



Urban transport and local air quality management in Great Britain

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Abstract

Urban environments are subjected to a number of environmental stresses due to the preponderance of trips made in urban environments by private means of transport. In the case of air quality, private transport sources are major contributors to emissions of nitrogen dioxide, carbon monoxide, particulates and VOCs. Furthermore, road transports air quality impacts were poorly managed by the system in operation prior to the Environment Act 1995. This paper will review the strategic framework for air quality management introduced into Great Britain by the Environment Act, 1995 which is designed to manage air quality at the level of the local authority. Given that the major urban impacts are transport related, the short term gains in air quality are expected to arise from the use of technical fixes at the individual vehicle level. However, the benefits of technical fixes will operate for a limited period before traffic growth negates the benefit. Therefore, it is essential that local government responsibilities such as land use planning, transportation planning and economic development are effectively integrated into a unified planning and decision making system if the necessary long term gains in air quality are to be achieved. There is little evidence that the integration of these functions within local authorities is sufficiently well advanced to enable effective management of local air quality to occur in the future.

Introduction

Great Britain, in common with other industrialised nations, is confronted by a significant environmental challenge from the air quality impacts of road transport [1,2]. Whilst there is an element of public perception in identifying and prioritising this problem, the issue is undoubtedly most acute in urban environments. The difficulty in policy terms is attempting to balance two perfectly legitimate public expectations. The first is the desire for personal mobility and accessibility. Transport systems are designed to provide personal transport choices in selecting a transport mode to undertake a journey. In practice this often results in high quality provision for car based choice but relatively poor provision, and hence patronage, for the public transport option. The second expectation is for a high quality atmosphere



which is, therefore, not perceived by the public as carrying unacceptable (but usually unquantifiable) risks to personal and community health.

The causes of the transport induced air quality problems of urban areas are usually the result of broader scale societal changes operating at the national and regional scale [3,4]. These include: decentralisation of population and employment; de-industrialisation; rising car ownership; lack of investment in public transport; more leisure time; and changes in pattern of retailing. The consequence of these changes in transport terms is that the frequency and length of individual journeys are now much greater than was the case twenty or thirty years ago. The responsibility for developing and implementing policy rests with both central and local government [5,6]. The Environment Act, Part IV, 1995 is the most recent attempt to provide a policy framework within which the air quality impacts of road transport can be managed within acceptable levels at the spatial scale of a local authority [7].

The current situation

Urban transport and urban air quality are significant political issues in Great Britain and there is considerable public debate surrounding the issues. This debate is informed by a number of important national actions including the Royal Commission on Environmental Pollution's 18th Report [1]. The growth in concern for air quality has arisen as a culmination of the changes in transport over recent decades and awareness of the projected increase in vehicle numbers and increase in distance travelled by individual vehicles. Seven out of ten journeys are now by car and account for 86% of distance travelled, distances travelled have increased ten fold in the last 40 years, coach and bus travel have halved since the 1950s and now accounts for just 6% of distance travelled [1]. In 1989 The National Road Traffic Forecasts from the Department of Transport predicted that total traffic would increase by between 27-47% by 2000 and between 83-142% by 2025 compared with 1988 [8]. Whilst more recent estimates have suggested the rate of growth may be slower, these data illustrate the scale and magnitude of potential growth and, in turn, were a major catalyst for policy debate about the repercussions for the environment and the feasibility of accommodating such growth [1].

Transport and air quality

Road transport is undoubtedly a major source of air quality management problems as can be seen from Table 1. A number of policies and technical controls exist to limit and manage air quality in the short term [1,3,6]. However, the urban air quality problem and the role of road transport were not particularly well managed by the policy and management framework in existence prior to 1995 [1,6,9,10]. The control framework suffered from a piece meal approach which had developed initially to control ground level concentrations of black smoke and sulphur dioxide. It provided a range of inappropriate powers and a system of control which separated mobile sources from fixed sources of pollution [10]. It was apparent that the former

framework provided by EC standards and WHO guidelines was no longer appropriate for the protection of human health and there was widespread public unease and a perception amongst the population of a potential risk to their health [6]. As such the framework for the long term improvement of air quality did not have either coherence or integration and linkage of control functions. It had also lost the trust of the public. In response both to this concern and to the substantial costs of low level air pollution in terms of health services, loss of economic efficiency, the need to clean buildings and the negative external perception of cities for inward investment, the UK Government published its strategic policy framework for air quality in 1995 [11]. This new framework was introduced into law in Great Britain by the Environment Act, Part IV, 1995 (see Table 2) [7].

Environment Act 1995

The Air Quality Management sections of the Environment Act are intended to provide a coherent structure within which it will be possible to develop policies and guide air quality management from an understanding of the health impacts of air pollution [7,9,10]. The eight sections of the Act provide a new series of effects-based air quality standards and enable the designation of air quality management areas. The Act requires the Department of the Environment (DOE) to prepare a National Air Quality Strategy to provide for the implementation of the requirements of air quality management. Nine individual air quality standards, based primarily upon human health effects, will be recommended by the Expert Panel on Air Quality Standards [11] (see Table 3). Local authorities and central Government will have new powers and duties to establish plans for delivering these new targets wherever air quality is at risk. These new targets and standards need to be supported by effective machinery if they are to be achieved. The air quality management process is intended to be explicitly linked to the development plan process, under the Town and Country Planning Acts, so as to provide integration and coordination.

Policy processes and implementation of air quality management

Whilst the major air quality concern in urban environments is that resulting from transportation. However, the implementation of urban air quality management in Great Britain will not solely be concerned with air quality and transport. The policy process will be a dynamic relationship between the policy processes of air pollution control, local economic development, land use planning and transportation [6,9]. Therefore, differing policy packages will be in competition for implementation and the resolution of this competition will dictate the effect the process of air quality management has upon transport.



Table 1. Summary of UK road transport impacts on air quality

Species	Emissions	Comment
Benzene	UK emission 56 kt. Road transport 44.8 kt. 78% petrol exhaust. 9% diesel exhaust. 7% petrol evaporation.	Highest 1994 annual average (1.8ppb) in central London. Largest number of hours over 10ppb in Birmingham East.
1,3 butadiene	Mainly derived from combustion of petrol and diesel.	Annual average highest in central London (0.4 ppb)
PM10	Diesel 49 kt (19% of UK total). Petrol 13 kt (5%of UK total).	Average 20-34 $\mu\text{g m}^{-3}$. Most monitoring stations exceed EPAQS criterion. eg 1994 Leeds 44 days of exceedances, 39 days in Newcastle.
Sulphur dioxide	2% of UK total. 45 kt diesel. 14 kt petrol.	Exceedances and high values not due to vehicles.
Nitrogen oxides	49% of UK total. 714 kt petrol. 431 kt diesel.	Highest concentrations in 1994 experienced in London. High values also in Manchester, Leeds, Sheffield, Edinburgh, Liverpool and other cities.
Carbon monoxide	91% of UK total. 4942 kt petrol. 178 kt diesel.	EPAQS criterion exceeded in Belfast and London. High values also recorded in Southampton and Cardiff.
Volatile organic compounds	UK emission 913 kt (includes evaporative emissions). Road transport exhaust 38% of UK total emission. 696 kt petrol. 77 kt diesel.	Highest mean concentrations of selected compounds recorded in London, Birmingham and Middlesborough.
Ozone	Not applicable	Number of exceedances of the EPAQS criterion are greatest in rural areas
Black smoke (<15 μm)	Road transport responsible for 51% of UK emission. Diesel 48%. Petrol 3%.	Traditionally a problem of coal burning areas. Now emission inventories show that the dominant source of black smoke in urban areas is diesel exhaust.

Source: [12,13].

Table 2. The Environment Act 1995

Part IV Air Quality	Commentary
Section 80	Obliges the Secretary of State (SoS) to publish a National Air Quality Strategy <i>as soon as possible</i> .
Section 81	Obliges the Environment Agency to take account of the strategy.
Section 82	Requires local authorities, any unitary or district, to review air quality and to assess whether the air quality standards and objectives are being achieved. Areas where standards fall short must be identified.
Section 83	Requires a local authority, for any area where air quality standards are not being met, to issue an order designating it an air quality management area (AQMA).
Section 84	Imposes duties on a local authority with respect to AQMAs. The local authority must carry out further assessments and draw up an action plan specifying the measures to be carried out and the timescale to bring air quality in the area back within limits.
Section 85	Gives reserve powers to cause assessments to be made in any area and to give instructions to a local authority to take specified actions. Authorities have a duty to comply with these instructions.
Section 86	Provides for the role of County Councils to make recommendations to a district on the carrying out of an air quality assessment and the preparation of an action plan.
Section 87	Provides the SoS with wide ranging powers to make regulations concerning air quality. These include standards and objectives, the conferring of powers and duties, the prohibition and restriction of certain activities or vehicles, the obtaining of information, the levying of fines and penalties, the hearing of appeals and other criteria. The regulations must be approved by affirmative resolution of both Houses of Parliament.
Section 88	Provides powers to make guidance which local authorities must have regard to.

Source: [7].

It is recognised that national policy measures, such as vehicle emissions, economic instruments and emission standards will have significant contributions to the overall attainment of an air quality standard (AQS) but in specific areas the main effort to improve air quality will have to come from the local level. At this level the local air quality management policy

package will be shaped by the policy goals of a local authority and by the requirements of Part IV of the Environment Act, 1995. Explicit within the strategic framework for air quality management is the intention to provide an enhanced level of anticipatory pollution prevention through better integration of air quality management into the development plans prepared under the various Town and Country Planning Acts and to include air quality criteria in the assessment of the annual local authority Transport Policies and Programme (TPP) spending bid to the Department of Transport.

Table 3. EPAQS recommendations

Pollutant	Concentration	Time
Ozone	50 ppb	Running 8 hour average
Benzene*	5 ppb 1 ppb (target value)	Running annual average
Carbon monoxide	10 ppm	Running 8 hour average
Sulphur dioxide	100 ppb	15 Minute average
Particles (PM ₁₀)	50 $\mu\text{g m}^{-3}$	Running 24 hour average
1,3 Butadiene	1 ppb	Running annual average
Nitrogen dioxide	Not available.	Due in 1996
Lead	Not available.	Due in 1996
Polycyclic Aromatic Hydrocarbons	Not available.	Due in 1997

* EPAQS recommend that the standard should be reduced to 1 ppb in the long term.

Discussion

This approach to air quality management implicitly recognises that air quality management does not provide for the elimination of pollution at source but accepts that some damage will occur [9]. Air quality management is not pollution prevention but the management of releases and their resultant concentrations in the atmosphere at levels determined to be socially, economically and politically acceptable. Furthermore, as air quality management is not static it is recognised that the level of acceptability will vary according to the rate of advance of epidemiological knowledge and will be further accelerated by public perception issues. It may well be retarded by the economic and political costs associated with pollution management [9]. The resolution of these issues occurs within the political process and the level of air quality management is essentially determined by the political process. This view of air quality management as an intervention at a politically mandated trigger may well be at variance with the perception by the public of the process as one in which air quality improvements will occur

relatively quickly through pollution prevention activities [9].

The implementation of air quality management will seek to integrate what were previously separate policy processes in the fields of air pollution control, land use planning and transportation. Whilst these policy areas interact at several points there are clear areas of separation and the policy processes of each will interact in different ways with the policy process of, for example, local economic development. The success of air quality management as a local policy process will depend to a great extent upon how the process is embedded within other local policy processes and how linkages and inconsistencies are tackled [9].

It is clear that the diverse nature of modern pollutants requires a managerial approach that is spatially differentiated and incorporates local action [5,6,9]. However, local air quality management policies may well come into conflict with a large number of other local policies in many fields that are also trying to be spatially differentiated. At the local level, action will be a product of the tensions and resolutions between these various policy packages [6,9]. As there are many factors acting to influence the shape and form of urban areas in the future, air quality management policies and practices must, therefore, be seen within the broad dynamic policy context about the future form, shape and function of urban areas. The ways in which local authorities approach the use and testing of AQSs will be an important test of the relative importance of policy packages [6,9]. Recognising this potential difficulty the Environment Act has provided powers for the Secretary of State to intervene in the implementation of air quality management to ensure remedial action if targets are not met [7].

The Act requires that a local authority prepares a first report on local air quality and publishes plans on how to improve, according to a set timetable. The report will be reviewed periodically and should be coordinated with the revision of local authorities' land use and development plans [11]. Local authorities will be expected to appraise development plans against their detailed assessment of air quality [11]. It will also take this assessment into account when exercising its planning, transport and pollution control responsibilities. The air quality management implementation process will be overseen by the Environment Agency [11]. In non Unitary authorities the County Council will make recommendations to a district and advise upon the requirements of an action plan. The relationships between the Environment Agency and the local authorities will be an important one in determining the balance between environmental protection and economic development issues. There is evidence that local authorities do not effectively integrate their environmental protection and economic development functions [14,15] but air quality management requires the successful integration of land use planning, transportation and economic development with air pollution control. The evidence is not convincing that this will happen and there is a need for research to identify and evaluate the most effective integrating strategies. Local government are expected to deliver the air quality gains anticipated by the public but it is clear that the air quality management process is incapable, on its own, of limiting the air quality impact of urban road



transport. It only will be one of the stimuli that ultimately leads to a more sustainable urban transport system. Such a system of urban transport will require strong political support, appropriate resourcing and significant evidence that the public are willing to reduce their dependency upon the private car. There is limited evidence of these conditions being fulfilled.

Integrative air quality management in practice

The difficulties in establishing effective integrationist approaches for developing policy and delivering desired outcomes is illustrated by an early attempt in North West England to confront the air quality impacts of road transport [16]. In 1993 a consortium of local authorities, academics and related bodies under the auspices of the statutory Manchester Area Pollution Advisory Council (MAPAC) undertook a wide ranging analysis of the problems of air quality and road transport [16]. The study produced a set of conclusions and recommendations for policy at the national scale and also specifically for the study area. Those specific to local government are presented in Table 4.

Table 4. Local policy recommendations from MAPAC

Many pollutants are speed dependent. Emissions can be reduced by road designs which limit speed such as humps and signing
Unitary Development Plans, Transport Policies and Programme and air quality monitoring strategies should be reviewed and integrated to ensure that the pollution effects of transport are being addressed comprehensively.
When considering development proposals the local Authority should require full details of the local pollution burden to be borne as a consequence of any development and to require that the development be properly connected to public transport systems.
Local authorities should conduct long term pollution monitoring for traffic related pollutants and should report the results and the impacts of such pollution to the public.
Local authorities should engage in public information and education programmes to improve understanding of traffic and pollution issues and to begin the process of changing car based transport habits.
Local authorities should consider providing demonstration projects of alternative fuels such as natural gas or electrically powered vehicles as part of their vehicle fleet provision.
Local authorities should re-evaluate their use and need of vehicles and include environmental assessments in the allocation of car user status.

Source: [16].

The recommendations of MAPAC were an early example of the integration required for air quality management and the success of the constituent authorities in adopting and implementing the recommendations

can be seen as a test of the support for the wide ranging policy changes needed for successful management of the road transports air quality problems. Rayfield [17] has surveyed the adoption and implementation of the recommendations for local authorities in Greater Manchester. The survey indicates that the recommendations have been well received and are generally thought to be consistent with the aspirations of the individual UDP and the Package Bid TPP [18]. The evidence for implementation is, however, less forthcoming. A variety of barriers to implementation have been cited [17] and may be summarised as lack of financial support from central government, lack of local political support and the policy conflict between economic development and the environment generally. These findings are consistent with the observations above regarding the difficulties facing local authorities in attempting to integrate different policy packages [14,15]. Implementation of the MAPAC findings would have placed the North West at the leading edge of responses to urban air quality problems. However, the difficulty in translating the recommendations of MAPAC into a strategic framework may well be an indication of the difficulties local authorities will encounter in seeking to develop integrative strategies for managing air quality and in encouraging a modal shift in urban transport choice.

Conclusions

With the passing into law of the Environment Act, 1995 [7] Great Britain has created a new strategic framework for air quality management which will be implemented by local authorities and overseen by the Environment Agency. The long term gains in air quality are anticipated to come from better integration of local government responsibilities such as land use planning, transportation planning and economic development. There is little evidence that the integration of these functions within local authorities is sufficiently well advanced to enable the comprehensive assessment and management of current and future local air quality to occur. Public expectations of the benefits of air quality management are high but the reality may not satisfy these expectations. The challenge of improving urban air quality is a significant test of local government's abilities. In order that they may confront this challenge effectively there is a need to improve the technical capabilities for local management and the structures within which current and future management strategies will be integrated and applied.

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