process perhaps than simply totalling the number of ticks.

The process of prioritising options was recently tested through a specific workshop designed to consider how local authorities and their action planning teams might approach option prioritisation. The vast majority of delegates favoured a matrix approach. Some used a *qualitative criteria analysis*, whereby the criteria were not given a numerical preference, but instead assigned a description, for example medium, high or low. A final judgement was made once the various criteria had been considered.

Table 2. Simplified qualitative approach for ranking and prioritising options

Option	Criteria for consideration			Overall ranking
	Cost effectiveness	AQ improvement	% people positively affected by option	
Closure of High Street to most vehicles	Medium	Locally improved in the medium term	Medium; residents, shoppers and retailers	2
Local bypass	Very high	Locally improved in the long term; causes problems elsewhere	Potentially low; will assist AQMA but may affect more elsewhere	3
New car parking strategy	Low	Moderate improvement in the short term	High; residents, shoppers, retailers	1

Table 3. Simplified quantitative approach for ranking and prioritising options (scores out of a possible maximum of five are allocated for each criterion)

Option	Criteria for consideration			Overall ranking
	Cost effectiveness	AQ improvement	% people positively affected by option	
Closure of High Street to most vehicles	✓✓✓	✓✓✓ (medium term)	✓✓✓	2
Local bypass	✓	✓✓✓ (long term) ✓ (short term)	✓✓	3
New car parking strategy	✓✓✓✓✓	✓✓✓ (short term)	✓✓✓✓✓	1

An alternative *qualitative* approach, whereby criteria were identified as having a negative or positive impact with respect to the option in question was also used. Finally, a *quantitative* approach involved a numerical scoring approach, rather than a ranking approach, whereby the criteria were *scored* for the option in question.

The temporal component and nature of an option, or series of options, may have a notable effect on the prioritisation process outcomes, with those options perceived as delivering short-term gains being seen as a priority. Local authorities will need to balance the opportunities presented by different options with respect to their impact on air quality over various time scales. A local authority need only be 'in pursuit of' the air quality objectives, and as such the Government may consider long-term actions in terms of compliance against EU limit values, and will wish to see evidence that the authority has considered the long-term air quality improvements afforded by the action.

Another temporal aspect which will have a major impact on the finalised plan is the sequence in which actions are carried out. Clearly for some actions to be effective, the ground work must be laid by the implementation of others. One of the more obvious examples of this is congestion charging, where other transport options will need to be made available so that drivers can exercise choice. It may therefore be that options which have a lower priority are implemented first simply because the sequencing demands this. Again, a matrix approach can be used to decide sequencing, with options being placed in short, medium or long term columns and the relationships between each drawn on.

Local circumstances and priorities will have an impact on the approach taken to prioritise actions for delivering local air quality improvement. As with other aspects of the local air quality management process, the local authority will need to provide a reasonable and reasoned justification for prioritising options to implement, ensuring that all those affected by such actions and options have been involved in, and consulted on, the process.

MAIN POINT

Once a list of options has been generated, an authority may wish to take a matrix approach in determining a prioritised list, whereby various criteria (for example cost effectiveness) are considered for each individual option, or indeed package of options, alongside all the other possible options. Sequencing may mean that some higher priority options need lower priority options to be implemented first, in order to prepare the ground.

Advice and information on prioritising options

Consultation for Local Air Quality Management: The How to Guide (1999), sets out principles behind the philosophy of consultation and the NSCA: Air Quality Action Plans: Interim Guidance for Local Authorities (2000), provides a wall chart approach for a table-completing focus in considering options and options ranking.

Thompson, A., Hine, P.D., Poole, J.S. & Greig, J.R., 1998. Environmental Geology in Land Use Planning. A Guide to Good Practice. Symonds Travers Morgan for DETR. 80pp.

Evaluation and Monitoring

The effectiveness of an Action Plan will be assessed at various stages in its development, and both prior to and following implementation. Assessment of the effectiveness of an Action Plan before implementation is needed to check that the proposed action will result in a sufficient decrease in air pollution. After an Action Plan has been implemented a local authority will need to monitor the progress of its Action Plan to establish whether or not it is having the expected impact. In order to carry out a proper evaluation, the following information will be needed:

- Current air quality, by pollutant and specific objective;
- Likely future trends and known developments, over the next five to ten years, under a *business as usual* or *do nothing* scenario;
- The sources of air pollution and their relative contribution to local air quality;
- Annual, weekly and diurnal variations for both emission sources and air quality;
- The specific locations affected by poor air quality;
- The number and characteristics of those exposed to poor air quality.

As discussed in the section on "Establishing the Baseline", this information should arise from the original review and assessment, Stages 1 to 3, and the further assessment, Stage 4. Due to the variations in both dispersion and meteorology generally, some modelling will, of course, be necessary for identifying the relative contribution of each source, through the consideration of source apportionment.

Effective source apportionment is necessary both for calculating the "ideal" reductions needed from each individual source, and for fully evaluating the options under consideration, either individually or as a package. When carrying out source apportionment, it is important that the information is broken down in such a way as to provide the basic information needed for each of the other two tasks.

For example, where there is an exceedance of the annual NO_2 objective, this may be due to emissions from point sources, roads, area sources (domestic and small scale commercial) and background. Assume that, for this example, the relative contribution from each of these to the exceedance is 15% point sources, 50% roads, 5% area and 30% background. The relative reduction from each sector can then be calculated if the objective is to be achieved. However, in order to develop the optimum range of options and estimate their effectiveness, the information needs to be broken down further. In the case of road sources, there needs to be an assessment as to the specific roads and highways of most significance, together with an assessment of the vehicle types, and time of day that is significant in terms of traffic flow and volume.

In this example, two of the options proposed are to introduce cleaner vehicles into the bus and taxi fleets, and to encourage large employers to reduce their employees' need to travel through Travel Plans. Therefore, the information will need to be broken down further into vehicle and/or usage types to give the relative contributions of buses and taxis, and commuter and other work related journeys. In this way, the basic information is provided, allowing a calculation of the effect of converting X% of the taxi fleet to dual-fuel, the reduction of commuter journeys by Y%, and/or the introduction of Z electric delivery vehicles.

It will not, of course, be possible to anticipate all of the information needs thrown up by the option development process at the start of the Stage 4 Review, which is when source apportionment will be carried out. Therefore, there is a need

to have close links between Action Plan development, and the more technical process of the Stage 4 Review. In this way, the review will help inform the development of the Action Plan, and conversely its development will help shape the review.

MAIN POINT

Assessment of the effectiveness of an Action Plan before implementation is needed to check that the proposed action will result in a sufficient decrease in air pollution. After an Action Plan has been implemented a local authority will need to monitor the progress of their Action Plan to establish whether or not it is having the expected impact.

Developing Indicators

The central objective of any Air Quality Action Plan must, of course, be the reduction in ambient levels of air pollution, in an attempt to achieve the air quality objective for the particular pollutant concerned. However, simply focusing on air pollution concentrations as the indicator of progress for an action raises a number of problems. In the assessment of effectiveness prior to implementation, this would be a reliance on modelling, probably complex modelling, which can be both time consuming and uncertain. In some instances, a complex urban model can take several days to run, making the assessment of even a modest number of options impractical.

Following the implementation of the Action Plan, there are numerous confounding factors, which can mask, or amplify, progress, the most important one being the weather. In addition, some actions may, on their own, produce only very small effects which woud be hard to measure in air quality terms, and the effect of such actions would be difficult to separate out from the effect of other actions.

Therefore, it would be useful to develop "surrogate" indicators, which can allow simpler assessment to be made, and more directly relevant monitoring information to be amassed. Indicators can thus be fitted into the following, loose hierarchy:

1 Air pollutant concentrations.
2 Direct effect indicators, e.g. traffic flows, vehicle mix.
3 Indirect effect indicators, e.g. number of companies with a Travel Plan, number of industrial units operating to ISO 14001.
4 Indicators of co-related policies, e.g. noise levels, bus use, etc.

Examples of the above and other indicators, and their related effects, are provided in Appendix 1 of this report.

MAIN POINT

Focusing on air pollution concentrations as the indicator of progress for an action raises a number of problems. For example, a reliance on complex modelling can be both time consuming and uncertain. There are numerous confounding factors, which can mask, or amplify, progress, for example meteorology. Therefore, it is useful to develop "surrogate" indicators, which can allow simpler assessment to be made, and more directly relevant monitoring information to be amassed.

Assessment Prior to Implementation

The percentage change in air pollutant concentrations can be assessed crudely, in terms of indicators such as traffic flow or emissions. However, an assessment prior to implementation should take into account more than simply the air pollution impact alone, but include the costs of implementation and the other impacts (positive and negative) which may occur, without the need, at this stage, to carry out complex modelling. An example of crudely assessing the air quality impact is shown in Appendix B of the *Interim Guidance*, using emissions as an indicator of percentage improvements that could be achieved. Appendix D of the *Interim Guidance* also provides details of the other impacts relating to some of the possible actions, which could be included in an Action Plan.

Once all potential options and actions have been considered, a final test of the prioritised options should be undertaken in a more comprehensive way, before the actual implementation of the Action Plan. This will allow the assessment of whether the Action Plan is likely to bring about the expected improvement in air quality and to assess the area of effect. For example, the closing of a particular road may increase the traffic on neighbouring roads within the AQMA and not necessarily improve air quality within the AQMA.

If the package of measures assessed at this stage does not provide the expected benefit, the authority must assess whether there are additional actions that can, cost effectively, be undertaken. If this is the case, then the authority could again assess the option previously developed and develop new prioritised options. If the judgement is that no further improvement can be obtained, given the restrictions of cost, perceptions and other impacts, then the current set of options should be implemented, under the explicit understanding that these are unlikely to achieve the air quality objectives. In this case, the local authority should make clear that, in its judgement, it has done all it reasonably can in pursuit of the objectives. Others, including the Secretary of State, or equivalent, will need to take a view on the reasonableness of this position.

Monitoring After Implementation

Once the Action Plan has been implemented, its effectiveness will need to be measured:

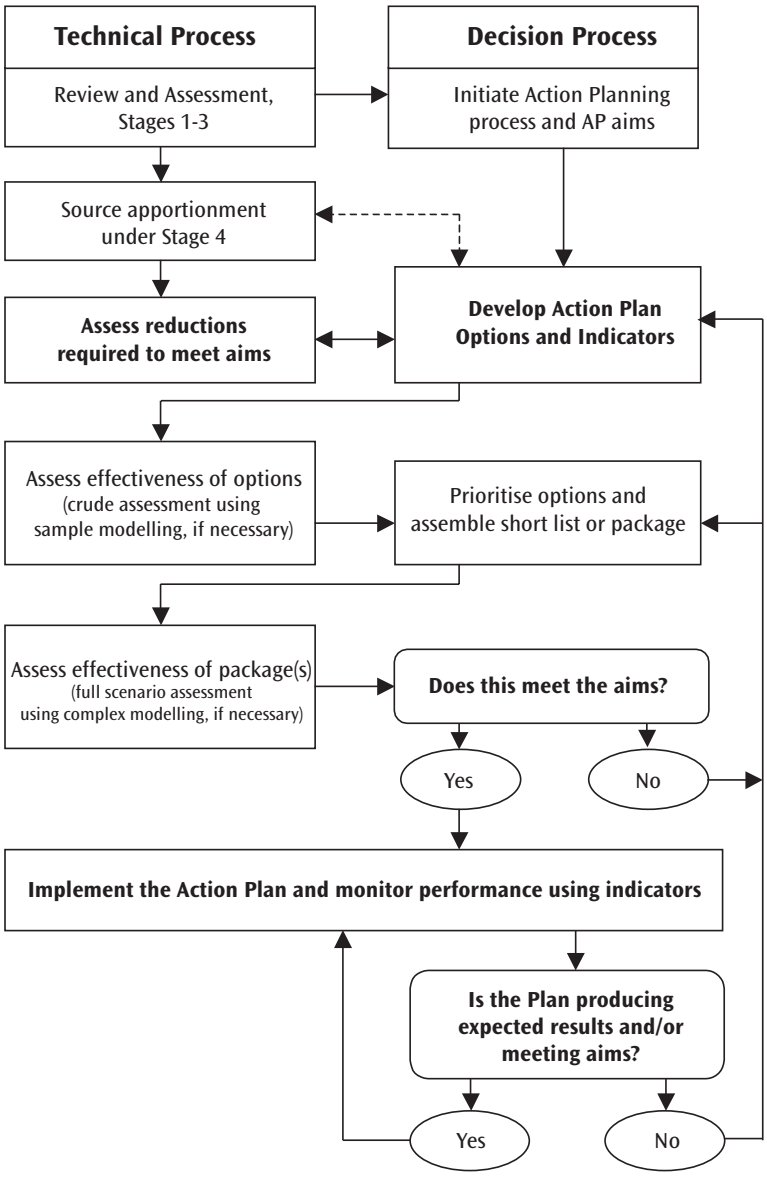
- Does the Action Plan framework provide the necessary reduction in air pollution?
- How do the public and community at large perceive the Action Plan?
- Is it cost effective?
- What are the other wider, non-air quality impacts and overall community impacts?

The main target of the Action Plan is to reduce air pollution in an AQMA. To assess the long-term effectiveness of an Action Plan, authorities will need to develop long-term indicators of the Action Plan's effectiveness. The basic indicator of whether an Action Plan is having the necessary effect, is to measure the air quality within the AQMA to assess trends (is it decreasing?). However, other indicators can also be developed such as those outlined in Appendix 1 and it is suggested local authorities access the relevant literature as to how best to assess their particular AQMA.

MAIN POINT

The Action Plan will need to be assessed both prior to implementation and following implementation. The main objective of the Action Plan is to reduce air pollution within an AQMA. To assess its long-term effectiveness, authorities will need to develop long-term indicators of the Action Plan's effectiveness.

Figure 6. Assessing the effectiveness of an Action Plan



The following references contain some useful European City studies of implementation:

1. The European Greenways Good Practice Guide; innovative approaches taken to addressing the problem of undertaking demands rising from national and European legislation on air quality whilst at the same time encouraging the socio-economic and cultural development of a town: europa.eu.int/comm/environment/cycling/greenways_en.htm

2. Eurocities 'Local Sustainability – the European Good Practice Information System'. Useful for some European examples of process and practice on a range of issues relevant to air quality actions. The following is a random selection of examples:
   – Belges, Belgium (integrated environmental & social development approach)
   – Freiberg, Germany and Tampere, Finland (climate change)
   – Kouvola, Finland (strategic decision making)
   – Riga, Latvia and Brussels, Belgium (air quality initiatives specifically)
   – Bologna, Italy and Bradford-on-Avon, UK (traffic in historic towns): cities21.com/coldfus/citylist.dbm

Similarly the Australians have developed their own Action Plans most easily obtained via the web as:

Air Shed Management Action Plan (100 options) and Sydney Region Air Shed Plan at:
www.iclei.org
www.epa.nsw.gov.au/envacts.html
www.environment.gov.au/net/npi.html

NSW has its Sustainable Energy Development Authority site at:
www.seda.wsw.gov.au

Consultation and Participation

Over the last few years, the subjects of consultation and participation have become increasingly important for local authorities, across the whole range of their activities and functions. Authorities are now required to carry out consultation during the development of most, if not all, of the growing number of legislative plans and this has increasingly been extended to include the use of participative techniques and practices. In the near future, as the provisions of the Aarhus Convention are entered into European and UK law, consultation is likely to become the norm rather than needing to be specifically required. However, the words "consultation" and "participation" encompass a huge range of activities, designed to meet quite different ends.

Under the Environment Act 1995, local authorities have an obligation to consult a defined list of consultees whenever they:

- Carry out any review or assessment of air quality under the Act;
- Undertake a further review or assessment under Section 84 of the Act; and
- Develop any action plan under Section 84 of the Act.

The list of consultees is added to by Guidance Note LAQM.G1(00) which says that relevant community groups should also be included and there is a presumption throughout the guidance that the local authority will carry out effective internal consultation, communication and participation. However, the form of that consultation, precisely when it should be carried out, and the ultimate purpose of the exercise is not explained.

In 1999, NSCA produced *Consultation for Local Air Quality Management: The How To Guide*, in association with BDOR Consultants and with the support of DETR, to assist local authorities with this task. In it, a series of principles for consultation were put forward and it was argued that the exercise should be as participative and inclusive as possible, if the local authority is to gain maximum benefit. It was also suggested that a clear agreed *process* for the exercise is needed at the outset, otherwise there is a real danger of expending considerable time and resources without accruing proportional benefit.

Since the publication of the *How To Guide,* NSCA has continued to gather information on consultation practice within local authorities and has recently run a series of interactive workshops for air quality professionals on participation. The outcomes of these workshops will shortly be published and will suggest a *model* for consultation for Local Air Quality Management. Through this work a number of potential problems have emerged which are, in part, specific to consultation on air quality issues. These include:

- raising and maintaining sufficient general interest to sustain a viable and useful participation process;
- obtaining sufficient political and managerial support to undertake the sort of advanced techniques proposed;
- securing the necessary resources "up front" to carry out useful participation, even though research has consistently shown that a properly run participation process usually saves time and money in the development and implementation of plans and strategies; and

- obtaining the skills needed to carry out a proper consultation process, as these are often not held within the air quality community.

There are no easy answers to these problems but potential solutions do exist. Firstly, it is important to remember that consultation and participation do not necessarily mean going "public" at the start of the process. In many cases, this is only done towards the end and much of the detailed work leading up to this is carried out by relatively small groups of representative groups of individuals. It is also important that the process does not get bogged down trying to involve one or two groups or individuals, rather than working with those who are prepared to participate. One technique for increasing involvement is to use those who initially participate to identify others who should be involved and then to approach them. This spreads the work load of expanding representation and means that the exercise is not perceived as wholly council led.

Political support can be difficult to secure, especially when participative processes are seen as ceding control outside the authority, thereby creating problems when implementation is required. This perception is undermined when participation is presented simply as the most cost-effective way of pooling the full range of knowledge, skills and experience available. Modern participative techniques provide a methodology and structure for doing this and, in fact, the plethora of modern techniques could simply be classed as "methods for effective working".

Necessary resources and specific skills are more problematic and this may be where collaborative working with colleagues, within and external to the authority, could offer the greatest rewards. Integrating consultation for air quality issues with other consultation processes, or with processes in other authorities, could offer benefits in terms of pooled resources, skills sharing, consistency of approach, and a reduced risk of "consultation fatigue". There are undoubtedly individuals either within the authority or within stakeholder organisations, who already have the necessary skills to carry out consultation and participation exercises. It may be more cost effective to identify and use these than to train air quality professionals from scratch.

Where do consultation and participation fit in the Action Plan process?

Advice implicit in both formal and informal guidance to date has varied between sending a report to consultees at the end of the process (essentially the legal minimum) and operating a continuous process alongside the more technical aspects of air quality management. However, there are a number of points in the process where active participation by a range of interests would be particularly valuable. In general, these are the areas that require less of a technological and scientific input and instead require a more objective assessment of a number of potentially opposing factors. Specifically, these are:

- the generation of the initial list of options;
- identifying wider potential impacts of options;
- the development of surrogate indicators (see previous section on Evaluation and Monitoring); and
- prioritising options prior to final assessment and implementation.

The last area is often overlooked but its specific inclusion in the consultation process can lead to a much greater degree of trust being developed, particularly amongst external groups. Obviously, the full range of information, such as available resources and potential time scales, must be included if meaningful input is to be made but the use of participation in prioritising options will generate a greater sense of ownership and therefore increased support for implementation.

MAIN POINT

Consultation and participation have a key role to play in action plan development, but the aim of the activity and its overall planning must be carefully considered. Existing processes and expertise should be used wherever possible or appropriate.

Advice and information on participation and consultation, including examples in practice

- Local Government Association (2000). Preparing Community Strategies Issues for Local Authorities, LGA, London.
- Action Planning: by N. Wates. From The Prince of Wales's Institute of Architecture, (14 Gloucester Gate, London NW1 4HG), 1996. An excellent guide to planning and running essentially one-off, large events.
- Creating Involvement: by L. Hart. Local Government Management Board, London, 1994. A very straightforward, practical guide to a number of well-tried methods.
- Guidance on Enhancing Public Participation: in the Modern Local Government series, from DETR, 1999. It includes good coverage from principles to practice.
- Involving Citizens, A Guide to Conducting Citizen Participation: by W. Wiedman, for the Wisconsin Department of Natural Resources, (from Wiedman c/o 4110 S. Detroit Avenue, Tulsa, Oklahoma 74105, USA), 1992. Though a struggle to acquire, this is a really excellent, short, practical guide to participative methods.
- Involving Citizens in Community Decision Making: by J. Creighton, Program for Community Problem Solving, (Program for Community Problem Solving, (1301 Pennsylvania Avenue NW, Suite 600, Washington DC 20004, USA). Perhaps the best practical guide available, not least because it covers theory, methods and details, consensus building and participation.
- Involving Communities in Urban and Rural Regeneration: from Department of Environment, Transport and the Regions, London, HMSO, September 1997. A good if rather traditional compendium of methods and approaches.
- The Guide to Effective Participation: D. Wilcox, Partnership, (13 Pelham Square, Brighton BN1 4ET), 1994. A basic textbook which covers some broad principles and references on a wide range of possible approaches, methods and techniques.
- The Good Practice Manual on Tenant Participation: by M. Kelly and C. Clarke of the Women's Design Service, (52-54 Featherstone Street, London EC1Y 8RT). Although based in specific areas of housing work, this is full of very useful, direct, proven practice of far wider relevance.
- Working in Neighbourhoods: C. Jones, Community Education Development Centre, for WWF UK, (from WWF Community Education, Panda House, Weyside Park, Godalming, Surrey GU7 1XR), 1995.

Section 3: Local and Regional Air Quality Strategies

Why Develop a Strategy?

For any local authority, whether declaring an AQMA or not, an air quality strategy (AQS) is very useful for ensuring that air quality is considered across various council planning and other activities. By establishing a framework for the inclusion of air quality considerations within council policies and procedures, a local authority is well placed to improve poor air quality or indeed maintain good air quality.

Local authorities do not have a statutory duty or obligation to prepare a local air quality strategy, although they are reminded that effective air quality management is afforded through the development of a wider air quality strategy. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland is underpinned by a number of principles, which in summary are:

- To provide the best practicable protection to human health and the environment;
- For the recommendations from the Expert Panel on Air Quality Standards' (EPAQS) to be the basis for the setting of Air Quality Objectives;
- To provide for compliance with the EU Air Quality Daughter Directives as well as allowing for more stringent national objectives for certain pollutants;
- For the objectives to reflect the practicability of measures necessary to improve air quality, their cost effectiveness and impact on other socio-economic issues; and
- For the strategy to take into account developments in European legislation, technological and scientific advances, improved dispersion modelling techniques and increased understanding in socio-economic impacts.

Whether an authority is developing an Action Plan for delivering air quality improvements or not, an air quality strategy can provide a broader framework for securing wider environmental objectives, such as climate change, noise and Integrated Pollution Prevention and Control (IPPC).

A strategy will provide the framework for addressing future national and international developments in air quality management, as new air quality standards emerge to protect health, as a result of increasing scientific understanding and technical developments. Governments, including local governments, will be required to translate newly emerging pollutant standards and objectives from the European perspective into the local air quality management process. The EU is currently considering legislation for *polycyclic aromatic hydrocarbons* (PAHs) and *heavy metals* (mercury, nickel, cadmium and arsenic), and in time these will emerge as Daughter Directives for implementation into UK air quality management regulations in the longer term.

MAIN POINT

For any local authority, an air quality strategy (AQS) is very useful for ensuring that air quality is considered across various council planning and other activities. A strategy will provide the framework for addressing future national and international developments in air quality management, as new air quality standards emerge to protect health, as a result of increasing scientific understanding and technical developments.

Why Develop a *Local* Air Quality Strategy?

An authority will need to consider the specific objectives for the development of a local air quality strategy. These may include the following:

- to address air pollution more widely for pollutants such as greenhouse gases, dioxins, dusts, local hot spots and indoor air quality;
- to address specific related policy areas, for example climate change, community planning;
- to provide the framework for reviewing new pollutants (e.g. PAHs) as they emerge from European Directives;
- to provide the framework for subsequent Air Quality Strategy Reviews and subsequent new or amended air quality objectives;
- to help foster partnership between groups of local authorities and within local authorities across various departments;
- to encourage corporate involvement in environmental protection and health planning;
- to accompany developing air quality action plans, and provide the framework for areas that *only just comply* following the Phase 1 assessment work;
- to prevent air quality deteriorating across a local authority or region.

Some local authorities may feel that a local air quality strategy provides a real catalyst for corporate involvement, and a mechanism for securing potential or extra funding for specific traffic or other related initiatives to help improve air and environmental quality more generally.

Why Develop a *Regional* Air Quality Strategy?

Sources of air pollution rarely impact on a single authority, and some actions to mitigate against air quality problems and to help improve overall air quality locally may be best achieved through measures identified and implemented on a regional scale. An example of this is a regional transport plan and regional economic plan, which has implications for the movement of goods and commuters on a greater scale than that of a single autonomous local authority. As a consequence of this, a more regional approach to air quality strategies, through the development of a Regional Air Quality Strategy, may be more effective for groups of local authorities within a particular region.

Regional air quality strategies (RAQSs) are currently being explored and developed by regional groups of authorities in various areas of the country, in order to facilitate a more regional approach to the securing of air quality objectives in a number of local authorities. Specific regional infrastructure developments or proposals that may benefit from a regional approach include the following:

- regional airports;
- motorway corridors;
- major regional retail centres;
- industrial corridors (Zone of Industrial Pollution Sources, or ZIPS).

Does a Council Need a Local Air Quality Strategy if Declaring an AQMA?

If a local authority has identified the need for AQMAs within the authority, then the air quality action plan will establish the necessary actions to assist with the alleviation of localised air quality exceedances. The Action Plan, as discussed in detail elsewhere in this report, will identify the players, evaluate and prioritise options and actions, taking into account wider issues and practicalities.

What an Action Plan does not provide, however, is a framework in which all potential mechanisms for addressing the wider LAQM process are explored for the implementation of air quality policy. An Action Plan may not be the appropriate vehicle for ensuring that future pollutants and objectives will be assessed and addressed, or for ensuring air quality is considered in the wider initiatives and planning processes of a local authority.

London has a draft strategy for the whole of the Greater London area, encompassing all 33 London Boroughs, and a number of individual Boroughs have developed, or are developing, their own local strategies. Almost all London Boroughs will require an Action Plan, and some authorities may choose to develop a joint Action Plan Strategy, as the City of Westminster has done. Whether declaring an AQMA or not, a strategy will establish a set of principles by which an authority can expect to improve air quality within its locality, and such a strategy will enable links to wider incentives and initiatives to be established.

MAIN POINT

Action Plans don't necessarily provide the framework for addressing the wider LAQM process for the implementation of air quality policy. Whether declaring an AQMA or not, a strategy will establish a set of principles by which an authority can expect to improve air quality within its locality, and such a strategy will enable links to wider incentives and initiatives to be established.

Developing a Local Air Quality Strategy

Developing a local air quality strategy will require some careful preparations so as to ensure that the process is as focussed, comprehensive and useful as possible. Some initial preparations will involve the following:

1 Consideration of the specific *policy areas* to be included (i.e. just LAQM, or wider frameworks of climate change, IPPC, noise, wider environmental protection, community planning).

2 Exploration of the *specific aims* of the strategy. This might include the following:

- to ensure local air quality is of the highest quality possible in the locality;
- to ensure that plans to mitigate against air quality problems also aim to reduce CO_2 emissions in line with national targets;
- to protect and enhance the natural and built environment so that plants, animals and people are free from the consequences of environmental pollution.

3 Identification of the *roles* and specific involvement of people, stakeholders, (industrial, business and commercial).

4 Securing *corporate support* for the development of the strategy as soon as possible.

MAIN POINT

Developing a local air quality strategy will require some careful preparations to ensure that the process is as focussed, comprehensive and useful as possible. These include consideration of the specific policy areas to the included, exploration of the specific aims of the strategy, identification of the involvement of stakeholders and securing corporate support for the development of the strategy.

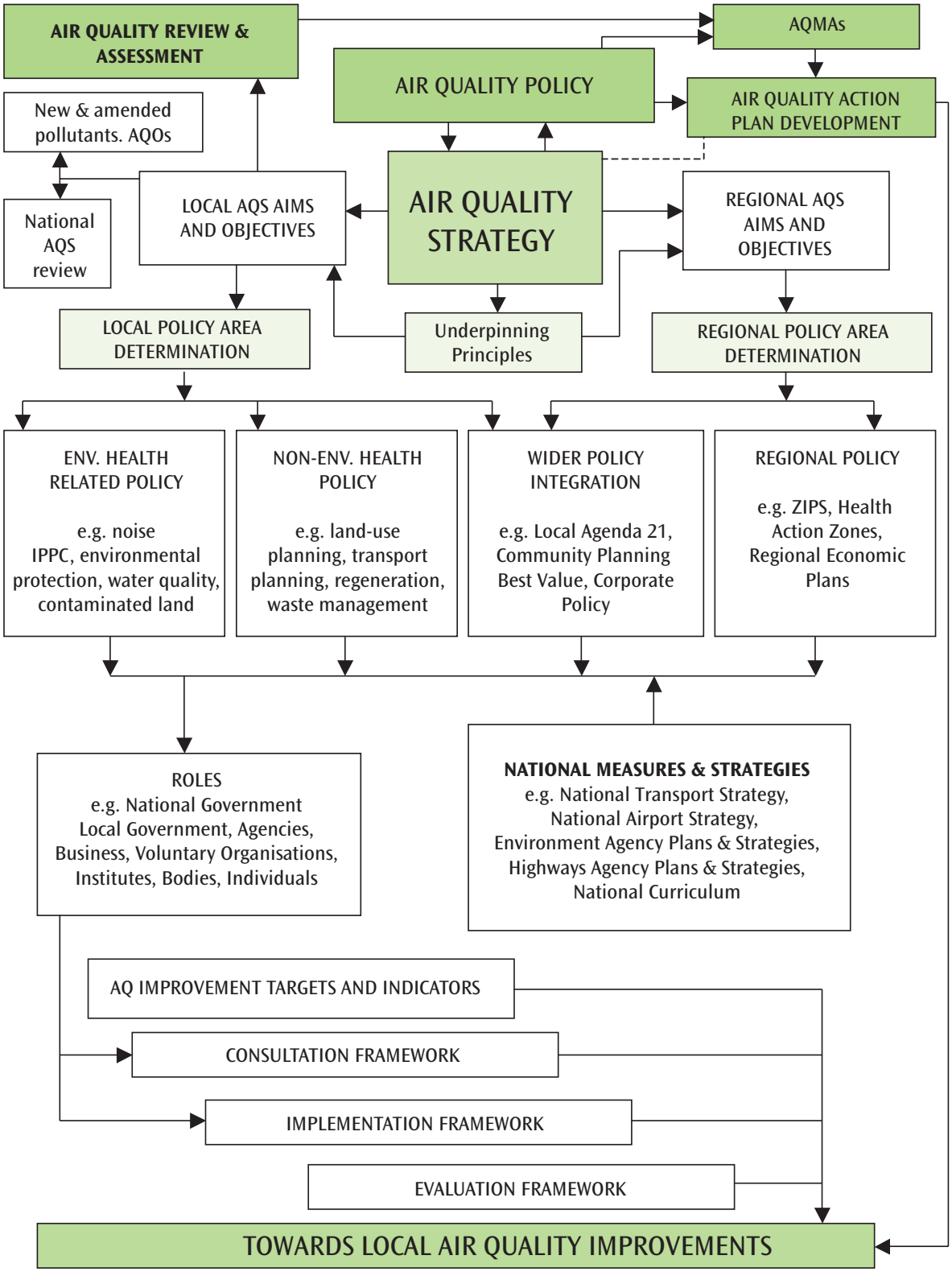
What is Included in a Local Air Quality Strategy?

The process of developing a local air quality strategy and a regional strategy is demonstrated in Figure 7. As well as identifying the various policy areas to be included, it is necessary to consider the frameworks for implementing the strategy, disseminating the information and evaluating the effectiveness of the strategy. An authority should explore the development of both air quality indicators and air quality targets such that the strategy can be evaluated in the long term, and established within a specific time scale.

Some useful academic references on local and regional air quality strategies

- Bishop, K., Tewdwr-Jones, M. and Wilkinson, D. (2000). *From Spatial to Local: The Impact of the European Union on Local Authority Planning in the UK*, Journal of Environmental Planning and Management, 43(3), p309-334
- Elsom, D. (1999). *Development and Implementation of Strategic Frameworks for Air Quality Management in the UK and the European Community*, Journal of Environmental Planning and Management 42(1) p103-121.
- Brown, F.E., de la Barra, T., Rickaby, P.A,. Steadman, J.P. and Turner, J. *Sustainability and the City: An Evaluation of Policy Scenarios for Urban Growth Using an Integrated Land-Use and Transport Model*, Air Pollution Series.

Figure 7. Process of developing Local and Regional Air Quality Strategies



Section 4: Case Study Scenarios

Introduction

For an air quality action plan to develop and unfold, a local authority must consider very carefully the process which it will follow. The steps of this process have been described in Section 2, and the purpose of this section of the guidance document is to provide some case study scenarios to examine, as examples of an approach to take.

Five case studies have been devised, which reflect a number of the local authority experiences and outcomes as a result of the air quality review and assessment process in the UK. Four of the five cases demonstrate different air quality management areas, all requiring action plans to be developed, and they represent a variety of local authorities from rural to urban authorities. A fifth case study is presented, which demonstrates a process for a local authority which does not require an air quality action plan, but which has chosen to develop a local air quality strategy.

Each case study is presented by way of a flow diagram, which illustrates the process of developing an action plan. A description of each local authority case study is provided, which details the local circumstances of the authority, and provides information on the actual exceedances predicted and public exposure identified.

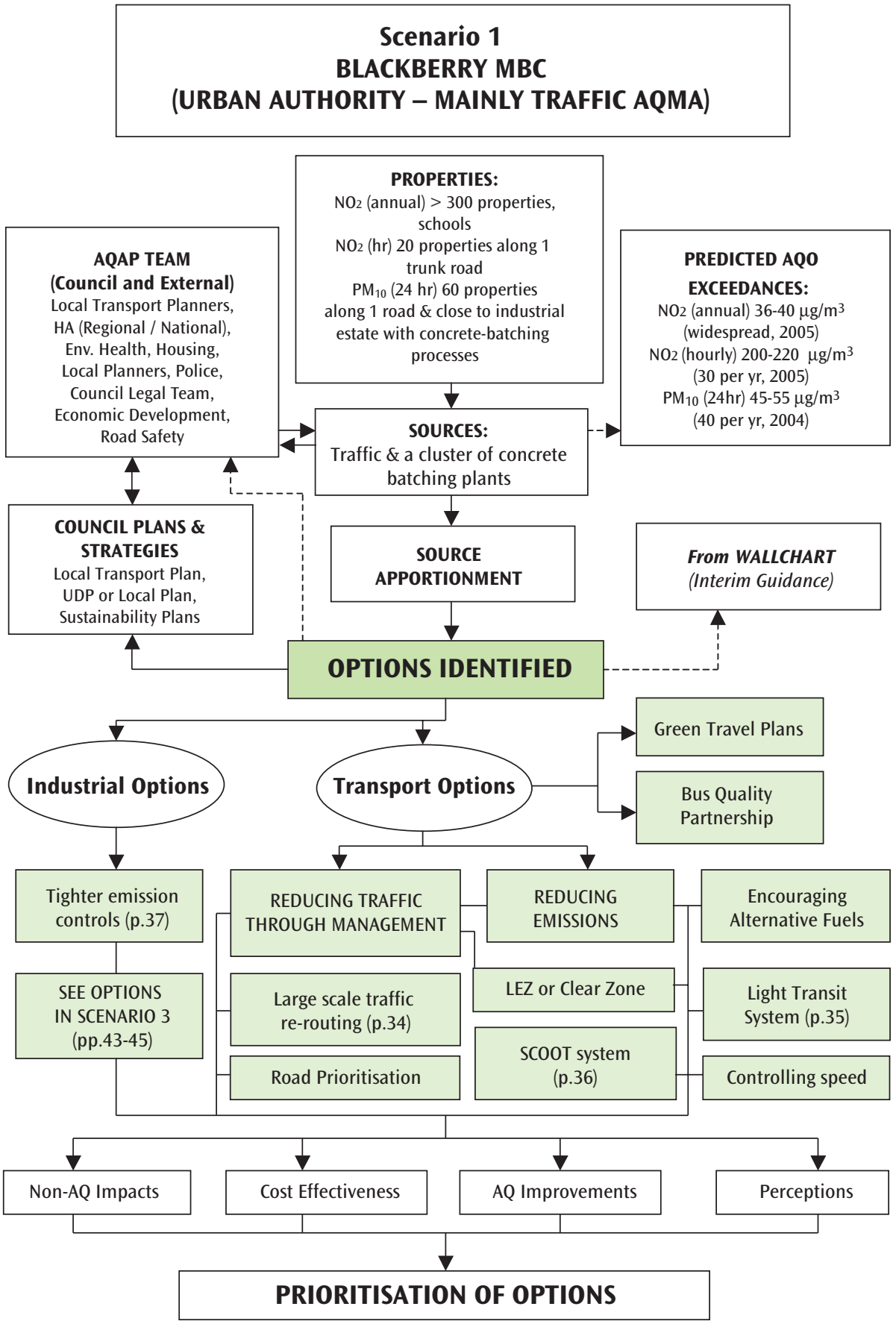
Finally, a list of four options is provided for each of the action planning local authorities. The list is not intended to be exhaustive, or indeed an accurate list of the most appropriate options for the particular local authority in question. However, the options are considered in the light of their cost effectiveness, and other such criteria identified in both this guidance and the interim guidance document. A summary is provided, which is intended to highlight the overall viability of the option for helping improve local air quality, although a final prioritisation of the four options is not provided in this guidance.

The scenarios have attempted to encompass many of the emerging issues for local authorities embarking on action planning. Appendix 2 at the end of this document provides some further information on specific issues not otherwise covered elsewhere in the document.

Four of the five local authority case studies were the basis for the NSCA's Spring Workshop 2001. The purpose of the workshop was to consider the process of prioritisation of options with respect to the case studies provided in this document. The outcomes of the workshop can be found at:

http://www.uwe.ac.uk/aqm/centre/AQMAs/aqaps.html

Case Study Scenario 1



Scenario 1: Blackberry MBC (Urban Authority – Mainly Traffic AQMA)

Description

Highly urbanised regional centre, with widespread exceedances of the annual NO_2 objective predicted. Pockets of NO_2 hourly objective exceedances predicted along main arterial routes, and localised exceedances of the 24-hr PM_{10} objective predicted along the same arterial routes and in close proximity to a number of concrete-batching plants. Large trunk road network, and busy ring road around regional centre. A number of large-scale retail centres are located both within the authority and external to it, which cause increased traffic through and within the authority. A cluster of concrete-batching processes (Part B) are located within a corner of the authority. Background concentrations are predicted to be 23 µg/m^3 (NOx) and 22 µg/m$^3_{(GRAV)}$ (PM_{10}) in 2005 and 2004 respectively.

Advanced validated modelling techniques identified AQO exceedances; AURN located within authority. Modelling validated using traffic counts, and continuous monitoring data. Large amount of non-seasonal commuter traffic. Largest employers within the authority are the Local Authority, the Health Authority and the financial sector. The concrete-batching processes and manufacturing base of the authority are not major employers.

An AQMA has been declared using the NO_2 annual mean predicted exceedances with margin for uncertainty (36 µg/m^3 contour). The NO_2 hourly and PM_{10} exceedances are encompassed within this spatial area. However the different objectives will require different mitigating measures due to the different averaging periods and sources.

AQAP Team & consultees: In addition to those identified in the diagram, the local Chamber of Commerce representative has been invited onto the AQAP team, together with the consortium developing the Light Transit System. The Local Health Authority has also joined the team, as a Health Action Zone is proposed for much of the urban centre of the authority, and will encompass much of the AQMA.

Plans & Strategies: The authority's Local Transport Plan contained a substantial section on air quality and sought to include consideration of air quality issues in all schemes during the period covered by the plan. This also included the initial version of a proposed Local Air Quality Strategy which sought to achieve objectives more stringent than the national objectives in areas not affected by traffic and not to allow air quality to deteriorate in those areas where it was already satisfactory.

The authority's Local Plan is currently being revised as part of the regular 5-year cycle of review. The air quality professionals are being brought into this process to ensure that air quality issues are properly addressed in the planning process. A protocol for dealing with air quality in determining planning applications is also being developed. The authority's Road Safety Strategy has recently been published, and proposals for additional pedestrian crossings along the roads within the AQMA are currently being considered.

Source Apportionment: The NO_2 annual and hourly objective predicted exceedances are both mainly traffic related, though other sources contribute a relatively small amount (less than 10%) to the overall concentrations. The NOx emitted from traffic has been found to be a combination of traffic travelling only within the urban centre and 25% through traffic. HGVs account for 9% of traffic on main routes, 75% of the HGVs are travelling through the urban centre. The PM_{10} predicted exceedance is a combination of both traffic-related primary PM_{10} (~15%), industry related PM_{10} (fugitive emissions, ~25%) and a high background (~30%) with high proportion of re-suspension from roads (~30%).

OPTION 1: Large scale re-routing of traffic through traffic management

OPTION 1 OBJECTIVES:

To manage traffic, both within the urban area and that passing through it, using traffic management measures to direct traffic along routes with sufficient capacity (current and 10-year predicted capacity), avoiding those routes where AQOs are predicted to exceed.

Non-AQ Impacts

If the aims of the scheme are achieved, traffic and resulting emissions will not reduce, but effectively be redistributed. Therefore overall CO_2 emissions will not be affected, noise may decrease within the AQMA, but may increase elsewhere. May not be equitable to cause increased volumes elsewhere in the authority.

Cost Effectiveness

Potential capital outlay significant, with no obvious pay back unless traffic-reduction and/or pricing mechanisms (i.e. tolling) also introduced.

AQ Improvements

If the aims of the scheme are achieved, overall traffic volumes will not be reduced. Emissions may decrease within the AQMA, but increase elsewhere. Careful consideration in relation to exposure in the areas where traffic will be redirected. A city-wide strategy is required.

Perceptions

There is likely to be a mixed reaction from residents depending on whether they are in an area of increase or decrease in traffic. Reaction of local businesses will be dependent on their particular circumstances, location and transport requirements.

OPTION 1 SUMMARY

A wider traffic management strategy encompassing this option as one element is required for this measure to work. The LTP should provide this mechanism. Otherwise, if implemented as a single measure, congestion will increase elsewhere in the city, affording potential new AQO exceedances or increased levels of exceedance. If well managed, re-routing of traffic may achieve the AQOs in the short term, but needs to be implemented along with traffic reduction measures for the longer term. This measure is likely to have more impact on the hourly NO_2 AQO than on the annual NO_2 AQO. It will be less effective for working towards achieving the PM_{10} AQO locally as traffic is only a relatively minor source.

OPTION 2: Light Transit System (LTS)

OPTION 2 OBJECTIVES:

To encourage a modal shift from cars to public transport by providing a fast, modern, clean, efficient public transport network, by way of a Light Transit System, to be developed mainly along and alongside existing highways and trunk road networks.

Non-AQ Impacts

If the modal shift is achieved, this measure will result in decreases in local CO_2 emissions, noise and potentially reduce road accidents. Equitable, so long as not prohibitively expensive to use and available to the wider community for commuting, leisure and other purposes.

Cost Effectiveness

Huge investment required to initiate a light transit system. Need to take a long-term view in order to assess cost effectiveness. Could potentially create revenue in the much longer term.

AQ Improvements

Potentially significant air quality improvements afforded in the longer term, particularly if alternative fuels are used, and the prioritisation of road space to non-car use. It is possible that this could be offset if the road space made available by the uptake of LTS were used by other vehicles.

Perceptions

Positive reaction from the wider public if viable as a real travel option, through being affordable, reliable and accessible. For some, this option may be considered a waste of local resources.

OPTION 2 SUMMARY

Significant financial investment necessary for implementing LTSs as part of city wide transport strategy to encourage people out of cars and onto public transport. Will only be effective for traffic going into the town centre and not those travelling through. May tackle both NO_2 AQOs if commuter traffic is significantly reduced. May marginally reduce PM_{10} concentrations. Care must be taken to avoid freed road space being used by other traffic. Unlikely to deliver air quality improvements by target dates.

OPTION 3: SCOOT System

OPTION 3 OBJECTIVES:

To smooth traffic flow, using traffic light sequences etc. in order to reduce emissions from stop, start driving. Should tackle congestion and also speed up public transport by prioritised lights and junctions.

Non-AQ Impacts

If successfully implemented should decrease CO_2 emissions through more efficient use of fuel.

Cost Effectiveness

Will be initially expensive to implement in terms of IT requirements, but once in place will be cost effective in the longer term.

AQ Improvements

Air quality improvements will be localised, where emissions are due to low speeds and congestion. Unlikely to have any knock on effects in other areas. It may also be possible to configure the system in different ways so that beneficial effects may be achieved during pollution episodes.

Perceptions

Negative perceptions unlikely. Public likely to benefit from a co-ordinated awareness campaign with respect to the concept of this initiative.

OPTION 3 SUMMARY

Would be useful as part of a package of measures. Will probably do more to alleviate hourly NO_2 problems than annual average, although will contribute to decreasing annual NO_2. Will be less effective in achieving the PM_{10} objective.

OPTION 4: Industrial Option

OPTION 4 OBJECTIVES:

To assist in the achievement of the 24-hr PM_{10} AQO through measures to reduce fugitive emissions from the concrete-batching plants, through improved dust arrestment and emission reduction techniques, so as to reduce, where possible, the potential 30% contribution to predicted exceedances of the AQO.

Non-AQ Impacts

Techniques for reducing fugitive dust of PM_{10} size may also result in improvement to the local nuisance dust situation/ improve visual amenity.
Reduction of raw materials lost to the environment may give rise to the possibility of cost savings due to good housekeeping.
Recycling of collected material from arrestment system where possible may provide cost savings.
Implementation of new systems may lead to the implementation of an Environmental Management System with other benefits such as reduced effluent/water use/noise and energy use.

Cost Effectiveness

Expense will be low to implement good housekeeping techniques backed up by detailed procedures and auditing as part of an Environmental Management System and will be very cost effective. Improvement on existing arrestment plant could involve medium to high costs if replacement or redesign of a system or plant is required.

AQ Improvements

Improvements will be localised due to the relatively low level fugitive sources and due to the size and density of the particles which are thought to be of a relatively high density and towards the coarser end of the PM_{10} size range.

Perceptions

Positive perception by the public who should be in support as even if the viability of the plants is an issue, loss of employment would be small. Support for relocation to a more suitable industrial site if practicable is likely to be a supported option also. Negative perceptions by the operator if costs of abatement medium to high and the viability of the enterprises are compromised due to increased unit costs.

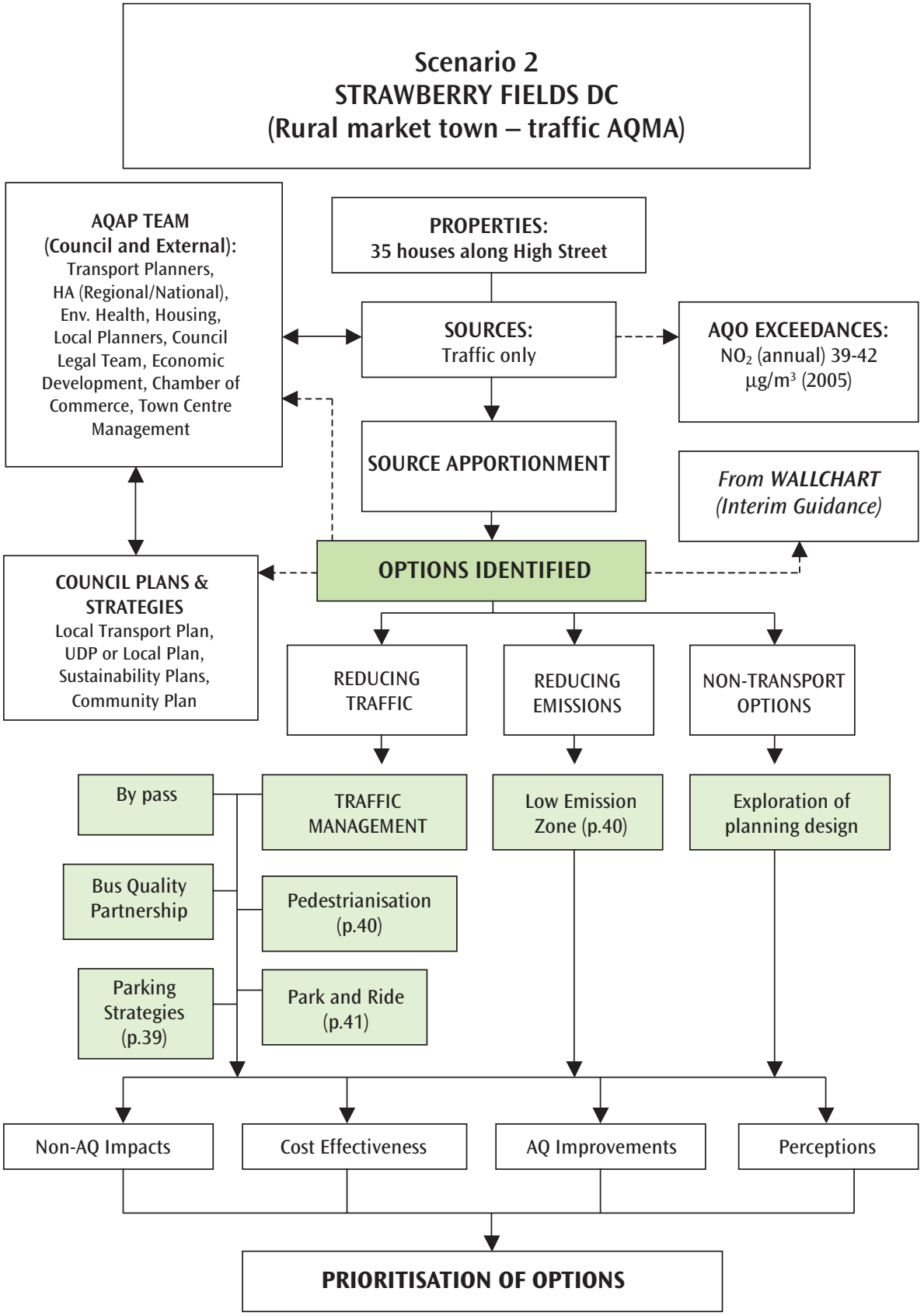
OPTION 4 SUMMARY

Useful as part of a package of measures, particularly the lower cost options of housekeeping and EMS. New arrestment facilities thought to provide only a marginal benefit however unless existing plant is compromised and does not meet process guidance standards. Relocation as part of some redevelopment scheme may be a locally desirable option if practicable and economic.

PRIORITISATION OF OPTIONS

When prioritising all available options, different measures will be effective for different objectives. An overall view will need to be taken on the best package of measures, not only for achieving all three air quality objectives, but also taking into account other non-air quality impacts, practicability and cost effectiveness. In this complex situation, a combination of measures will be required, particularly for achieving the PM_{10} objective. In some cases, measures that are not necessarily effective singly may be required in order to increase the effectiveness of other measures. For example the use of parking charges may make some public transport measures more appealing to the public and community overall.

Case Study Scenario 2



Scenario 2: Strawberry Fields District Council (Rural Authority – Congested Streets AQMA)

Description

Rural authority with congested narrower streets around the centre of the main town within the authority. Streets are semi-canyon (terraced) in topography. The town centre has a number of historically important buildings, and the town is locally important as both a retail centre and an employment centre. Popular and well established open-air market twice a week. The centre suffers constant traffic congestion, and morning and evening peaks, as well as congestion over the weekend period from shoppers and tourists.

Both the provision and use of public transport has been declining over recent years, and there is a large amount of on-street parking contributing to the overall traffic problem in the town, and indeed in outlying villages and small towns within the authority. The exceedances of the NO_2 annual objective has been identified through intermediate modelling, and the authority has six months of real time NO_2 monitoring, together with several years of NO_2 passive monitoring information.

AQAP Team & consultees: Representatives from local residents groups, market holders and two local transport organisations (Transport 2000 and Dial-a-Ride) keen to participate in the team. The Business Town Centre Manager is keen to be involved in discussions.

Plans & Strategies: Authority has a detailed Mobility Strategy, with objectives to make the whole town centre accessible to all. Cultural Heritage Policy conflicts in some respects with the Local Transport Plan in relation to enhanced parking provisions along some of the town centre residential roads.

Source Apportionment: The council needs to assess the nature of the traffic situation (detailed vehicle stock, speeds and journey lengths) in order to implement effective solutions. The majority of traffic is visiting the town centre, with 15% through traffic. HGVs account for 6% of traffic in and around the town centre, including those that are delivery vehicles for the shops in the town centre.

OPTION 1 : Targeted Parking Strategy

OPTION 1 OBJECTIVES:

Parking strategy proposed seeks to increase parking charges for long-term parking (i.e. commuters, employees), but retain cheap, short-term parking (up to 4 hours). This aims to discourage peak hour traffic movements, whilst encouraging visitors and shoppers to the town centre. Aims to smooth traffic flow over the course of the day.

Non-AQ Impacts

Not equitable unless coupled with public transport improvements and other initiatives. No reduction in local noise, and no overall reduction in CO_2 emissions. Potential to increase travel movement locally, and thereby potentially no improvement in road safety.

Cost Effectiveness

Likely to be cost effective due to revenue generated by parking charges. May increase vitality of the town centre. Assists businesses to become more profitable if their parking facilities are used at weekends by shoppers and tourists.

AQ Improvements

Should reduce NOx emissions at peak hours and hence contribute to annual NO_2 objective achievement.

Perceptions

The package needs to be sold as a benefit to the commercial centre of the town. Pressure groups might not oppose if they see that commuters are discouraged.

OPTION 1 SUMMARY

As part of an overall traffic management strategy this will contribute to air quality improvements. Difficult to assess how effective it would be as a single measure.

OPTION 2 : Pedestrianisation

OPTION 2 OBJECTIVES:

To alleviate congestion completely along specific streets. May be part of a wider environmental improvement scheme.

Non-AQ Impacts

Increased environmental improvements generally, economic benefits to local businesses, may allow more businesses to move in, for example street cafes, to utilise extra space. Noise improvements as well as potentially decreased CO_2 emissions. Equitable and will have enhanced road safety. Need to avoid knock on effects in adjoining areas, and ensure access to those less mobile is maintained.

Cost Effectiveness

Not cost effective for the local authority, but in a wider sense, will encourage more businesses, encourage tourism etc. Improved vitality of town centre during the evenings and at weekends with street entertainment, festivals etc may improve overall commercial and economic diversity and development locally.

AQ Improvements

Significant within pedestrianised areas, but a wider view needs to be taken to avoid knock on consequences of diverted traffic elsewhere.

Perceptions

Generally not positively received by trades people, but it has been shown in most circumstances to increase trade. Other members of the population may be positive, particularly if implemented with increased public transport opportunities affording wider travel choice.

OPTION 2 SUMMARY

There will be a need to control access of delivery vehicles, which may pose a problem at night, as partially residential. Some good pedestrianisation schemes already implemented.

OPTION 3 : Low Emission Zone

OPTION 3 OBJECTIVE:

Lower emissions within a restricted area, thus leading to improved air quality in the longer term.

Non-AQ Impacts

May have major socio-economic implications as lower social groups have older and more polluting cars. May reduce traffic coming in which may have positive or negative impacts on trade and business, depending on what other measures are introduced at the same time.

Cost Effectiveness

Cost of implementation may be significant in the short term, and enforcement costs may be high, depending upon the regime implemented. Technologies required may prove prohibitive for some sectors or businesses.

AQ Improvements

Depends on the criteria used for the LEZ itself. Potentially good, but more likely to be effective for PM_{10} rather than NOx emissions. This option could have knock on effects elsewhere.

Perceptions

Both positive and negative perceptions likely. Residents may be opposed due to lack of access. Businesses likely to be opposed unless the wider environmental improvements can be stressed as good for business.

OPTION 3 SUMMARY

LEZs may not cause a vast reduction in NOx unless hydrogen or electric cars replace petrol. Likely to have very mixed reactions from different sectors of the population. LEZ will have huge financial implications, for example for buses in retrofitting to meet the LEZ criteria. Social equity issues need to be overcome and enforcement issues also need careful consideration.

OPTION 4 : Park & Ride Scheme

OPTION 4 OBJECTIVE:

To encourage a modal shift from car journeys into the town centre to the use of public transport, particularly commuters.

Non-AQ Impacts

Issues of equity, as option benefits car owners more so if implemented as only option. May have a positive effect on CO_2 emissions. Required land take may be significant, placing pressure on local green belt.

Cost Effectiveness

Likely to be expensive to implement initially.

AQ Improvements

Variable. Low emission buses should be encouraged to avoid an increase of polluting buses in the town centre. Air quality will deteriorate round the Park and Ride sites and these need to carefully sited.

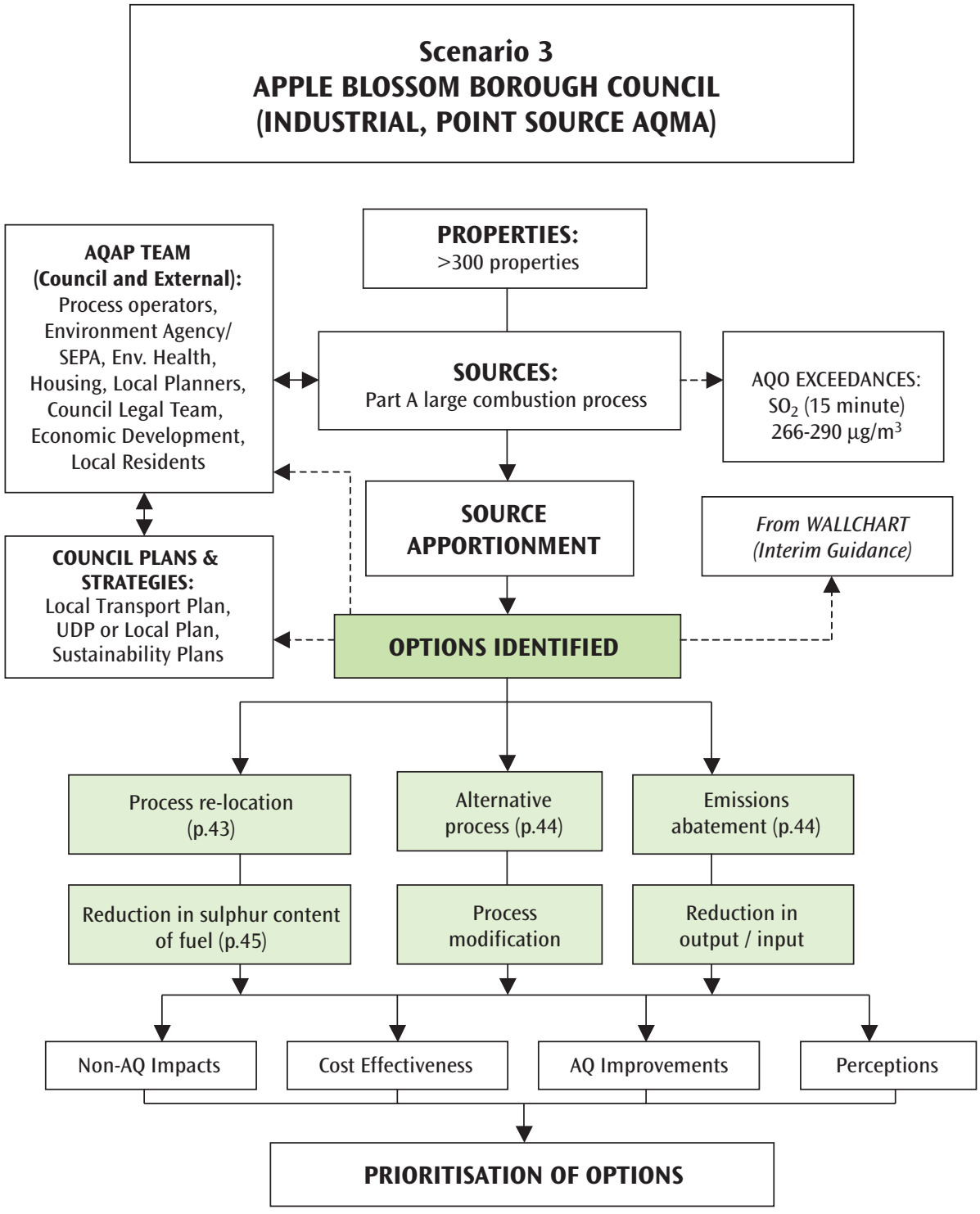
Perceptions

May be negative with residents living adjacent to proposed site. Perceived as beneficial for those who gain from faster commuting.

OPTION 4 SUMMARY

In the right circumstances may be a very effective measure when implemented as part of a wider strategy of traffic management measures. Successful schemes have been implemented. In some instances people might drive further to get to the Park and Ride site for a faster and cheaper journey. Siting of the car parks should be carefully considered with this in mind.

Case Study Scenario 3



Scenario 3: Appleblossom Borough Council (Industrial, Point Source AQMA)

Description

Largely rural authority, with one large town and a number of smaller towns and villages within the authority. A 55MW thermal input coal fired boiler plant serving a local food and drink manufacturer is situated within the authority in an old established run down industrial area close to the centre of one of the small towns. The factory, of marginal economic viability, employs between 100 to 200 people seasonally, depending on its output. The only AQO predicted to be exceeded is the 15-minute SO_2 AQO, for which the area of exceedance is widespread over a small town and a number of small villages in the south of the Borough.

Advanced modelling has identified the exceedance footprint, and the Environment Agency/SEPA has required the operator to undertake some air quality monitoring to confirm the exceedance. Several years of data from the authority's SO_2 bubbler indicate a fairly consistent background level of SO_2 in a town centre location and although the authority is within an area of former coal mining, there are no Smoke Control Areas within it. The authority having completed its third stage Review and Assessment for SO_2, has declared an AQMA covering the exceedance footprint. Following the declaration of the AQMA the Environment Agency/SEPA asked the operator to submit proposals, which would enable it to meet the air quality objective. The operator identified three possible techniques which might be implemented and discussion with the local authority suggested the further possibility that the site could have significant redevelopment potential.

AQAP Team and Consultees: The authority has put together an Air Quality Action Plan Team made up of key stakeholders. The members of the team are drawn from the Residents Association, Chamber of Commerce, Environment Agency/SEPA, Health Authority, Local Members and Officers from the Authority drawn from Environmental Health, Planning and Economic Development.

Plans and Strategies: The authority has entered into the consultation stage on its Unitary Development Plan and has included draft policies on air quality and land use planning in the part 1 consultation draft. It also has a Local Air Quality Strategy which is integrated with all its other relevant policies.

OPTION 1 : Process Re-location

OPTION 1 OBJECTIVES:

To reduce the exposure of the public to elevated levels of SO_2 emission through the re-siting of the identified source elsewhere and to facilitate the redevelopment of an old industrial area for commercial and residential use.

Non-AQ Impacts

Potential for a reduction in noise; potential for increased travelling of displaced workforce; potential for increased regeneration and employment opportunities as a result of re-location; land made available through re-location for commercial and residential development opportunities, however, may in turn create additional impacts from demolition, construction and operational phase traffic.
Potential environmental improvements due to elimination of nuisance dusts from stockpiles, improved visual amenity etc.

Cost Effectiveness

Financial cost of re-location may be too great for the company to bear in isolation and local employment would be at risk. Should grants be available there may be an opportunity for planning gains which could make this an economically viable option.

AQ Improvements

Local air quality improvement may be significant reducing SO_2, PM_{10} and NO_x.

Perceptions

Local perception – both public and industrial – likely to be adverse due to loss of local employment and disruption. The perception may be positive, however, if redevelopment encourages additional employment or provides low cost housing; additionally, poor perceptions may be mitigated if the process was a "bad neighbour" and if local employment is maintained.

OPTION 1 SUMMARY

An option requiring huge expenditure on the part of the process operator; however substantial benefit could be obtained if alternative sources of funding could be identified. This option will require the agreement of the operator.

OPTION 2 : Alternative Process

OPTION 2 OBJECTIVE:

To reduce the exposure of the public to elevated SO_2 levels through the change in process to a gas fired CHP plant.

Non-AQ Impacts

Will obtain benefits of reduced nuisance from fuel stocks as change from coal to gas.
Potential for more efficient process, i.e. greater power output per unit of fuel burnt and hence also a reduced CO_2 emission for a comparable power output (assisting in climate change mitigation).
Need to build new facilities will create new employment opportunities.

Cost effectiveness

Potentially high cost but as rewards also high, they may make this a viable option.
CHP plant generating heat and power will provide large cost savings.

AQ Improvements

Potentially large, e.g. including not only reduction of SO_2 but also NO_x and PM_{10}.

Perceptions

Perceptions by industry of high additional costs but may be sold on the benefits of a CHP scheme and cleaner plant will lead to the perception by the public of benefits.

OPTION 2 SUMMARY

Potentially high cost but with high potential payback with the operation of the CHP plant. The scheme would also enable the Air Quality Objective for SO_2 to be met.

OPTION 3: Emission Abatement

OPTION 3 OBJECTIVES

To reduce the exposure of the public to the elevated levels of SO_2 emissions by fitting abatement systems to reduce the quantity of the SO_2 emissions, in this case by means of a flue gas desulphurisation plant (FGD).

Non-AQ Impacts

Fitting an FGD system will produce a waste product for which there are no current recycling opportunities and which will need to be disposed to landfill.
Increased traffic serving the FGD to deliver raw materials and remove waste.
Increased noise unless suitably attenuated.
Increased water use.
Increased land use on site and additional infrastructure required.
Increased power consumption hence greater coal burn and CO_2 emissions (approx 2%).

Cost Effectiveness

High capital and operating costs.

AQ Improvement

Potentially high (90-95% SO_2 removal) but also with a reduction in PM_{10} releases.

Perceptions

Operator perceives the higher costs do not give any increase in efficiency.
Environmental groups may consider FGD not to be a sustainable option.

OPTION 3 SUMMARY

Relatively high cost scheme which may not be seen as sustainable but likely to remove the SO_2 problem.

OPTION 4: Reduction in Sulphur Content of Fuel

OPTION 4: OBJECTIVES

To reduce the exposure of the public to the elevated levels of SO_2 by means of reducing the sulphur content of the fuel used. Coal of sufficiently low sulphur content would need to be imported.

Non-AQ Impacts

Company viability may be affected by insecurity of supply and difficulties in ensuring consistent fuel quality.
Use of imported coal may adversely affect current local supplier.

Cost Effectiveness

Likely to be a cheap option if the fuel supplies can be maintained.

AQ Improvements

May be difficult to achieve compliance if the number of exceedances is large.
Will be no improvement in NO_x and PM_{10}.

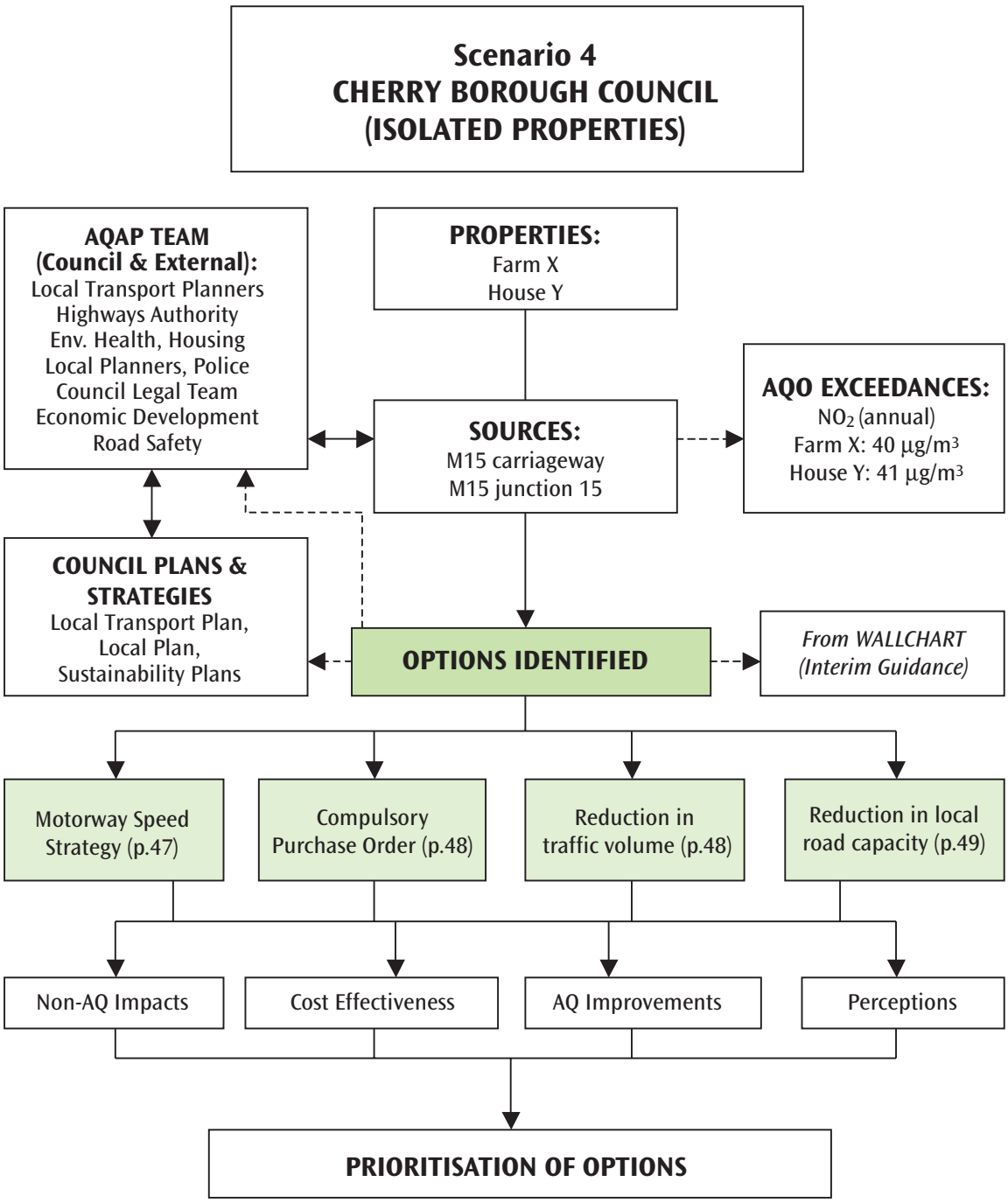
Perceptions

Operator's perception may be negative as there may be operational difficulties if supply not guaranteed or of poor quality.
Public perception may also be negative as they will see no change in the operation.

OPTION 4 SUMMARY

An option that may not achieve the required level of compliance with the Air Quality Objective.

Case Study Scenario 4



Scenario 4: Cherry Borough Council (Isolated Properties)

Description

Rural location, with heavily trafficked motorway alongside which a small number of dwellings are located. A motorway junction within the Borough has a farmstead located between the junction and the motorway. Exceedances of the NO_2 annual objective are predicted at the farmstead and one other residential property only. Predictions have been made using an advanced model, and diffusion tubes have recently been located at the façade of each property. The exceedances are borderline, calculated using -2 standard deviations. Real-time monitoring is currently being installed at the farmstead by the local authority. No further residential development is proposed in the area. The background concentration of NO_2 in 2005 is predicted to be 17 $\mu g/m^3$.

The junction of the motorway intersects a road under County Council control, leading to a local town. A 40mph speed limit has been imposed along the said road, approximately 100 metres from the slip road turn off. The motorway junction is free-flowing for the majority of the time, although often congested at peak times.

A resident's forum has been established and initial contact with the County Council made. The Highways Authority has been contacted regionally, but have not responded so far.

AQAP Team & consultees: The team includes local transport planning officers, and road safety officers. Farming community representatives wish to be involved in the action planning process, and the local transport company has expressed a wish to be included in the planning processes.

Plans & Strategies: The draft Local Plan has the land adjacent to the farmstead and nearby house earmarked for commercial development, and the Local Transport Plan proposes measures to alleviate the congestion at the junction through widening the slip road in the medium term. Sustainability Strategy is in draft stage, and the emerging Local Economic Development Plan seeks to encourage the agricultural and commercial vitality of this area in particular.

Source apportionment: The source of NO_x emissions is traffic only; there are no local industrial processes combining with traffic emissions. Traffic at the junction is likely to be the key source of emissions responsible for the elevated NO_2 levels and predicted exceedances, along with the motorway traffic.

OPTION 1 : Motorway Speed Strategy

OPTION 1 OBJECTIVES:
To reduce emissions through speed regulation, rather than flow of vehicles. To be implemented as either a blanket speed limit, or a variable limit depending on traffic flow and time of day.

Non-AQ Impacts
May reduce ambient noise levels and likely to improve safety on that stretch of motorway. Reduced fuel consumption would have beneficial effects on CO_2 emissions and fossil fuel reserves.
Possible increased journey times leading to frustration. Economic consequences of increased journey times particularly for businesses.

Cost Effectiveness
Depends on actual strategy employed. Variable speed limits costly to implement and enforce. Blanket speed limit likely to be more cost effective but would still require effective enforcement.

AQ Improvements
May have some beneficial effects on concentrations during free flow periods but if periods of congestion remain this is likely to have limited effect on the annual average NO_2 concentration.

Perceptions
May be perceived as a restriction on freedom to travel and will only be effective where enforcement is undertaken and resources are made available.

OPTION 1 SUMMARY
May be an effective measure in some circumstances, but in many cases the improvements to safety will be a more important reason for implementation with air quality 'piggy-backing' this issue.

OPTION 2: Compulsory Purchase Order

OPTION 2 OBJECTIVE:
To remove specific exposure.

Non-AQ Impacts
Dependent on nature of buildings and farm. If these are working businesses, CPO will have socio-economic impacts; if currently working at a loss, may be beneficial for residents.

Cost Effectiveness
Likely to be relatively good. One-off cost implication.

AQ Improvements
None.

Perceptions
Dependent on nature of properties. If these are attractive and if the farm is a viable business then the perceptions are likely to be negative but if they are rundown and the farm is either non-operational or in financial difficulty it could be welcomed.

OPTION 2 SUMMARY
Superficially an attractive option with one off cost implications. Could be less attractive if CPO is resented. Potential legal problems in executing CPO. Possible variation might be to defer CPO until properties came on the market naturally.

OPTION 3: Reductions in Traffic Volume

OPTION 3 OBJECTIVE:
To reduce overall emissions and thereby assist in improving ambient air quality

Non-AQ Impacts
May reduce ambient noise levels, climate change gas emissions and likely to improve safety on that stretch of motorway. If traffic is displaced to other routes may have adverse safety, air quality or climate change impacts in other areas.

Cost Effectiveness
Variable depending on actual measures utilised.

AQ Improvements
Likely to be reasonably good **if** reductions are achieved. However, reductions in emissions will not be proportionate with pollutant concentration reductions.

Perceptions
May be regarded as a restriction on freedom to travel. May be positively perceived if the improvement is noticeable and alternatives to car use are made available.

OPTION 3 SUMMARY
If real reductions can be achieved this is likely to be an effective measure to achieve improved air quality improvements. However, measures need to be investigated on a fairly wide scale in order to incorporate any potential knock on effects due to displaced traffic.

OPTION 4: Reduction In Local Road Capacity

OPTION 4 OBJECTIVE:

Ultimately to reduce traffic volumes, and hence emissions, to improve ambient air quality.

Non-AQ Impacts

May reduce ambient noise levels, improve safety and reduce climate change gas emissions. If traffic is displaced to other routes it may have adverse effects on ambient noise levels, safety and climate change gas emissions.

Cost Effectiveness

Variable, depending largely on how enforcement issues are tackled.

AQ Improvements

Likely to be good on the road with reduced capacity. May deteriorate in other areas. However, reduced road capacity may increase the congestion on the road, thus reducing overall speed that may result in increased emissions.

Perceptions

Public may see it as a restriction on travel. Depends on what alternatives are made available.

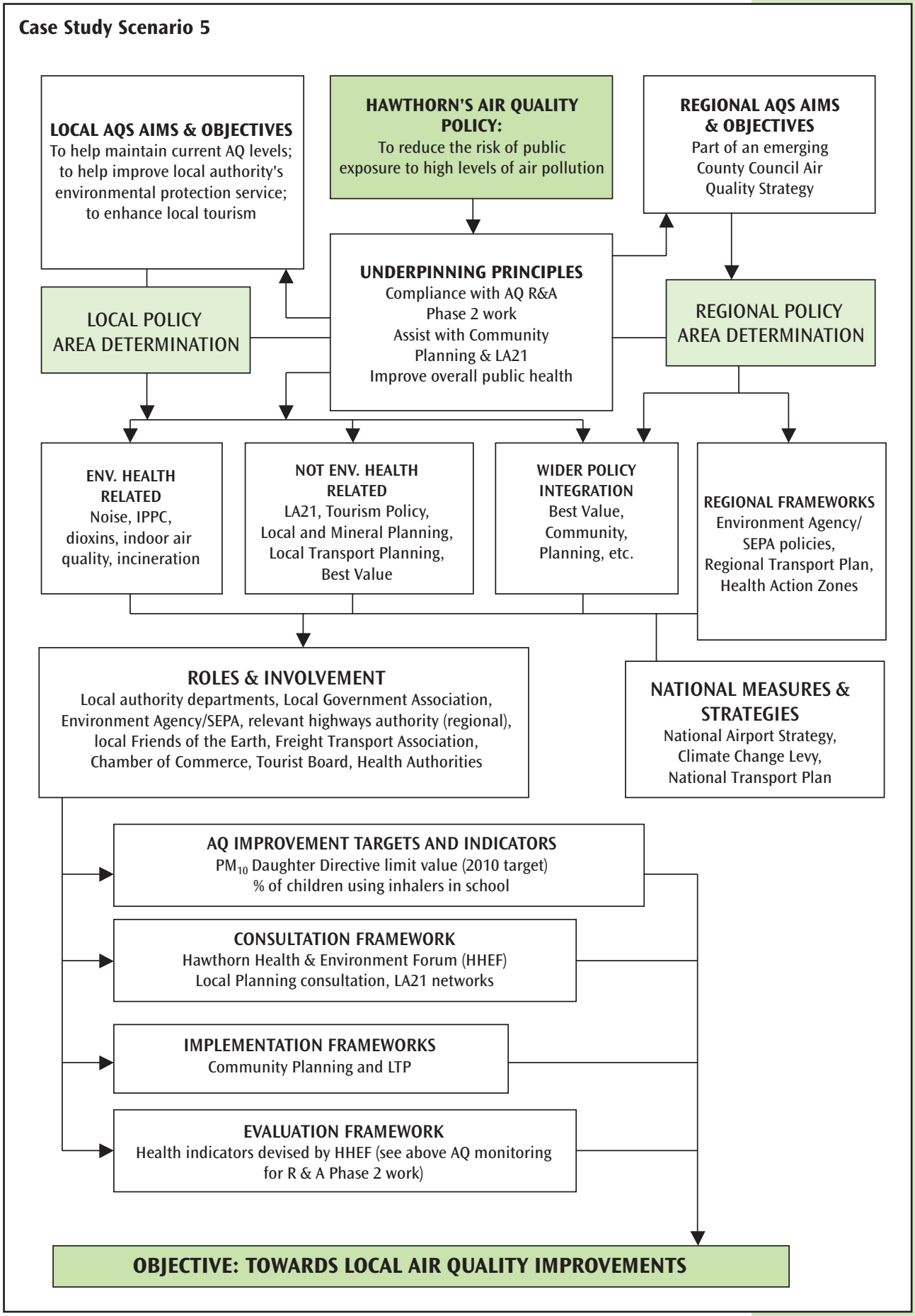
OPTION 4 SUMMARY

Effectiveness will depend on how alternatives to car transport are implemented. If no alternatives are made available, road may become more congested with resulting higher emissions.

PRIORITISATION OF OPTIONS

The prioritisation of options will depend on the feasibility of each option. The feasibility in turn will be influenced by public perceptions, public acceptability and cost of each option. The fact that the predicted exceedance is marginal will raise the question, in some quarters, of whether it is worth taking any action. This course, however, does run counter to the view that it is not just a matter of achieving the objectives but also that it is important to reduce concentrations of pollutants as far as is reasonably practicable. It is also an example of the thinking that it is permissible to pollute up to the objective levels which in turn is a contradiction of the European Air Quality Framework Directive approach. Even so in these circumstances it is questionable whether the very high cost measures can be justified given the combination of marginal exceedance and low numbers of exposed people.

Case Study Scenario 5



Scenario 5: Hawthorn Borough Council (Non-Declaring Authority)

SUMMARY TEXT

Hawthorn Borough Council is one of a number of local authorities in its County that does not require an AQMA. The authority is situated on the coast, and is a particularly popular destination for beach goers and surfers. Other authorities within the County have predicted exceedances of the annual NO_2 objective, due mainly to traffic and seasonal congestion through some of the smaller towns and urban areas on route to the coast.

The authority is keen to ensure air quality is a local indicator as part of its commitment to the local health initiatives underway, as the authority is part of a pilot project for a *Health Action Zone* within the region. Concern is mounting with respect to outline proposals for a civil airport within the County, in terms of the impact it may have on the local and regional transport network. However, the proposal is welcomed from an economic development and tourism perspective.

There are no major industrial areas within Hawthorn, although the two neighbouring authorities do have a number of industrial processes regulated by both the Environment Agency/SEPA and the local authorities. These include a small power generation plant, road stone coating works and food processing works. An incinerator is however proposed within the authority, as part of the County and Local Council's waste strategies.

Please note:

Detailed information relating to the prioritisation process with respect to the various case study options presented, has purposefully not been provided. The limited provision of information reflects a number of points for consideration with respect to specific case studies.

Section 5: Conclusions

The transition from the scientific air quality review and assessment to the emergence and development of Action Plans and local strategies marks the point at which Local Air Quality Management becomes particularly challenging and important. The move from *review* to *action* requires a move away from LAQM simply as a technical exercise to one which involves much wider *policy* interests and considerations. It may be difficult for some air quality professionals to relinquish their control over the process but this is necessary if plans and strategies are ultimately to be successfully implemented.

This guidance sets out to provide a *process* for the development of Air Quality Action Plans and local air quality strategies, and to build on the advice already offered by the previous NSCA publication *Air Quality Action Plans: Interim Guidance for Local Authorities*. While the primary audience for this is likely to be air quality specialists, it was written with consideration for those other professionals who will need to be involved in the process. It expands on some fairly well known themes, but also introduces new concepts which, while they are new in air quality management, will be familiar within other professions and planning frameworks.

The processes contained in this document and the advice from the *Interim Guidance* are both applicable to statutory Action Plans and to non-statutory air quality strategies. They can also be applied to other problems for which a multi-agency or multi-professional approach is required, such as the development of a strategic approach to contaminated land or noise control action plans.

There are obviously a large number of specific points within the guidance, but a few broad themes run through it, as follows:

1. One of the very first steps in the development of the Action Plan or strategy is to establish what else is being undertaken (or is planned) within the authority and within the area the plan is intended to affect. This is done for a number of reasons:
   - to set the Action Plan or strategy in context, and to establish its relationship to other plans and strategies in existence or in development;
   - to discover actions either underway or planned which will have an impact on air quality (directly or indirectly) and which could be articulated in terms of air quality;
   - to establish what skills, knowledge and experience could be brought into the process;
   - to investigate the processes already developed for other purposes and to assess their suitability for use in air quality management.
2. Once the need for an Action Plan or strategy is established, air quality management can no longer be the preserve of just one professional group or department. If the plan or strategy is to be fully effective and properly implemented, it will need the cooperation and involvement of a wide range of professionals, agencies and interests. This point is especially important where the sources giving rise to the air quality problem lie outside the control of the local authority, such as major industrial processes or trunk roads and motorways (as will often be the case for AQMAs). While the agencies with legislative control over these sources have made steps to become involved in the review and assessment process, much greater participation is now needed. Unless demonstrable effort is put into this at all levels, it is likely that LAQM will fail to deliver the full range of benefits that are potentially available.
3. There is no one way to develop an action plan, or to develop the elements within it, such as the prioritisation of options. This guidance provides the starting point for the process of developing Action Plans and strategies but it needs to be developed and adapted to suit local needs and circumstances. Equally, other suggested processes will emerge over time which may be more suitable in certain circumstances, but local authorities should not wait until the "perfect" guidance is available before moving forward with their Action Plan or strategy.
4. This is the first time that local plans to tackle air quality problems will have been developed and implemented. It is therefore more important to get the basics right than to have a plan which promises much but is impractical, unsupported and consequently cannot be implemented.
5. It is also important to be realistic as to the timescales for implementing certain types of actions. Review and Assessment focused on the compliance dates for the air quality objectives and, theoretically at least, so must Action Plans. However some of the more significant actions available, particularly in the field of transport management, will take longer to implement and will not have an effect for some time. Clearly, the system of local air quality management will continue after these dates and Action Plans and strategies need therefore to plan for the short, medium and long term.

Future Developments

The next phase of review and assessment will need to be completed before the end of 2003 and while the depth needed is not yet clear, it does offer an opportunity to further integrate air quality with other strategic planning areas. Most notably, Local Transport Plans are due for revision in 2005, which means that the results of review and assessment can be fully included. In order for this, and other integration to take place, the relationships between the various disciplines, departments and agencies must be established ahead of time.

There will also be an opportunity to undertake an assessment of the effectiveness of Action Plans and strategies. While there will probably not have been time for significant impacts on air quality concentrations, trends will emerge from any surrogate indicators being used. This information can be used either to modify the proposals, or to press ahead with their further implementation.

Action plans provide us with real opportunities for improving the overall quality of life and the environment through focusing on alleviating the worst air quality problems in our local authorities. Opportunities for improving travel choice, improving the long term health of local communities and forging or enhancing local and regional partnerships and collaborations will prove to be the most important outcomes of the process of local air quality management in the UK.

Appendix 1: Effectiveness Indicators

The previous section on Evaluation and Monitoring (page 20) discusses the need to develop indicators to assess whether the Action Plan is having the desired effect, over time. This need centres on the length of time taken to establish a trend in ambient air quality concentrations and the confounding factors which may mask changes in concentration, in particular meteorological conditions. It also sets out a hierarchy for indicators, which may assist in deciding which indicators to use, which should be "headline" indicators, etc. In general, research into indicators for Local Agenda 21 and sustainable development work have shown the following general considerations:

- it isn't necessary to have a large number of indicators; in fact, large numbers of indicators can often confuse the picture, especially when they do not all exhibit the same trend;
- the data to support the indicators should be readily available, although "readily available" is not always apparent and so care should be taken before rejecting indicators on these grounds;
- they should be directly applicable to what is being measured or attempted;
- they should be easily presented and easily understood, although this is will vary depending on the target audience.

The following are some examples of the type of surrogate indicators which might be used to support and monitor the implementation of an Action Plan or strategy. There are, of course, many more, and their development should feature in the consultation and participation process which accompanies the Action Plan or strategy. The "adoption" of indicators already in use within other policy areas may also prove useful, both in fostering links with these areas and in obtaining the necessary data.

Traffic flow – a reduction in traffic flow would in general result in a reduction in emissions, which may result in a reduction in air pollution concentrations. However, the re-routing of traffic to another local road in the same area may increase air pollution concentrations in that area.

Journey times – a reduction in journey times can result from a number of different factors, including a reduction in vehicle numbers, improved traffic flow or simply an increase in speed, so this indicator needs to be used carefully. Differential journey times, e.g. the difference between bus, car and bike journey times, can also be used.

Road density – the lower the road density in a given area the lower the emissions are likely to be in general; however, air pollution may be high close to arterial routes even if the density is low (such as a motorway passing through a rural area). Road density can give an indication for large urban areas where the main sources of air pollution are associated with road traffic.

Fleet mix – this could be broken down further depending on the requirements and objectives of the plan, and could include the proportion of pre Euro I (i.e. pre 1992, non-catalyst) vehicles registered in the area; ratio of petrol to diesel vehicles; proportion of vehicles (of a particular type) using cleaner fuels; mix of vehicle types and engines; etc.

Vehicle occupancy – an increase in vehicle occupancy should result in lower levels of congestion and decreased journey times. However, this may be masked by the appearance of "suppressed demand".

Road capacity – if the road capacity is substantially lower than the traffic flow this may result in higher air pollution due to congestion.

Emission density – when emission inventories are compiled, gridded totals are also typically compiled, these give an indication of the total emissions per area on an area by area basis. These total emissions can be used to crudely assess the spatial variation and areas where pollution levels have changed.

Industrial process density – the lower the industrial process density in a given area the lower emissions are likely to be in general; however, air pollution may be high close to industrial processes even if the density is low (such as a low stack with high emissions).

Fuel Sales – for example, the sales of Ultra Low Sulphur Petrol and/or Diesel.

Appendix 2: Specific Issues

Fugitive and Uncontrolled Dusts

Although fugitive and uncontrolled dusts are generally considered to be within the larger particle size fractions, there is a considerable body of evidence now to suggest that significant quantities of PM_{10} are released during various processes. Around 28% has been suggested as emitted nationally from quarrying, materials handling, stockpiles, construction and demolition (APEG, 1999). Fugitive mineral dusts often fall within the *respirable* fraction and under certain conditions sub-micron particles have been observed. In general, the amount of fugitive dust generated and emitted from point and area sources will depend upon:

- the type and quantity of process and processing activities being undertaken;
- the character and land use of the area surrounding the site and;
- climate or local meteorology, and topography.

How to monitor?

Dedicated gravimetric sampling enhanced by particle characterisation is required for identifying the sources and assessing fugitive dusts. Complex dispersion modelling remains unreliable for such purposes, and real-time monitors do not necessarily retain and offer up the complete range of chemical components for precise analysis. Samplers such as the *Partisol* can be effective when:

1. placed along a straight line at appropriate distances from the point source into the risk area; or,
2. set out in a triangular pattern to establish the effects of weather on emissions.

In both cases, if resources dictate, sampling can run sequentially or as appropriate in order to optimise the use of available instrument/s. Analysis of the particles and apportionment combined with weather data invariably provides the means to assess the impact of the point source or sources in question. Whilst sampling downwind from a fugitive source is nearly always required, additional upwind locations will add value to the dataset.

Distances and sources

Surprisingly few investigations have provided empirical data dealing specifically with the distance fugitive PM_{10} will travel from a point source. However, a respiratory health study examining the effects of open-cast coal mining in the North East (using Partisol sampling equipment), detected shale particulates representative of fugitive emissions from open-cast mines at up to 1km from the site boundary. This has led to planning consideration for PM_{10} monitoring where public habitation is at 1km distance from new mineral extraction sites (MPG11, 2000) The same health study also reported fugitive particulate matter due to roofing at one site. During a 13 day period 26% of elevated PM_{10} mass events was attributable to this. Other construction/development programmes have caused PM_{10} emissions elsewhere in the United Kingdom and merit consideration for control (BRE, 2000). In assessing the influence of mineral processing, the High Peak authorities found PM_{10} exceedances within 400m of large limestone workings. In winter the quarries did not appear to make a significant contribution, but in the summer calcium levels indicated that they were the dominant input. Continuous lime and cement processing overnight proved a key factor (DETR, 1999). Spherical iron fly-ash with a size range of 0.2 to 3mm, derived from combustion sources, along with angular iron particles from stocking grounds associated with steel production at Port Talbot have also been readily detected.

Impact zones

The impact of fugitive PM_{10} will clearly vary for the reasons discussed above, however, a 1km distance appears the furthest detectable for significantly large sources. In general, however, effects will be mitigated with distance from the emitter and might be regarded on a zone by zone basis.

Wider Planning Issues

One of the most commented on features of the local air quality management regime is that some of the major sources of air pollution are largely outside the control of the local authority. In addition, there are no powers or duties that can oblige those who do control these sources to comply with air quality action plans. This is one of the main reasons why authorities are not under a legal obligation to deliver the air quality objectives in their areas, but instead to take steps in pursuit of them. It is also the central motive for "working with others" during the development of action plans (see Section 2).

Where a source, such as an airport, is likely to be responsible for breaches of national air quality objectives, there may be a case for direct Government intervention, although this will depend both on the availability of actions at that level and on political will. That said, the DETR and devolved administrations are likely to want to see evidence that authorities with airports or other major traffic generators in their areas have a clear understanding of the emissions from these sources, and have at least considered what steps they might reasonably take in pursuit of the air quality objectives.

Airports

Only a small number of authorities are likely to have serious air quality problems as a result of emissions from aircraft and airports. Whether or not authorities are required to designate air quality management areas in the vicinity of airports, there are a number of steps they can take to reduce emissions from the site. Although local authorities have no legal powers over aircraft movements, for example, they may in many cases be able to enter into agreements with the airport operator over emissions from airport operations. This sort of partnership working can lead to significant reductions from, for example, vehicles in use at the site and/or operational aircraft stands.

Motorways and trunk roads

Where the main source of emissions is a motorway or trunk road, over which the authority has no direct control, it will be necessary to secure the co-operation and support of the relevant highways authority (i.e. Highways Agency, Scottish Executive, National Assembly, etc). In some cases however, the highways authority may consider that no cost-effective measures can be taken, in which case the authority will need to make this clear in its action plan and/or Stage 4 report. In other cases, the relevant highways authority might be able to introduce lower speed limits, bring forward road improvements which will have a positive impact on air quality, upgrade nearby junctions, or make better use of variable message systems to inform drivers of the availability of park and ride or other facilities. Depending on the local circumstances, authorities themselves may also be able to have an indirect impact on levels of local traffic on trunk roads and motorways. This might be through, for example, encouraging the widespread adoption of travel plans among local employers, by entering into bus and freight quality partnerships and/or by other policies on parking and traffic management in nearby areas.

Shopping centres and retail/leisure parks

Similarly, where a major shopping centre or other development is attracting large volumes of traffic into or through an air quality management area, the authority will need to consider ways of mitigating the problem, in cooperation with the operator of the site. Can more be done to encourage people to travel to the site by public transport? What scope is there to enter a freight quality partnership to allow deliveries out of hours, perhaps in return for commitments on cleaner, quieter lorries?

In all cases, the key action for the local authority will be that, in drawing up the action plan, it has been working in partnership with other agencies and thinking creatively about the sort of measures that might be introduced. In many cases, the extent to which the authority can make a real difference will be limited. However, to dismiss voluntary agreements and partnership approaches would be a mistake, as these can often deliver greater improvements, more quickly, than statutory measures.

Please see other sections for details of references within this section.

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