

INDUSTRIAL AIR POLLUTION IN THE CONTEXT OF LOCAL AIR QUALITY MANAGEMENT

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ABSTRACT

This paper explores the relationship of industrial air pollution and its control within the context of the local Air Quality Management Framework operating in England and Wales. Data are presented from a questionnaire survey of 105 local authorities who, having undertaken a review and assessment of local air quality, predict exceedences of one or more UK air quality objectives. The contribution of industrial emissions, as either a major or contributing source, to these exceedences, is assessed, as is the relationship between the local authorities and the Environmental Agency, which is the regulatory body for large industrial processes in England and Wales.

INTRODUCTION

The Environment Act 1995 [1] introduced into the UK the concept of Local Air Quality Management (LAQM), moving from an air pollution control system that was almost exclusively based on emission standards to a system that places greater emphasis on ambient air quality standards [2]. Part IV of the Act requires the preparation of a National Air Quality Strategy (NAQS), which formulates standards and objectives for the main pollutants and target dates for their achievements. Air quality regulations were laid before Parliament in 1997 and revised in 2000 for the following pollutants: benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide, particulate matter, and sulphur dioxide. Since the 1995 Act came into force, there has been a statutory requirement for local authorities to review air quality within their areas, and to conduct an assessment in order to decide whether Air Quality Objectives (AQOs) will be achieved on specified dates as prescribed by regulations (part IV, s. 82).

For the first round of air quality review and assessment, the UK government recommended a three – stage approach [3], in which each stage increased in detail and complexity. At each stage, local authorities were required to assess the likelihood of an AQO being breached by target dates at locations with relevant public exposure. If an AQO exceedence is predicted after the Stage 3 assessment, an Air Quality Management Area (AQMA) declaration should follow. Where AQMAs have been declared, local authorities are required to prepare action plans setting out how the relevant objectives are to be achieved by specific target dates. In carrying out their reviews and assessments local authorities are required to consult with the Environment Agency (EA) and other statutory consultees.

The EA functions that are specifically related to air pollution control include its role as the regulator of pollution emissions for certain industrial processes, and its being a statutory consultee in the NAQS. Section 81 of the Environment Act 1995 states that whilst exercising its pollution control functions, the EA is to have regard to the Strategy. This means that when the EA determines the authorisation limits for an industrial process, they

must take into account the air quality standards and objectives. Being a statutory consultee, the EA is obliged to contribute to achieving the AQOs and, therefore the EA needs to work together with the local authorities. The EA holds substantial information about national and local air quality, with regards to emissions from prescribed industrial processes. In addition, it has the expertise to model emissions from industrial installations and therefore can assist local authorities in carrying out their reviews and assessments, and also in the establishment of AQMAs and action plans. In 1998 the EA identified eleven Zones of Industrial Pollution Sources (ZIPS) located in major industrial areas. ZIPS were established on the basis of the likely cumulative effects of air pollution from industrial sources and identify key areas where the EA might need to take action [4, 5]. In each ZIPS, an assessment was made of the contribution from the EA regulated processes to local air quality [6,7].

This paper investigates the extent of contribution from industrial pollution sources in the context of LAQM, and explores the working relationship between local authorities, as regulators of LAQM, and the EA, as the regulator of many industrial sources.

METHODOLOGY

The research methodology comprised of an appraisal of local authority review and assessment reports and a questionnaire survey of local authorities and EA officers.

The first step involved an appraisal of local authorities which had identified AQO exceedences in their Stage 3 reports (n=121). These 121 authorities were gathered from the Defra and the National Assembly for Wales Air Quality Review and Assessment Archive, which holds information on the locations, pollutants and AQOs exceedences that require AQMAs. Data from the database were then used to identify any significant industrial sources in a given local authority area. The appraisal was an exploratory study to identify a suitable sample for the questionnaire survey. Three local authority classifications were defined: (i) with exceedences due to industrial sources (n=27), (ii) having industrial contribution to the exceedences (n=78), and (iii) without industrial contribution (n=16). The technique developed to define these typologies is explained elsewhere [8]. Local authorities defined as typologies i and ii were then used as the questionnaire samples. The self-administered questionnaire was sent by post to local authorities (n=105) in mid-2002. Questionnaire questions included open and closed-ended questions with multiple scales questions as one of the components of closed questions. Chi-squared was used to identify any statistically significant differences between the typologies using the Statistical Package for the Social Sciences (SPSS) [9].

RESULTS

Of the 105 local authorities contacted, an overall response rate of 67% was achieved, with 18 of the 27 'industrial exceedence', and 52 of the 78 'industrial contribution' authorities responding.

When asked about their relationship with the EA, more than half of surveyed local authorities stated that they planned to work with the EA in the development of their action plans. At the time of the survey, only a small percentage (~25%) of authorities had produced an action plan. Co-operation with the EA was significantly ($p<0.05$) higher amongst local

authorities with an industrial exceedence (82% of respondents) than for those with an industrial contribution (48%). Table 1 shows the options that local authorities intended to incorporate into their air quality action plans in relation to industrial sources. The most chosen options were to seek tighter emission controls and to fit cleaner technology. Three local authorities were considering re-location of the industrial processes responsible for air quality problem.

<i>Action plan options</i>	<i>Percentage</i>
Tighter emission controls	23
Reduce sulphur content of fuel	9
Cleaner technology	15
Process relocation	5
Improving energy efficiency	14
Promote the use of Environmental Management System to Small Medium Enterprises	12

Table 1. Action plans options in relation to industrial sources ⁽ⁿ⁼⁶⁵⁾

Participants were asked about their collaboration with the EA in the first Round¹ of review and assessment of air quality. Half of them had a working relationship and detailed analysis showed a difference in this relationship between industrial exceedences and contribution authorities ($p<0.05$). Nearly 80% of the industrial exceedence authorities worked with the EA whilst the percentage was less, 57%, for the industrial contribution authorities. In general, survey participants worked with the EA as part of air pollution groupings and in relation to the EA's function as a statutory consultee.

Local authority officers were asked about their knowledge of ZIPS. Seventy percent of survey participants were not aware of ZIPS but further analysis has shown that the proportion of industrial exceedences authorities that were aware of ZIPS was significantly higher than the industrial contribution authorities ($p<0.05$). Other results are shown in Table 2.

<i>Statements in relation to ZIPS</i>	<i>All Local Authorities (%) (n=70)</i>	<i>Industrial exceedences authorities (%) (n=18)</i>	<i>Industrial contribution authorities (%) (n=52)</i>
Aware of ZIPS	26	44	19
Working with EA	3	6	2
Not aware of ZIPS	70	44	79

Table 2. Local authorities and Zones of Industrial Pollution Sources (ZIPS)

Survey participants were asked to rate the main impact of industrial sources, transport, and other emission sources to local air quality in their areas. Transport was considered as having a major impact by 95% of local authorities whilst only 10% of them regarded industrial

¹ Local authorities in England and Wales are now carrying out the second Round of air quality review and assessment, which consists of two steps: Updating and Screening Assessment, and Detail Assessment.

sources regulated by the EA as having a major impact on air quality. A smaller number of local authorities (5%) believed that emissions from local authority regulated industrial processes, and domestic sources, were having a significant impact. Further analysis was performed by dividing participants' responses into the two classifications of local authorities. Chi-square analysis revealed a significant ($p < 0.05$) difference in response between industrial exceedences and industrial contribution authorities regarding EA regulated industrial sources but not in relation to other pollution sources (95% confidence level). Local authorities were also asked to judge the effect of the EA regulated processes to air quality in their area. The industrial exceedences authority considered the processes to be more significant than the other classification.

DISCUSSION

The first Round of LAQM process has resulted in over 120 local authorities declaring AQMAs in England and Wales. Although the majority of local authorities consider traffic as the major cause of air quality objective exceedences within their area, a significant minority (26%) were identified from their review and assessment reports to have air quality problems arising predominantly from industrial emissions, and a further 74% have some industrial contribution, albeit background. The discrepancy between the opinions expressed by local authority officers in the questionnaire, and the data extracted from the local authority reports, may arise for a number of reasons, including: evolution in understanding of local authorities of the causes of air quality problems within their areas; a tendency to contribute on those emission factors directly under the local authority's control; or failure to properly account for background concentrations of pollutants.

Due to the transboundary nature of air pollutants, one local authority may need to work with adjacent neighbouring authorities or at regional level. The EA is one of the stakeholders in LAQM process and plays its role through the regulation of emissions from major industrial processes and provision of information on emissions to local authorities. In the first Round of review and assessment, the questionnaire revealed that the EA worked closely with many local authorities throughout the AQM review process, but that close collaboration was more likely between the EA and local authorities with industrial related AQMAs (industrial exceedences authorities) than with the industrial contribution authorities. The results of the questionnaire showed that local authorities declaring AQMAs due to industrial sources were more aware of ZIPS than local authorities with predominantly traffic related problems, although only a small percentage of the industrial exceedences authorities were working together with the EA in relation to their industrially related AQMAs. This is because an EA regulated industry is rarely the sole cause of an AQO exceedence, with the exception of sulphur dioxide released from coal-fired power stations [7]. For this problem, the EA is taking national action which should ensure that coal-fired power stations do not lead to a breach of the sulphur dioxide 15 minute objective in 2005.

CONCLUSION

In conclusion, a small number of local authorities in England and Wales identified industrial emissions as a source of air quality problems in their localities. The results of the survey show that these authorities still considered the EA regulated processes to have a quite significant impact to local air quality together with contribution from industrial processes regulated by local authorities. Specifically for the authorities with industrial related AQMAs,

they collaborated extensively with the EA in the first Round of LAQM process and envisaged that a continuation of their working relationship with the EA in the next round. Industry is not generally seen as a major contributor to local air quality problems because of strict pollution control mechanisms applied to major industrial processes. However, further research is necessary to investigate the impacts from smaller industrial processes on air quality at a local level.

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