PLANNING POLLUTION PREVENTION

A comparative study of US and UK anticipatory controls over new stationary sources of atmospheric pollution

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ABSTRACT

It is generally agreed that the prevention of environmental pollution is better than attempting to cure it. Because there are few anticipatory (as opposed to retrospective) air pollution control powers available over many British pollution sources, land use planning powers have become very important in obviating pollution. Unfortunately, previous research has shown that the use of planning controls over the siting of new development has often failed to prevent serious problems occurring. The prospective air pollution control powers in the United States are less discretionary and stronger than in Britain and the use of such antitipatory techniques as environmental impact assessment is widespread. It was therefore decided to undertake a comparison between the implementation of anticipatory air pollution controls in the USA and the United Kingdom to make recommendations to assist in improving the utilisation of preventive controls over pollution. Accordingly, an investigation was made of federal, state and local air pollution controls and land use controls. Detailed case studies of the way in which these controls over air pollution from new sources are implemented were carried out. The methods of research included literature review, postal correspondence, structured personal and telephone interviews and attendance at conferences and seminars. The seven case studies involved the perusal of files, and interviews with the principal actors, together with correspondence to verify the accuracy of drafts. The results of this investigation and these case studies were compared with those of previous work in Britain using a procedural model and the evaluation crtieria of efficiency, equity and effectiveness.

Following an introductory chapter the procedural model is explained and the roles of the developer, the air pollution control agency, the land use planning agency and the objectors in the authorisation process for a new air pollution source are outlined. The evaluation criteria are also explained. The next chapter examines the various land use planning controls for abating air pollution from new sources. The following chapter describes the various US national characteristics relevant to an analysis of stationary source controls, together with the powers available to air pollution control agencies and land use planning agencies, and practice in their utilisation. The American case histories appear in the Appendix and are summarised in the following chapter. The next two chapters are broadly equivalent and explain the British anticipatory control context and describe its implementation in practice by means of case history summaries. In the next chapter the common elements of the American and British systems of pollution prevention are analysed to derive six hypotheses, based upon the procedural model, about the outcome of the authorisation process for a new or modified source of air pollution which hold true in the cases examined. In the penultimate chapter the differences betweent the two systems are analysed, again utilising the case study material, and some of the relative advantages of each system of anticipatory air pollution control are evaluated using the criteria advanced earlier. In the final chapter the differences between the siting process for new air pollution sources in the United States and the United Kingdom are summarised and evaluated. The shortcomings of each system are then highlighted and a number of possible measures to overcome these are suggested, the adoption of which should help to assist in improving the utilisation of anticipatory pollution controls : planning pollution prevention.

DECLARATION

A small proportion of the work referred to in Chapter 3 of this thesis was submitted in support of an appliction for the degree of Master of Arts of this University in 1975. No other portion of the work referred to in this thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institution of learning.

EDUCATION AND RESEARCH EXPERIENCE

Since obtaining a degree in chemistry in 1965 I have qualified as a town and country planner (Dip TP, Manchester, 1969), was employed as a research worker in the Pollution Research Unit, University of Manchester from 1969 to 1973 (MA, Manchester, 1975) and have taught and undertaken research in the Department of Town and Country planning, University of Manchester, since 1975.

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IN MEMORIAM

CYRIL WOOD

PREFACE

The idea of undertaking this study grew from previous work on planning and pollution in the United Kingdom. The concepts of ambient pollution standards, increased public participation, freedom of information, environmental impact assessment, etc, had been put forward as means of improving British pollution prevention and it seemed useful to investigate how they affected the siting process for new pollution sources in the country from which they originated. As a result of a comparative investigation, it was hoped that more relevant recommendations for improving practice in the anticipatory control of pollution might be advanced.

It thus appeared to be necessary to spend a period of time in the United States both to become acquainted with the legal and administraive provisions relating to land use planning and pollution control and to permit a number of detailed case studies to be undertaken to determine how these provisions were implemented. I gratefully acknowledge the support of the Economic and Social Research Council which awarded a personal research grant to spend a year in the United States during 1982-83. Additional support was provided by the Sir Herbert Manzoni Trust and the University of Manchester, to which bodies gratitude is also due. In addition, I thank the land use planning departments at George Washington University, the University of North Carolina at Chapel Hill, the University of Miami, the University of New Orleans, the University of Texas at Austin, Portland State University, and the University of California at Berkeley for providing the necessary facilities and, frequently, stimulation, information and help.

I also wish to record my thanks to the many people who have offered their encouragement and advice. While it is invidious to single out only a few individuals I am compelled to acknowledge the help of Norman Lee (Economics Department, University of Manchester), Tim O'Riordan (School of Environmental Sciences, University of East Anglia) and, particularly, David Robinson (Department of Town and Country Planning, University of Manchester) in Britain. In the United States, Chris Duerkson, Bob Healy and Rick Liroff of the Conservation Foundation, David Callies of the University of Hawaii, Mike Enders of George Washington University and Mel Webber and David Vogel, both of Berkeley were especially helpful. To the many other individuals who gave me their time and patience, read and commented on drafts of case studies, or helped in other ways, I record my most sincere thanks. Much of the strain of completing this study has fallen on Jo Wood, without whose support I would not have been able to undertake the research, and Jackie Jolley, without whom it would not have been reported. To both I offer my heartfelt gratitude.

Christopher Wood
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CONTENTS

TABLES

FIGURES

APPENDIX : UNITED STATES CASE STUDIES (VOLUME 2)

1. INTRODUCTION

The importance of preventing future pollution, as opposed to attempting to cure existing pollution, is explained in this chapter. A distinction is drawn between the land use planning anticipatory controls and the 'technical' anticipatory controls available to minimise future pollution from stationary sources. Some of the problems that have arisen in implementing preventive controls over pollution in the past are discussed. These have been, in particular, the development of new pollution sources in locations where they have subsequently caused damage and the inadequacy of the mitigation measures employed in instances where environmentally acceptable development may have been feasible. There have also been cases of developments which would not have caused perceptible pollution damage being refused because of vigorously expressed fears about such damage. Further, there have been instances where a pollution source has caused no significant damage until new sensitive development has been allowed too close to it.

The main purpose of this study is to assist in improving the utilisation of prospective pollution controls to overcome these problems. To achieve this aim, it is necessary to investigate the various anticipatory control techniques, the legal and administrative powers available to ensure their use and the implementation of these techniques and powers. The reasons for choosing the main research tools, comparative study of the United States and the United Kingdom and the use of detailed case histories, together with their shortcomings, are outlined. The main objectives of the study are summarised before the chapter is concluded by a brief explanation of the structure employed to present the research results.

Pollution : prevention or cure

Pollution[1] is an inevitable consequence of most human activity. The Commission of the European Communities has put this succinctly:

> Almost all human activities make some impact on the natural environment, and almost all industrial processes which transform natural resources into products for man's use give rise to some pollution. Acceptance of the reality of this situation is now general, although there are still some who call for a removal of all pollution, not realising that this would signal the end of human activity, as well as of industrial civilisation as we know it. (2)

It is generally accepted that pollution prevention is better than cure and, in the phrase that Royston has popularised, that 'pollution prevention pays'.[3] Royston gives many anecdotal examples of this maxim and the European Commission states that 'several studies show that the cost of preventing pollution and nuisances is less than the cost of repairing the damage caused and introducing anti-pollution measures'.[4]

The Commission found that:

> Too much economic activity has taken place in the wrong place, using environmentally unsuitable technologies. The consequence has often been a choice between accepting pollution as a necessary evil or paying very large sums for its elimination. (5)

The Commission's environmental policy is overtly directed towards prevention by anticipatory, or prospective, control: 'the best environmental policy consists in preventing the creation of pollution or nuisances at source rather than subsequently trying to counteract their effects'.[6] This theme of anticipatory action is now widely recognised and is being promoted by a number of international bodies.[7]

While it has not formally endorsed the policy of anticipatory action to forestall pollution, the British government was a signatory to the European environmental programme and generally supports the principle that prevention is better than cure. In the United States of America, also, this concept has wide currency. For example, the central purpose of the National Environmental Policy Act is to ascertain the environmental damage likely to be caused by a federal action before it is taken, in order that it may be modified, abandoned or proceeded with in the full knowledge of the consequences.[8]

Needless to say, the intention to prevent does not invariably preclude the necessity to cure. However carefully considered, prospective controls cannot always anticipate either changes in technology or future trends in production, which may result in unexpected pollution levels, or changes in public attitudes, which may lead to the decreasing acceptability of once-tolerated levels. Similarly, it must be remembered that achieving pollution control compliance in the first instance is no guarantee that it will continue indefinitely. Consequently most countries adopt a two-pronged, mutually reinforcing, approach to pollution control. Holdgate has summarised this as being:

> 1. Through a land use planning or development control process in which the distribution of sources of pollution is adjusted so as to be compatible with other priority land uses, and so that pollution from new development is constrained from the outset;

2. Through controls, operated by various official agencies or voluntarily within industries, limiting existing sources of pollution and ensuring that new sources comply with conditions imposed when they are built. (9)

Morell has expressed this two pronged approach succinctly:

> A judicious combination of pollution control technology and more responsible land use decision making in the Environmental Age provides the only effective, long term solution to the problem of air pollution. (10)

As will be seen from Chapter 3, land use planning controls are primarily preventive (prospective or anticipatory) whereas technical and other (eg housekeeping) source controls (Holdgate's second category) can be both preventive and retrospective (curative).

Preventive pollution control problems

The main problem of utilising preventive controls over pollution is that they do not always work satisfactorily. Apart from the difficulties associated with changing technology, production levels and public attitudes mentioned above, the preventive controls applied may fail to mitigate pollution levels adequately and serious damage may occur. While such damage may sometimes result from teething problems in the commissioning of new plant, it is often more deep-seated. It may well be caused by a failure to anticipate both the likely pollution concentrations following the application of controls and the effect of that pollution in the particular locality concerned.

In the United Kingdom, for example, both the use and the effectiveness of land use planning controls over pollution have been somewhat variable. The Royal Commission on Environmental Pollution, while recognising that many considerations other than pollution were important in making planning decisions, was very critical: 'Our concern is not that pollution is not always given top priority; it is that it is often dealt with inadequately, and sometimes forgotten altogether in the planning process'.[11] The conclusion that planning practice in the control of pollution has frequently left much to be desired has been borne out in a number of studies.[12] While there is some evidence that the attention paid to potential pollution problems by local planning authorities may be increasing, there is still ample scope for improvement.[13]

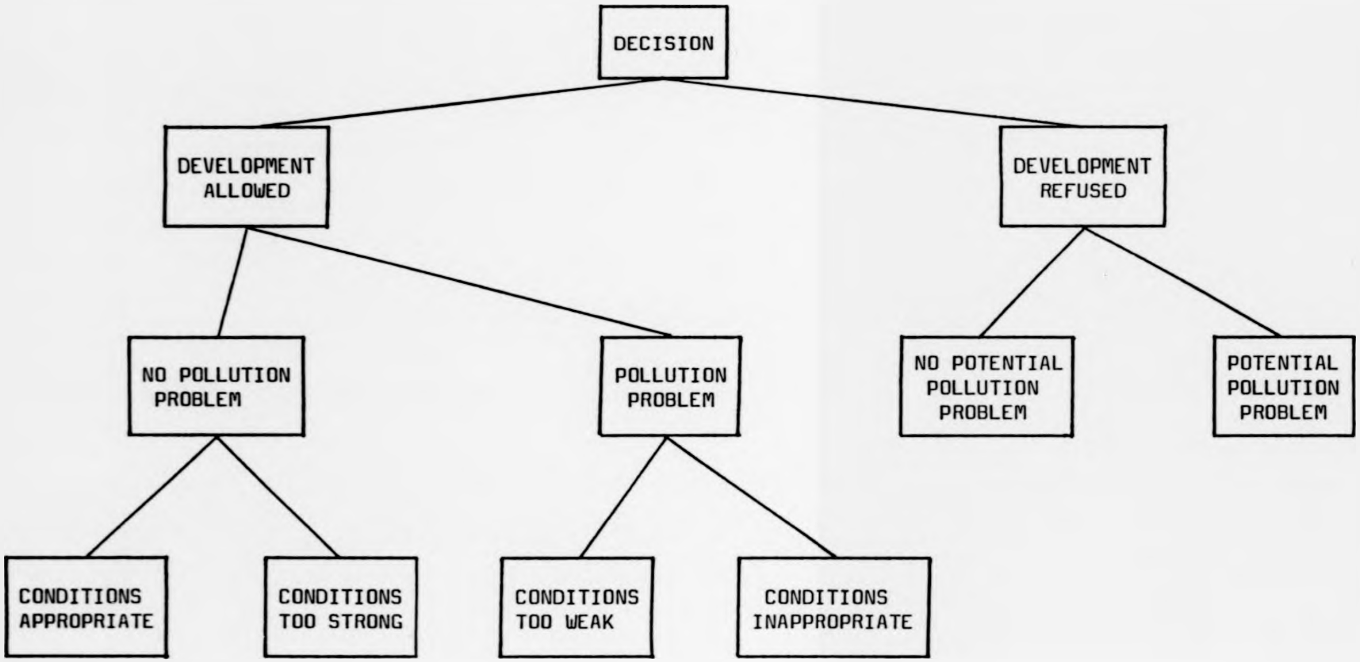
In the United States there have also been many inappropriately sited polluting industrial establishments and many instances of sensitive receptors being located too close to existing sources of pollution.[14] These mistakes have occurred in localities with land use planning controls as well as in jurisdictions without them.

If there have been numerous instances where anticipatory controls over pollution have proved inadequate, there have been others where development which could have proved environmentally acceptable has been prevented, ostensibly because the anticipated pollution concentrations were too high. This is another aspect of the problem of siting new sources of pollution. There have been examples of such decisions in the United Kingdom[15] but it is in the United States that a tangled skein of environmental legislation has allowed much new development to be stopped by determined opponents, frequently by recourse to the courts, and sometimes with little regard to the actual environmental merits of the issue. Indeed, the term 'preventive control' frequently acquires an ironic meaning as development, rather than just pollution, is prevented.

A further aspect of the use of anticipatory controls over pollution is the appropriate selection of conditions appended to any permission. Figure 1.1 shows the possible outcomes of a decision relating to a new source of pollution. If development is permitted, no pollution problem may arise but the conditions may prove unduly and unnecessarily onerous for the developer. If a pollution problem does occur it may either be because the conditions are too weak or because the development is fundamentally unsuited to the location and no conditions would be appropriate. Of the six outcomes, only two (the use of 'appropriate' conditions and the refusal of a development which would have caused a pollution problem had it been allowed) would be 'satisfactory' decisions. (These terms are discussed in Chapter 2.) Even the former acceptable outcome may be subsequently marred by permitting the encroachment of sensitive land uses such as residential or educational properties upon the existing pollution source.

There may be a very large number of reasons for failing to reach a satisfactory decision. To take only a few examples, the legal powers available to impose conditions may be inadequate, the enforcement of conditions may prove to be weak, the potential pollution problem may not be recognised and either the developer or

FIGURE 1.1 OUTCOMES OF THE USE OF PROSPECTIVE CONTROLS OVER POLLUTION



the objectors may prove to be unduly influential. It is clear, then, that the appropriate utilisation of preventive pollution control requires not only an adequate armoury of legal anticipatory powers but the conscientious implementation of these powers.

The purpose of this study is to suggest ways of overcoming the problems associated with the use of preventive controls over pollution and hence to assist in improving the utilisation of such controls. This involves investigation of the techniques available for predicting and preventing pollution problems, of the legal and administrative powers available to put these techniques into effect and of the implementation of these powers in practice. The study is concerned more with land use planning anticipatory abatement than with 'technical' prospective abatement of pollution.

The purpose of the study tends to dictate the research tools employed. Because improvements in the use of prospective controls are sought, there is considerable merit in undertaking a comparative study of the legal and administrative powers available for preventive control and of the implementation of those powers. Similarly, because of the number of factors involved in determining the outcome of any particular application for development likely to result in pollution it is appropriate to use the case history as a method of investigating the implemention of anticipatory controls over pollution. These research methods are discussed in the next two sections of this chapter.

Comparative study of the implementation of preventive pollution controls

Comparative studies of national approaches to solving environmental problems have a number of advantages. First, analysing the operation of a policy process in two or more countries can reveal more insights and raise more useful questions about that process than studying it in a single country.[16] Second, comparative studies have often led to valuable and practical suggestions to improve the effectiveness of the national processes examined.[17] This, perhaps their main justification, is probably particularly true in regard to the analysis of how new policy measures turn out in practice. Of course, the transferability of the anticipatory powers or implementation methods used in one country needs to be carefully considered before firm recommendations about their adoption in another can be made.

The choice of countries for comparative study is clearly important. The twin approaches of using land use planning powers and specific pollution legislation to abate pollution applies in the United Kingdom as elsewhere. Britain has a strong and fairly comprehensive land use planning system and the official position has been expressed by the Department of the Environment:

> Planning permission should be refused only where the authority is satisfied that the development in question would result in a significant deterioration of local air quality even after the use of specified powers to control pollution. (18)

As will be shown in Chapter 6, these specific powers are largely confined to plant by plant controls over certain (but not all) new sources of pollution. Despite official British acceptance of the role of land use planning in the control of pollution, the use of both technical and land use planning controls to implement preventive pollution abatement leaves much to be desired. At present, land use planning decisions affecting pollution levels, like most other British planning decisions, are made on an ad hoc basis by considering the merits of the particular case in question, bearing in mind any relevant national and local policies.

This approach is in marked contrast to that adopted in the United States where there are much stronger prior technical controls over emissions from virtually all new sources of pollution. As will be shown in Chapter 4, the national source by source control requirements linked to the use of environmental quality standards to control the location of pollution emitters provides a formidable array of technical powers. Indeed, it is inevitable that the national pollution control legislation will itself encourage land use patterns which will reduce pollution levels.(19) The use of environmental impact assessment in certain circumstances, as well as the generation and release of detailed information relating to air pollution control, encourages the prior evaluation of pollution impacts and should lead to improvement in the quality of decisions. However, the American system is very complicated and formalised and concern has been expressed by economists and others that the United States 'should abolish reliance on symbolic standards and instead concentrate on pragmatic ways of getting the job done'.(20)

By contrast with the national air pollution control system, the US land use planning system has never received national endorsement(21) and is essentially local and disparate in character. Despite the enormous variations in local land use planning controls, and in their implementation, the value of using land use planning legislation to reduce pollution has been recognised for many years.(22)

In summary, therefore, the nationally homogenous UK system of preventive controls involves a relatively weak set of formal pollution control powers (with some new industrial sources escaping prior technical control altogether) and a relatively strong set of land use planning powers. The US preventive system, on the other hand, involves strong and reasonably homogeneous national prior pollution control powers but variable and frequently weak land use planning controls. Despite the very substantial governmental differences between the countries, an analytical comparison of the operation of anticipatory controls over pollution in the United States and the United Kingdom should provide valuable insights into the nature of both systems of control and informed recommendations for overcoming some of the acknowledged shortcomings of the preventive control systems in both counties.

Needless to say, there are considerable difficulties involved in comparative studies. The comparisons of the topic being examined may be clouded by different cultural values and various 'equivalence' problems.(23) These difficulties are especially acute in dealing with issues that do not lend themselves to objective quantification. The cultural value problem is not so difficult between the US and UK as between most countries, as the same language and many legal, economic and historical traditions are shared. Nevertheless, there are considerable differences in cultural beliefs and these, together with such factors as physical characteristics, climate and government systems, can help to explain the radically different systems of environmental regulation and to the preventive approaches adopted to control air pollution in particular. The various organisational and procedural differences will need to be outlined at the outset but the most effective way of overcoming equivalence problems is the use of a common framework for analysis of the situation in both the United Kingdom and the United States (see Chapter 2).

While a comparative study could be made of anticipatory controls over air, water, land and noise pollution, there are a number of advantages of limiting it to a single medium - air - and to the control of stationary rather than transportation sources of air pollution. Concentration on a single type of pollution allows a more detailed examination than would otherwise be possible. Further, it is in air pollution control that the archetypical British means of control over industrial pollution, the use of 'best practicable means', is most widely established, and perhaps it is here that the rigid American standard-setting approach is best examplified. Air pollution is probably the most widely understood and most widespread form of pollution and consequently has most literature devoted to it. This is certainly true of the writing dealing with land use planning controls over pollution in the United States.(24) Finally, most of the existing UK case studies of planning and pollution tend to relate more to air pollution than to other forms of pollution [25] For these reasons this study is concerned only with preventive controls over new or modified stationary sources of air pollution.

There are obvious dangers in studying one form of pollution in isolation. Action taken to reduce air pollution may well lead to increases in other types of pollution, since the wastes from which pollution stems must be disposed of elsewhere (perhaps on land or in water bodies). This multi-media nature of the pollution problem is well exemplified by sulphur dioxide emissions. Low stacks lead to high local air pollutant levels, tall stacks may contribute to acid rain and water pollution and desulphurisation leads to either solid waste or liquid waste disposal problems which may themselves lead to water pollution. The problems of the indestructability of matter and of the appropriateness of the medium to which waste is discharged must therefore be borne in mind in analysing air pollution control. In the United Kingdom, these problems have received official recognition in the acceptance of the concept of the 'best practicable environmental option'.[26] One of the objectives of the environmental impact assessment system in the United States has been to endeavour to contribute to overcoming these problems.

The same difficulty in isolating air pollution as the subject of study applies to the objectives of the control agencies. It has to be accepted that those concerned with administering air pollution control powers frequently cannot implement these without regard to other objectives. Thus, air pollution controllers are normally only too aware that local employment may hinge on their decisions and they therefore interpret their regulations (to the degree that they are flexible) to permit industrial enterprises to operate while controlling pollution. Land use planning is, by definition, a multiple-objective activity. The control of air pollution, and indeed of all types of pollution, is merely one desirable aim in a whole array of environmental, social and economic land use planning goals. Thus, air pollution control, while laudable, will seldom be the sole objective of a planning decision and may be neglected because other objectives (such as job creation, visual amenity, etc) are given more weight. Having said this, it should be the case that air pollution control is explicitly considered where it is likely to be a problem, even if it is subsequently outweighed by other land use planning goals. At any event, decisions in which air pollution is an important issue are not uncommonly locally controversial and have frequently dominated political agendas.(27) This multiplicity of objectives in the controlling agencies renders quantitative analysis virtually impossible because of the number of factors involved in making the relevant decisions and leads inexorably to the choice of the case study as the main research tool.

Case studies of the implementation of preventive pollution controls

The case study method allows the researcher to investigate the institutional, social, political and environmental variables in a particular decision in considerable detail.(28) It has become a well-established research method in studies of developments with environmental repercussions in both the United Kingdom(29) and the

United States.[30] Some authors, both American[31] and British, have, however, left their case studies to speak for themselves by resisting 'a natural inclination to draw conclusions and make recommendations on the basis of the case histories themselves'.[32] Others have attempted to present conclusions of general applicability.[33]

The case study is an appropriate method for obtaining a realistic insight into actual practice and for generating hypotheses about the role of the various variables involved. As Baldridge has put it:

> It is particularly useful
> a) if there are few data assembled on the topic;
> b) if the research is basically exploratory;
> c) if the objective is research in depth, and
> d) if change and dynamic processes are crucial
> to the investigation. (34)

These criteria certainly apply in the analysis of preventive controls over air pollution. The case study approach usually involves other research methods: interviewing and documentation studies are normally obligatory; participant observation is by no means uncommon;[35] and the use of questionnaires may be invoked.

It is necessary to sound a note of caution about the role of hypotheses in comparative and case study research. It has been suggested that the comparative method is not very helpful in testing hypotheses. Stretton asserts that the function of comparison is to stimulate the imagination : to question rather than to answer:

> Comparison is strongest as a choosing and provoking, not a proving, device: a system for questioning, not for answering. ...Comparison tempts the comparer to exaggerate both similarities and dissimilarities, to distinguish like from unlike decisively. The temptation is probably stronger in proportion as the user's purpose includes the development of theory or of general models. (36)

Further, Greenberg et al have demonstrated how the inherent complexity of most case studies involving public policy (due to the temporal nature of the process,to the multiplicity of participants and of policy aspects and to interaction between the different variables) makes the testing of significant hypotheses extremely difficult, if not impossible.(37) They also warned against the danger of utilising predictive variables which are actually outputs of the process observed.(38) There is thus a considerable danger that hypotheses advanced on the basis of a literature review and prior knowledge of the process and actors involved in imposing anticipatory controls over air pollution from new stationary sources will turn out to be either inadequate, or incomplete, or both. It is for this reason that hypotheses are not formally tested in this study: rather, hypotheses about the outcome of siting decisions are advanced on the basis of analysis of the case study material.

The weaknesses of the case study approach as a research tool are well known.(39) In particular, concentration on only one case study would render it virtually impossible to make use of contrasting situations and thus the insights provided by comparative parallels and differences may be lost.(40) Further, the case study exhibits the danger of being atypical or at least biased, however carefully chosen. The first of these weaknesses can be overcome by undertaking a number of case studies and, perhaps especially, by conducting a comparative study between two nations where insights should be revealed by the obvious differences between them. The particular case studies presented were chosen to reveal as many differences as possible but the limited number of suitable subjects made it impossible rigorously to 'match' United States studies with United Kingdom studies. In any event, matching would nullify one of the objectives of case study research: the maximisation of the number of variables observed.

The danger of unrepresentativeness of the case histories can never be completely overcome. The case histories recounted, which all concern specific development involving new industrial or public sector sources of air pollution which were proposed but which may or may not have been constructed, were to some extent chosen because of their intrinsic interest rather than to be representative of the activities of the authorities concerned. The problem of inadvertantly choosing totally unrepresentative cases can be reduced by studying the context of the case studies (by means of a literature review which includes other case studies as well as more general discussion), by undertaking questionnaire surveys, by undertaking interviews with practictioners in the field or by increasing the number of case studies.(41)

The strategy adopted here involved a mixture of these methods.(42) Numerous interviews were carried out with officials at both local and higher levels of government, with researchers in universities and research institutes, with industrialists and with pressure group campaigners in the course of this study, apart from those undertaken in connection with particular case histories. The 'focussed' interviewing technique was used throughout.(43) There is no set questionnaire in this type of interview and most of the questions are open-ended, to encourage the respondent to talk freely, developing his views while imparting the factual information requested. There are obvious problems of interviewer bias which can only be countered by striving for neutrality and double-checking the information received.(44) These interviews yielded valuable information and insights which have been used at each stage of the study.

The number of case studies conducted has been limited by the amount of time available. In the United Kingdom eight published case studies in which the researcher had been personally involved were utilised. In America states with land use powers of varying strengths and, to a lesser extent, with air pollution control powers of varying strengths were selected : the seven case histories specifically undertaken as part of this study followed (see Appendix). As mentioned above, it is possible to increase the effective number of studies by reference to other published case studies and, although these are seldom strictly compatible, this strategy has been adopted by including one such case study summary to bring the number of US case histories to eight. Thus, by a combination of these methods it is possible to avoid many of the pitfalls of case study analysis.(45)

Quite apart from the limitations of the case study as a research tool, any case study is bound to have additional flaws:

> Although care may be taken to make cases complete and accurate, no case can achieve perfection. No case writer can know everything about any particular process. Memories are faulty, motivations are not entirely conscious, and sometimes the writer must depend on an unrepresentative document that happens to be the only source available to cover a particular point in a case. (46)

In almost every instance, accounts were obtained from more than one protaganist, documentary evidence was checked and drafts of the case studies were sent to several participants so that factual details could be verified.

The case studies are reported as factually as possible, generally in chronological order, and analysis of the material is presented separately. While this method of presentation does not eliminate bias, since the selection of relevant data and the wording of the accounts involves conscious choice, it should allow others to draw their own conclusions more easily.

Objectives of the study

The purpose of the study, as mentioned above, is to suggest ways of improving the utilisation of preventive controls over pollution. In order to make recommendations for improvement it is first necessary to understand fully the process of authorising a new or modified source of air pollution. As explained in Chapter 2, the outcome of this process is dependent upon such a large number of conflicting factors that it would be unwise to make predictions. However, it is possible to postulate hypotheses about the influences on the likely outcome of a particular siting decision on the basis of the case studies undertaken. The objectives of this case study are thus:

1. To develop a set of hypotheses to enable some indication to be gained of the likely outcome of particular instances involving the use of anticipatory controls over pollution.

2. To reveal, by comparison, obvious shortcomings in the UK and US preventive pollution control systems.
3. To demonstrate whether there are any British or American anticipatory powers or techniques which might with benefit be adopted by the other country.
4. To demonstrate whether there are any British or American methods of implementation of anticipatory powers which might with benefit be adopted by the other country.

Structure of the study

The framework for the study is presented in the next chapter. The process of obtaining the various necessary permits for construction of a new stationary source of air pollution is first outlined. This allows the setting up of a procedural 'model'. Various evaluation criteria, against which preventive air pollution control decisions and the two regulatory systems could be judged, are then discussed.

Chapters 3, 4 and 6 are designed to provide the policy framework and ideological setting necessary for an understanding of the implementation of land use planning and technical and other anticipatory source controls over air pollution available in the US and the UK. These controls and, in particular, the land use planning techniques for abating air pollution from new sources, are reviewed in Chapter 3. The following chapter discusses several of the US national characteristics relevant to an analysis of stationary source control, together with the powers available to the air pollution control agencies and the land use planning agencies in that country and practice in their utilisation. The American case histories of the implementation of anticipatory controls over new air pollution sources conducted as part of this study appear in the Appendix and are summarised in Chapter 5, which also contains a resume of a published case study. Chapter 6 is broadly equivalent to Chapter 4 and explains the British anticipatory control context. Chapter 5 presents summaries of the British case histories utilised.

Chapter 8 and Chapter 9 contain the analysis of the case study material. They are structured similarly, utilising the procedural model advanced in Chapter 2. Thus, in Chapter 8 the common elements of the British and American systems of pollution prevention are analysed according to the role of the developer, the air pollution control agency, the land use planning agency and the objectors. The siting process as a whole is then discussed. Finally, there is an examination of the factors determining the success with which controls on new sources are implemented. This analysis leads to the derivation of six hypotheses about the outcome of the authorisation process for a new or modified source of air pollution which hold true in the British and American cases studied. In Chapter 9 the differences between the two systems are analysed and the relative advantages of each system of anticipatory air pollution control are evaluated using the criteria advanced in Chapter 2. The contrasting roles of the developer, the air pollution control agency, the land use planning agency and the objectors are used to explain these national differences.

The final chapter then draws together the findings of the preceeding ones to attempt to satisfy the four study objectives. The six hypotheses about the outcome of the siting process advanced in Chapter 8 are first tabulated. There follows a section in which the differences between the siting process for new air pollution sources in the United States and the United Kingdom are summarised and evaluated. The shortcomings of each system are then highlighted and a number of possible measures to overcome these are suggested, the adoption of which should lead to the fulfillment of the purpose of this comparative study; assisting in improving the utilisation of anticipatory pollution controls: planning pollution prevention.

Notes and references

1. For the purpose of this study pollution may be defined as 'the introduction by man of waste matter or surplus energy into the environment, directly or indirectly causing damage to persons other than himself, his household or those with whom he has a direct contractual relationship.'

2. Commission of the European Communities (1979) State of the Environment : Second Report CEC, Brussels, p 49.

3. Royston, M G (1979) Pollution Prevention Pays Pergamon, Oxford. Royston claims that 'adding on' pollution control equipment is about 3 or 4 times more expensive than 'building in' the same controls (p 37).

4. Commission of the European Communities, op cit, p49.

5. Ibid.

6. Commission of the European Communities (1977) European Community Policy and Action Programme on the Environment for 1977 - 1981 Official Journal C139, 13 June 1977, p 6.

7. Most recently by the International Union for Conservation of Nature and Natural Resources (1980) World Conservation Strategy IUCN, Gland, Switzerland on behalf of the United Nations Environment Programme and the World Wildlife Fund.

8. National Environmental Policy Act 1969 42 USC 4321-4327.

9. Holdgate, M W (1979) A Perspective of Environmental Pollution Cambridge University Press, Cambridge, p 202.

10. Morell, D (1974) Air quality and land use, in Hussey, E T (ed) 'Proceedings of the Conference on Air Quality Impact Analysis for Application in Land Use and Transportation Planning, Berkeley' University Extension, University of California, Berkeley, CA, p 19.

11. Royal Commission on Environmental Pollution (1976) Fifth Report : Air Pollution Control : an Integrated Approach Cmnd. 6371, HMSO, London, p 93.

12. See, for example, Wood, C (1976) Town Planning and Pollution Control Manchester University Press, Manchester; Wood, C and Pendleton, N (1979) 'Land Use Planning and Pollution Control in Practice' Occasional Paper 4, Department of Town and Country Planning, University of Manchester; Ledger, M J (1982) 'An Assessment of the Effectiveness of Land Use Planning Powers to Control Pollution' Unpublished PhD Thesis, University of Manchester; and Miller, C and Wood, C (1983) Planning and Pollution Oxford University Press, Oxford.

13. Miller and Wood, op cit.

14. Arnold, G and Edgerley, E (1967) Urban development in air pollution basins - an appeal to the planners for help Journal of the Air Pollution Control Association 17 235-7.

15. Miller and Wood, op cit.

16. Lijphart, A (1975) The comparable-cases strategy in comparative research Comparative Political Studies 8 158-177.

17. Lundquist, L J (1978) The comparative study of environmental politics : from garbage to gold? International Journal of Environmental Studies 12 89-97.

18. Department of the Environment (1981) 'Clean Air' Circular 11/81, HMSO, London, para 30.

19. See, for example, Council on Environmental Quality (1974) Fifth Report US Government Printing Office, Washington, DC, pp 31-34 and Train, R E (1976) The EPA Programs and Land Use Planning Columbia Journal of Environmental Law 2 255-289.

20. Friedlaender, A F (ed) (1978) Approaches to Controlling Air Pollution MIT Press, Cambridge, MA, p 11.

21. Lyday, N (1976) The Law of the Land Urban Institute, Washington, DC.

22. Hagevik, G H, Mandelker, D R and Brail, R K (1974) Air Quality Management and Land Use Planning Praeger, New York, pp 85-89.

23. Lundquist, L J (1980) The Hare and the Tortoise : Clean Air Policies in the United States and Sweden University of Michigan Press, Ann Arbor, MI.

24. See, for example, Kurtzweg, J A (1973) Urban planning and air pollution control : a review of selected recent research Journal of the American Institute of Planners 39 82-92 and Kaiser, E J, Elfers, K, Cohn, S, Reichert, P A, Hufschmidt, M M and Stanland, R E (1974) Promoting Environmental Quality through Urban Planning and Controls Report EPA - 600/5- 73-015, US Government Printing Office, Washington, DC. This is probably not true in the UK. Despite the chapter on air pollution and planning in the Royal Commission's fifth report (op cit, pp 91-102) and other British work (see for example, Wood (1976) op cit pp 49-69), more seems to have been written about noise pollution control through planning measures in the UK (see, for example, Wood (1976) op cit). This is almost certainly a consequence of the lack of prospective controls over noise under the pollution control legislation and the consequent necessity to use planning powers (Department of the Environment (1973) 'Planning and Noise' Circular 10/73, HMSO, London).

25. Despite strenuous efforts to find suitable case studies on all forms of pollution, air pollution appears most frequently to be the issue in which UK planning authorities become involved, though often in association with other forms of pollution.

26. This phrase was coined by the Royal Commission (op cit, p 76) which advocated its use in controlling the various forms of pollution from a new source. It returned to the theme in its tenth report, where it defined bpeo as 'the optimal allocation of the waste spatially; the use of different sectors of the environment to minimise damage overall'. (Royal Commission on Environmental Pollution (1984) Tenth Report : Tackling Pollution - Experience and Prospects Cmnd 9149, HMSO, London, p 176).

27. See, for example, Blowers, A T (1982) 'The triumph of material interests - geography, pollution, and the environment' Paper to the Geography and Planning Study Group, Institute of British Geographers Annual Conference, Southampton. In his description of an application to construct a new brickworks, he states '...by far the most dominating issue during the period 1978-81 in Bedfordshire was the brickworks plan. It absorbed energies that might otherwise have been devoted to policies over which the County Council had far more control...'.

28. An excellent, though dated, review of the necessity for certainty and accuracy in case studies and of their role in advancing theory can be found in Bock, E A (1962) Case studies about government; achieving realism and significance, in Bock, E A (ed) Essays on the Case Method in Public Administration International Institute of Administrative Sciences, New York, NY.

29. See, for example, Gregory, R (1971) The Price of Amenity Macmillan, London; Kimber, R and Richardson, J J (eds) (1974) Campaigning for the Environment Routledge and Kegan Paul, London; Smith, P J (ed) (1975) The Politics of Physical Resources Penguin, Harmondsworth; Miller and Wood, op cit; and Blowers, A T (1984) Something in the Air : Corporate Power and the Environment Harper and Row, London.

30. See, for example, Muir, W K (1963) Defending "The Hill" against metal houses, in Bock, E A (ed) State and Local Government : a Case Book University of Alabama Press, Birmingham, AL; Crenson, MA (1971) The Un-politics of Air Pollution Johns Hopkins Press, Baltimore, MD Caldwell, L K, Hayes, L R and MacWhirter, I M (1976) Citizens and the Environment Indiana University Press, Bloomington, IN; and Duerkson, C J (1982) Dow vs California : a Turning Point in the Envirobusiness Struggle Conservation Foundation Washington, DC. At least one author has undertaken both British and American case studies (Hall P (1982) Great Planning Disasters University of California Press, Berkeley, CA).

31. See, for example, Bock (1963) op cit, and other volumes in the American Inter-University Case Program Series.

32. Smith, op cit, p ix.

33. See, for example, Kimber and Richardson, op cit, on the strategies for environmental groups and Hall, op cit, on the nature of the public sector decision making process.

34. Baldridge, J V (1971) Power and Conflict in the University Wiley, New York, NY, p 33.

35. See, for example, Blowers, A (1980) The Limits of Power Pergamon, Oxford in which the author reports case studies of planning decisions made while he was chairman of Bedfordshire County Council Environmental Services Committee.

36. Stretton, H (1969) The Political Sciences :General Principles of Selection in Social Science and History Routledge & Kegan Paul, London.

37. Greenberg, G D, Miller, J A, Mohr, L B and Vladeck, B C (1977) Developing public policy theory : perspectives from empirical research. American Political Science Review 71 1532-1543.

38. Ibid.

39. Babbie, E R (1973) Survey Research Methods Wadsworth, Belmont, CA, p 37 and Baldridge, op cit, p 32.

40. Baldridge, op cit, p 32.

41. This last remedy is obviously very time consuming if the same researcher is involved. However, it has been attempted by using published case studies: Gladwin assembled data on about 3000 environmental disputes, including 366 US chemical process industry cases, which are capable of formal analysis : Gladwin, T N (1980) Patterns of environmental conflict over industrial facilities in the United States, 1970-78 Natural Resources Journal 20 243 - 274.

42. Questionnaire surveys of plannning and pollution control officers were undertaken in the UK but the issues raised by the case study approach are generally too complex to yield useful results from this approach. (Miller, C E, Wood, C M and McLoughlin, J (1980) 'Land Use Planning and Pollution Control' Pollution Research Unit, University of Manchester, Volume 1, pp 39-62. The questionnaire survey was designed principally to establish how often planning powers were used to control pollution and the extent of collaboration between control authorities.)

43. Merton, R K, Fiske, M and Kendall, P L (1956) The Focussed Interview: a Manual of Problems and Procedures Free Press, New York, NY.

44. Moser, C A (1958) Survey Methods in Social Investigation

Heinemann, London, p 206.

45. 'The best social research format is usually one that involves the use of different methods focussed on the same topic' Babbie, op cit, p 38.

46. Bock, E A and Campbell, A K (eds) (1962) _Case Studies in American Government_ Prentice-Hall, Englewood Cliffs, N J, p viii.

2 A FRAMEWORK FOR COMPARISON

The principal purpose of this comparative study, as explained in Chapter 1, is to assist in improving the utilisation of anticipatory controls over new or modified stationary sources of air pollution. The comparison of the United States and United Kingdom systems and, in particular, the examination of a number of detailed case histories in both countries is intended to help to achieve this purpose. Any framework for comparison of the two systems must therefore be capable of encompassing both the national control systems and the characteristics of the case histories.

A comparative framework to achieve these objectives needs two main components. The first is a procedural explanation of the process of utilising anticipatory controls. This procedural 'model' should enable the case study outcomes in both the United States and the United Kingdom to be analysed and the national air pollution control and the land use planning systems to be compared. The second is a set of criteria against which to examine case study outcomes and hence the national systems of anticipatory controls. These evaluation criteria should ideally enable judgements about the 'satisfactoriness' of national systems of preventive controls to be made, the seriousness of national shortcomings to be analysed and the advantages and disadvantages of transferrable anticipatory controls to be assessed.

This chapter accordingly commences with a discussion of the procedural model. This is essentially a simplified account of the process through which a developer must progress in order to gain the permits necessary to construct and operate a new source of air pollution. This enables the principal actors in the permitting process to be identified and demonstrates where the various available anticipatory powers and techniques can be applied and where difficulties are likely to arise.

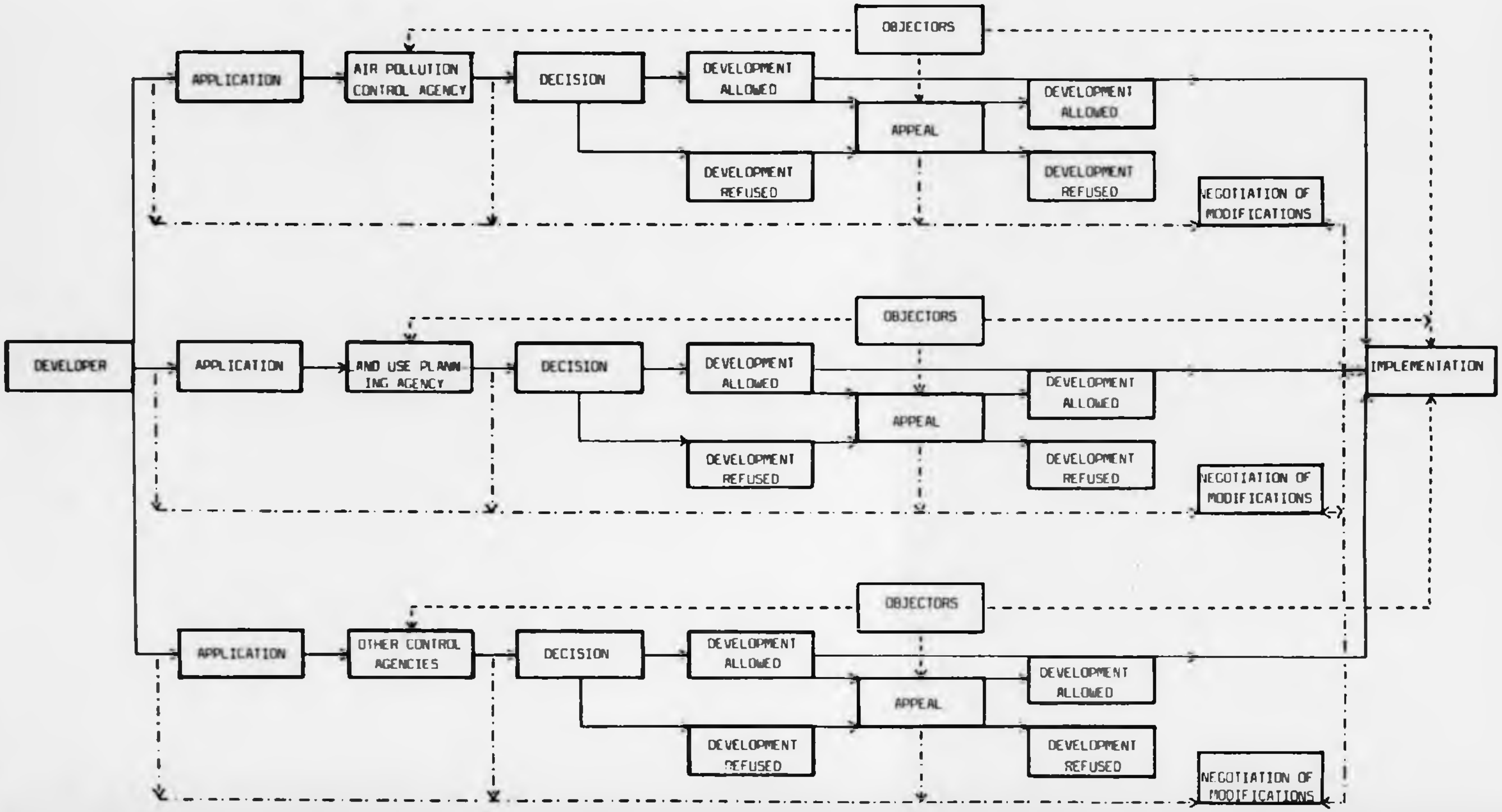
The evaluation criteria utilised in the comparison of national systems of preventive controls are then discussed. The first is efficiency, which gives a measure of the maximisation of the net benefits of all types from a new source of air pollution. Because costs and benefits are difficult to measure another concept, that of cost-effectiveness, is often employed to describe the least cost method of achieving a given level of pollution control. The second is equity, which is a measure of fairness in decisions about new pollution sources. Both outcome equity and procedural equity are discussed. The last is effectiveness, a measure of how well controls operate in practice.

Procedural model

Several permits are usually required before construction and operation of a new or modified stationary source of air pollution can commence. The siting approval process has been categorised as 'decide-announce-defend'.(1) Basically, the developer (who may represent either a private company or a public body) chooses a site on the basis of engineering, technical, financial, legal and (sometimes) environmental considerations. He then often proceeds, usually secretly, to acquire the land or an option to purchase it. There may then follow a period of informal negotiation with several agencies, including the air pollution control agency (which may be local, regional and/or national) and the land use planning agency (which is usually, but not always, local). The developer then announces his project, frequently as an immutable proposal, and applies for the necessary permits from the control agencies (Figure 2.1). He will often propose prospective pollution controls but there is normally a period of negotiation between the developer and each of the agencies, during which the developer may be asked to make modifications and the agency may decide to relax some of its requirements, where it has the freedom to do so. As the various environmental and other impacts, including air pollution, become widely known the public, which has no reason to expect any flexibility in the developer's position, often sets about trying to delay or stop the project by all the legitimate means available to it, including subjecting the control agencies to pressure to refuse the relevant permits. These objectors may, for example, be local residents, local environmental groups and/or national environmental groups. There may well also be supporters of the project. (Some applications may arouse no controversy at all.)

The next stage in the authorisation process is an agency decision which, if it is an approval, will almost always be accompanied by conditions which may make further modifications to the proposal necessary. The air pollution control agency's conditions will, of course, include prior controls over pollution, often utilising both equipment requirements and emission standards. The land use planning agency's permit may also often be accompanied by similar anticipatory controls over air pollution. At any event, this agency's decision

FIGURE 2.1 THE SITING PROCESS FOR A STATIONARY SOURCE OF AIR POLLUTION



will affect air pollution levels and the consequent damage (Chapter 3).

If the developer or (in the United States) the objectors are unhappy with the decision there may well be an administrative or legal appeal against it during which further negotiations may take place and following which additional controls and modifications may be required. Finally, once all the permits have been obtained, the developer may proceed to construct the facility though there may be further protest from the objectors both during construction and during subsequent operation, especially if air pollution problems occur. Yet more negotiation between the developer and the control agencies may be necessary in the process of implementing their conditions.

The decision whether to allow a new source of air pollution and, if so, what conditions to apply, is seldom clear cut and therefore frequently highly political. As Gregory observed, after examining a number of celebrated British environmental controversies:

> Undoubtedly, there are some forms of pollution that really are matters of life and death, or will be in the not too distant future. They, of course, are forces of absolute evil, and no price is too great to ward them off. But it would be nonsense to suggest that all threates to amenity are as serious as this. The conflict between industry and amenity takes many forms, but it is not always a contest between virtue and evil. (2)

O'Hare, Bacow and Sanderson, reported, on the basis of US siting case studies, that many developments were universally agreed to be necessary but, because they were locally undesirable land uses (LULU's), objectors would oppose them by every method available:(3) they would insist that they should be sited anywhere, but 'not in my back yard' (NIMBY). Rather similar conclusions were reached by Morell and Magorian, in a study of siting hazardous waste facilities in the United States. They emphasised the problems of 'double-veto' by state and local agencies:

> In most states local land-use regulatory authorities, cities and counties, can veto the location of a new facility by withholding the necessary discretionary zoning or other land-use approval... This double veto usually precludes sitng new facilities because local authorities would not balance local desires versus statewide interest in both environmental quality and industrial management. (4)

However, whereas a local government will frequently object at the behest of its citizens,(5) it will often favour a development opposed by certain groups of residents.

Frieden found that environmental opposition in California was sometimes a successful ploy by affluent existing residents to protect their own amenities:

> The regulatory process in this case turns out to be highly political, with the priorities and directions set mainly by influential suburbanites. In contrast to earlier capture of regulatory agencies by industry, this time the captors are local growth opponents and public officials guarding their own turf against newcomers. (6)

Fix and Muller confirmed the highly political role of local governments in environmental regulation in the United States:

> Regulatory costs are only infrequently and selectively attributable to state and federal rules... Rather, regulatory costs reflect the attitudes of the local population toward growth which is reflected through the political process. (7)

Blowers, in discussing an application to construct a new brick works in Bedfordshire, affirmed that opinion about potential pollution was frequently a crucial factor in the political siting process. He classified environmental issues as dormant, passive or active:

> Important environmental issues become active when conflict between powerful interests can no longer be suppressed or contained. The importance of issues is not necessarily intrinsic but politically determined. (8)

Acceptable compromises between pollution and amenity are bound to be sought where issues are not clear-cut. This need to compromise has led to the growth of bargaining and negotiation in determining the final outcome of any particular decision about a new stationary source of air pollution and to the use of environmental mitigation measures (Figure 2.1).

Negotiation and bargaining in land use planning practice is universal. Thus, a set of conditions applied to a land use permit is often a record of the negotiations between the developer and the land use planning agency, together with the controls necessary to implement these. Certainly the concept of 'planning gain' is no more than an agreement that the developer will contribute a number of additional amelioration costs in return for the grant of his planning permit:[9]

> Planning gains are defined as the achievement of a benefit to the community that was not part of the original application and, therefore, not normally commercially advantageous to the developer. (10)

The prevalence of negotiation in the implemention of air pollution controls has been stressed by several authors. Thus Downing stated, in considering various national systems (including American controls), that:

> Bargaining between the source of pollution and the responsible control authority is universal.. It is most often informal, typically technically illegal, and done in secrecy... The result of this complex bargaining depends upon the relative strengths of the participants and the cost to each of participating in the bargain. (11)

The importance of bargaining in the American pollution control system has also been emphasised by Hagevik, who advanced a bargaining framework on the basis of American research. Indeed, he stated that 'most of the legislation is basically similar to zoning legislation' where negotiation was also the accepted means of procedure.[12]

Bennett, in a comparative study of pollution control by local authorities in England and the Netherlands, confirmed that 'in exercising control local authorities generally seek to accommodate the interests of the polluters and to contain decision making within an informal bargaining process' outside both the legal and political arenas.[13] Peacock, who scrutinised British and West German regulation, agreed that 'the setting of regulatory standards, and the subsequent enforcement of those standards, involves a continuing process of bargaining'.[14] The co-operative bargaining approach of the land use planning agencies and the pollution control authorities in both Britain and the United States towards polluters is thus well documented.[15] Sometimes, air pollution objections may be a proxy for other concerns about a new project.[16]

Since negotiation is an activity which normally presupposes the consent of the regulated and mutual trust with regard to the exchange of information, third parties (frequently those most affected by a decision) are often excluded from the process.[17] For example, Jowell states that:

> It is generally accepted that the effective negotiation of planning gain must be conducted among a small number in an atmosphere of relative secrecy. ...Little or no public participation is considered possible. (18)

This exclusion may lead to frustration among objectors left out of the bargaining process concerning a new stationary source of air pollution. This has led to the growth of environmental mediation, especially in the United States.[19] One of the prerequisites for success in environmental mediation is scope for flexibility.[20]

Such flexibiity implies the use of co-operation, compromise and environmental mitigation. The importance of mitigation measures in resolving environmental conflicts is stressed again and again in the literature.[21] For example, Duerkson, who undertook an extensive investigation of the problems of siting new industry in the United States based upon case history and other research (including studies in Europe) emphasised the need for citizen participation and mitigation to settle siting disputes.[22]

Gladwin's study of 366 environmental battles in the United States is one of the most fascinating accounts of site-specific conflicts. He reported a change in focus from existing to greenfield projects as targets of environmental concern:

> environmental conflict is focussing on change - the focus is shifting from old to new targets, from existing pollution problems to potential environmental impacts and from 'band-aid' remedies to preventive or risk reduction measures. (23)

He suggested that the empirical characteristics of reported environmental conflict were that it was: spreading; continuing; varying tremendously in character; broadening; characterised by a dvision of labour among opponents; decentralising; quite litigious; increasingly characterised by governmental administrative rather than legal action; moving out of the courts; growing in size; becoming more costly; shifting from 'regulatory' (ie. rule dictated) to 'social' (ie. political) in general character.

Gladwin concluded that 'the notion that there is "no best way" to manage environmental disputes has begun to gain wide acceptance'. This conclusion has been confirmed by Knödgen's studies in France and Germany:

> There is no generally valid formula for successfully siting in Europe. On the contrary, it is necessary to carefully take into account the differing political, cultural and economic background of each country and the various regions within Europe. (24)

Gladwin suggested that the outcome of an environmental conflict could not yet be predicted on either a theoretical or an empirical basis and indicated that dozens of interacting variables served to shape the magnitude and distribution of the conflict outcomes. the most important factors in the cases he examined were probably the:

> characteristics of the parties involved, nature and magnitude of the goals in contention, nature of the issues at stake, past and anticipated relationship between the parties, strategies and modes of conflict behaviour engaged in, differential power or resources among the parties, presence and influence of audiences, availability and use of third parties, and character of the resulution mechanisms employed. (25)

It can be seen from Figure 2.1 that there are four possible results arising from a developer's proposal to construct a new source. The first is that it is built as proposed, without the negotiation of further mitigation measures. the second is that additional mitigation of the environmental and other impacts will be agreed and the modified proposal will be constructed. The third is that the project is constructed but that unacceptable pollution arises and further mitigation measures are negotiated. The fourth is that the project is not constructed. As was shown in Figure 1.1, there are only two 'satisfactory' outcomes to the process. These are the use of 'appropriate' conditions to prevent pollution problems from a permitted source and the refusal of permission for a development which would have cause pollution problems, irrespective of the control measures employed, had it been allowed. The question of how to define 'satisfactory' or 'appropriate' requires the use of evaluation criteria, which are now discussed.

Evaluation criteria

As Mitchell has stated:

> Whenever a value judgement is made about a policy, programme or project, such decisions are based on criteria, whether implicit or explicit. ...measuring or operationalising the criteria represents a major obstacle in evaluation research... Ideally, a variety of criteria should be used when judging the adequacy of a given programme. (26)

While there are numerous criteria which could be adopted for judging the national systems of anticipatory air pollution control, including flexibility, responsiveness and comprehensiveness, those mainly utilised here are the classical measures of efficiency, equity and effectiveness. These are felt to offer a sufficiently broad range of measures, though mention of others will be made. There is, in practice, some overlap between the requirements of these three criteria and conflicts can frequently arise in satisfying each of them. It is therefore often necessary to strike a balance (ie. make a trade-off) between the requirements of each in utilising techniques, formulating powers and implementing these in any particular siting decision.

Efficiency

Efficiency has many meanings but here it is used to measure the relationship between the benefits and costs arising from a decision or regulation. An allocation of benefits and costs is said to be efficient 'if it is impossible to move to another allocation which would make some people better off and nobody worse off'.[27]

The concept of efficiency is derived from welfare economics where the achievement of a Pareto optimum, at which all possible gains from exchanges have been exhausted, is regarded as efficient. Thus the economic efficiency criterion for adopting a regulation is whether or not the environmental and other benefits - both public and private- exceed the combined costs to those that must comply, as well as to the administering and enforcement agencies and other parties.[28] Benefits and costs are defined broadly to cover all the relevant social benefits and costs, not just the financial cost of pollution abatement and the corresponding financial benefits.

It is a condition of economic efficiency that polluters should bear the costs imposed on second and third parties and incorporate these in output prices. This is the 'polluter-pays principle'.(29) One way of bearing the residual costs remaining after the use of pollution control technology is to pay compensation to those directly affected by the pollution. Though the use of direct financial payments is often controversial, it can be consistent with the attainment of economic efficiency, as Knödgen has stated:

> A company planning to construct a plant...should be obliged to take into account not only investment costs but also the social costs of production... If it is possible to compensate for the negative external effects completely, by direct negotiation between those on whom damage is inflicted and those inflicting it, the negotiated solution then acquires the allocative function of an efficient pricing system, whereby only those projects can be implemented which can produce a surplus on returns over social costs. (30)

The benefits and costs of a new source of air pollution may be different in different areas. Thus in areas of low unemployment and high demand for industrial development, the developer might be expected to yield concessions (perhaps in the form of planning gains) to offset the air pollution costs involved. However, where unemployment is high and demand for industrial and commercial use is low, the reverse may be true. The distance of the source from sensitive neighbours (and hence the damage caused by the pollution from it) will also affect the balance between costs and benefits. Obviously, if the benefits of a heavily polluting development are low, no local jurisdiction will have an incentive to permit it.(31)

Efficiency thus provides one indication of whether or not a decision or action is basically satisfactory. In Figure 1.1, an efficient outcome would result if a development which would have caused pollution costs, irrespective of the control measures employed, which outweighed the benefits of the source is refused or if the controls employed to limit pollution problems from a permitted source represent the optimal level of control.

There are several problems in using efficiency as an operational measure. One is that, given ambient variations in pollution concentrations, it is not generally possible to measure the full range of benefits associated with abatement or, for that matter, the costs incurred by all the individual polluters. It is thus extremely difficult to compare them using common units (usually monetary value).

In reaching an efficient decision on whether or not to permit a new source of air pollution, and on what conditions to apply, it is necessary to achieve the optimal level of mitigation by the least cost method available. This optimal level is the point at which the marginal costs of further amelioration or mitigation, including the costs of the control agencies, are just equal to the marginal costs of the pollution damage caused by the development.(32) The optimal solution to a pollution problem arising from a new source may thus mean that some pollution damage is caused after controls have been applied, the elimination of which would cost society more than the value of any additional benefit arising.

Where a new stationary source of air pollution is involved, the notion of the optimal level of air pollution control has to be extended to take into account the other externalities of a development, such as other forms of pollution, congestion, loss of visual amenity, etc. Once again, because both the precise costs of pollution damage and the costs of pollution control (including all the transaction costs involved in gaining any permits) are generally unknown, in practice it is virtually impossible to identify the optimal level of mitigation of impacts. Thus, the air pollution control agency should try to determine the optimal level of air pollution control (both in general and where particular new sources are involved) by applying weights to the different costs and benefits. The land use planning agency, in considering a new source, may use different weights and arrive at a different optimal level. It may decide that more air pollution control is needed or that other types of mitigation are also required.

There are several methods of determining costs and benefits available. Cost benefit analysis is concerned to evaluate whether the social costs of a variety of proposals is justified in terms of the anticipated benefits. It is frequently used to help choose the least cost alternative.(33) Lichfield's planning balance sheet is principally used to choose between alternative plans, using a table based on both tangible and intangible parameters. Its principal advantage over cost benefit analysis is its recognition and formal incorporation of these unmonetarisable variables.(34) Its disadvantage lies in its relatively limited field of application.Hill's goals achievement matrix is an attempt to incorporate community objectives within the evaluation, and to apply a weight to each in order to achieve an overall index allowing comparison between alternatives.[35] The weakness here is that no formal method for choosing the objectives and weighting them is advanced, though in practice this has been done by officials and by citizen participation.[36]

A proposal to construct a new stationary source of air pollution will often not involve site alternatives. The choice will thus be to accept it as proposed, and hence to evaluate it against the no-project alternative, to negotiate mitigation of impacts and to evaluate the modified proposal against the no-project alternative, or to refuse it. Cost benefit analysis, the planning balance sheet and the goals achievement matrix all rely heavily on comparison to allow for the cancellation of some costs. This technique renders them difficult to apply to a single proposal because many costs and benefits cannot be cancelled by comparison with the no-project alternative. However, in principal at least, these methods are useful in determining whether a decision satisfies the criterion of economic efficiency. The major problem of comparing, say, the number of jobs created with the air pollution generated remains, and no evaluation is likely to yield an indisputable preference between them.

There may be considerable uncertainty about the future level of air pollution from a new source because of difficulties of estimating how much waste will arise and what the resulting pollution concentrations will be. In addition, there are great difficulties associated with damage estimation. (These are discussed in Chapter 3.) There will often be radical disagreement about the likely effects, particularly in the case of emotive pollutants such as dioxin or heavy metals, because the only factual basis may be a mass of obtruse and strongly contested ('soft') scientific evidence.

Uncertainty will also occur because of hazards arising at the construction and operating stages of future developments. Risk assessment involves weighting the size of an impact by the probability of its occurence per unit of time. There are substantial differences of view about the confidence which can be placed in such probability estimates, especially where a very large impact of very low probability of occurence has been estimated (eg. a major explosion at a chemical works in an urban area). Public perception of risk becomes an important political consideration in these circumstances and certain risks, where the potential impact exceeds a stated level, are sometimes considered unacceptable. They are not always associated with the risk of explosion or serious malfunction. As the Organisation for Economic Co-operation and Development has put it:

> However small an objective probability may be (say of ground contamination by a toxic material), it is the public perception of this issue that will place pressure on environmental authorities to take action. This pressure may be resisted if the authorities feel the risks are exaggerated, but may still prove politically difficult to resist. (37)

Such uncertainty, associated with potential routine or catastrophic hazards, renders the estimation of economic efficiency even more difficult.

Various environmental impact assessment methodologies have been utilised to attempt to evaluate the environmental impacts of projects (Chapter 3). Several of these involve quantification but they suffer from problems of over-complexity, 'expert' attribution of weights and limitation of coverage.(38) While it is extremely important to understand the damage anticipated from a new source, these environmental impact methodologies do not allow a comparison of the environmental costs with other types of cost or with economic and social benefits, especially if these mostly accrue to groups other than those bearing the costs. The repertoire of comprehensive evaluation tools available in considering whether or not to recommend a project to proceed is thus somewhat limited. Very few of these attempt to take any account of questions of equity or uncertainty.(39)

All evaluation schemes which rely exclusively on expert quantification are bound to be unacceptable as the sole aids in decision making because they short-circuit the citizen participation and political processes. As McAllister argues, the central purpose of evaluations should be to help individuals reach personal judgements.(40) He states that evaluations can use quantification to estimate particular impacts, but that these ought not to be aggregated. Rather, information should be set down in readily assimilable, summary form although it will seldom lead to a clear-cut judgement between rejection and acceptance.

The control agencies, because of the difficulties in establishing the level of control at which the efficiency criterion is satisfied, normally tend to endeavour to minimise the costs of damage, leaving the developer to argue the case against the marginal costs of increased control. They thus choose some level of control, often on the basis of standards (Chapter 3), in order to avoid having to try to calculate the benefits of control in any particular instance. Cost-effectiveness - the cost of achieving the given level of control - is then used to give a partial measure of efficiency. This cost includes both the expense of the permit application procedure (to the developer and to society) and the expense of control attributable to the developer.

By insisting on early consideration and then on anticipatory controls (which are much cheaper to the developer than retrospective controls - Chapter 1) and by handling the permit applications in an effective and timely manner, the control agencies can ensure that the chosen level of control or amelioration is obtained as economically as possible. Cost-effectiveness, despite the problems of measuring costs precisely, is clearly more practical criterion than efficiency itself, which involves balancing, and hence measuring, both costs and benefits.

Given the lack of information about the national costs of control and of air pollution damage and about these costs in relation to a specific pollution source, it will seldom be possible to make other than general observations about the efficiency or cost-effectiveness of the control systems and of the outcome of case histories. It is precisely this lack of availability of an accurate measure of the net benefits of a permission that makes the political process so important in decisions about new stationary sources of air pollution.

Equity

Equity is usually defined to mean either the identical treatment of identical people or the different treatment of different people in order to reduce the consequences of these innate differences. 'Whether or not either concept of equity is desirable is a pure value judgement'.[41]

There are two distinct aspects of equity which must be considered as evaluative criteria: outcome equity and procedural equity. Outcome equity is concerned with who bears the costs of, and who benefits from, the outcome in any particular case, ie. with fairness. Where a new source of air pollution is involved, equity has to do with people's sense that they are not required to make sacrifices while others make windfall gains. Where several equally efficient solutions exist which will make some people better off and some worse off, value judgements about equity have to be taken. A new air pollution source may be sited and designed to achieve the optimal level of pollution control but the distributional effects may sometimes be unacceptable as the local population has to bear the burden of pollution damage. Trade-offs may thus have to be made between efficiency and equity where they conflict.[42]

It is possible to distinguish three different groups in considering outcome equity: the developer, the population directly affected by the development, and the larger public. The developer will normally gain by undertaking the proposed development: either by making profit or by undertaking some statutory duty cost-effectively. It is inequitable that the developer should gain if the local population, and perhaps the larger public, lose by suffering pollution or other damage unless he fully compensates them. It is also inequitable that the developer of an environmentally innocuous development should be forced to adopt a less efficient solution as a consequence of having the project blocked by local pressure groups. Some developments may be in the public interest such as certain waste disposal facilities, power generation plants, etc but it is not equitable that the few should suffer from their impacts without compensation so that the many may benefit. Again, if the local population is very generously compensated, the wider public may be unfairly asked to bear the consequences of very high prices and/or longer range pollution. The intensity of resentment at lack of fairness will depend on the scale of the injustice and the expectations of those affected.

The polluter pays principle demands that the costs associated with the pollution from a source should be fully borne by the polluter responsible or that compensation is paid.[43] If the use of pollution controls proves ineffective in limiting damage, equity may demand that the third parties affected by a development be awarded compensation. The other solution, that of imposing pollution charges, does not necessarily compensate those directly affected.

The concept of equity obviously extends to developers of different sites. The air pollution control agency will tend to regard it as inequitable to impose more stringent controls on a developer on one site than on another. Consequently, striving to achieve an equitable outcome in any particular siting decision will normally be the function of the land use planning agency. The attainment of an acceptably equitable outcome may involve some loss of efficiency by demanding mitigation of impacts beyond the optimal level of pollution control. It may also demand some clawing back of gains, in the form of taxation or other compensation, to the benefit of those impacted by the development. Again, political judgements are bound to be involved in determining whether or not to permit a new air pollution source where the distribution of costs and benefits raises questions of equity.

Procedural equity demands that the decision making process should be fair and be seen to be fair. In a procedurally equitable system, the developer, the local population and the wider public should have similar rights to participate in the decisions affecting them. This may demand advertisement and other publicity, consultation, the making of representations, public hearings or inquiries, appeal procedures and other appropriate means. While some objectors to a proposal may never be satisfied, the vast majority will accept an outcome if their views have been genuinely considered and are reflected in the decision.

Because of the costs involved in consultations, hearings etc, procedural equity frequently conflicts with efficiency, though this need not always be the case. Equity and efficiency considerations may coincide in allowing a full expression of the various concerns. The delays that this entails may frequently be justified by alerting the developer to local circumstances or environmental factors of which he was unaware. In turn, this may enable early incorporation of mitigation measures to take place to achieve a cost-effective and equitable outcome.

Effectiveness

The effectiveness of a pollution control system is a measure of how well it works in practice. Thus, the effectiveness of a decision refers to the extent to which it is complied with and achieves the desired objectives. It should not be confused with cost-effectiveness. Effectiveness is thus closely related to the implementation of policies or conditions attached to a permission. This, in turn, subsumes the enforcement of any sanctions against non-compliance. It may, of course prove very expensive to implement the conditions of an approval for a new stationary source of air pollution, and hence not necessarily efficient.

Bardach has argued that the implementation of a policy is prone to the diversion of resources, the deflection of goals, dilemmas of administration and the dissipation of energies, which he termed 'implementation games'. There are frequently delays in the 'game'. He stated that:

> The 'implementation process' is (1) a process of assembling the elements required to produce a particular programatic outcome, and (2) the playing out of a number of loosely

> interrelated games whereby these elements are witheld from or delivered to the program assembly process on particular terms. (44)

This analysis, stressing the control various individuals hold over the elements in the implementation process, helps to explain why negotiation appears to be such an important element in the application of conditions to new stationary sources of air pollution to minimise damage. Were implementation a less involved process, conditions could be imposed by the control agencies without the need for discussion to ensure their effectiveness.

There have been several attempts to advance a conceptual framework of the implementation process.(45) Mazmanian and Sabatier, in their examination of policy implementation, suggested the types of variable likely to be significant in any particular instance: the tractability of the problem (for example - applying this to pollution control - the nature of the pollution likely to be emitted and the technical feasibility of its control); statutory and procedural influences (eg. the policy context, the structure and personnel resources of the controlling authority); and personal influences on the decision (eg. the attitudes of professional officers and elected representatives).(46) Their framework stresses the need for clear and mutually consistent objectives in the statutory policy to be implemented.(47) Unfortunately, if all the variables necessary to account for a particular decision on whether or not to approve a new air pollution source are set down, the model they suggest becomes hopelessly unwieldy for explanatory or predictive purposes.(48)

Further, the requirement for clearly defined policy objectives is hardly ever met in practice, as Fudge and Barrett have pointed out.(49) They, too, tended to emphasise the role of negotiation in achieving objectives, which themselves may be quite deliberately left vague in the original legislation either because of uncertainty or in order to blame the implementers if they prove ineffective. They concluded that no clear distinction could be made in policy analysis according to the content of a policy as originally conceived and that actually implemented. They also asserted that:

> observation of what actually happens in practice leads to the inescapable conclusion that certain individuals, groups or governments tend to find a way of doing or getting done, what <u>they really want to do</u> while others do not. (50) (emphasis in original)

Pressman and Wildavsky drew rather similar conclusions. They stated that 'implementation is evolution'. 'In practice, implementing a policy is a unitary process or procedure, not a tandem operation of setting a goal and then enforcing the plan that embodies it'.(51) They put their finger on the nature of policies relating to new source control embodied in the air pollution legislation when they stated that:

> In most policies of interest, objectives are characteristically multiple (because we want many things, not just one) conflicting (because we want different things), and vague (because that is how we can agree to proceed without having to agree also on exactly what to do). So if the objectives are not uniquely determined, neither are the modes of implementation for them. (52)

It will often be necessary to make trade-offs between efficiency and effectiveness. As Downing stated:

> Economic realities require some balancing of benefits and costs. When this is done during implementation, no matter who is responsible for action, laws which ignore costs will be compromised. Implementation deficits may result from efficient adjustment to economic realities or both. In any case they appear to be inevitable and universal. (53)

It is clear that the criterion of effectiveness may be difficult to apply because the number of objectives to be satisfied in making a decision about a new stationary source of air pollution is frequently considerable. However, it should be possible to determine whether or not particular conditions relating to air pollution control emissions or the installation of equipment have been met and hence, at least to this extent, to determine the effectiveness of the decision in controlling air pollution. Thus, in Figure 1.1, the decision to refuse permission for the unsatisfactory source of air pollution is bound to be effective (provided the developr does not proceed regardless) since no pollution will result. The effectiveness of the 'satisfactory' conditions in the second efficient outcome will depend on their precise formulation and the determination of the developer and control agencies to enforce them.

Equity may require effectiveness. Where stringent air pollution controls are imposed, because the damage from a new source is likely to be substantial and to satisfy local residents, any implementation deficit will be inequitable: the residents will be subject to greater pollution levels than they were given to anticipate when they accepted the development.

It would appear from the work of Gladwin, Knödgen, Mazmanion and Sabatier and others that no simple formula is readily available for predicting the outcome of any case history involving anticipatory controls over air pollution. The most that can be attempted is the postulation of a number of hypotheses about the influences on the likely outcome of a particular siting decision. This may be done by examining the role of the various actors in the process : the developer; the air pollution control agency; the land use planning agency; and the objectors. Hypotheses relating to each of these actors and to the process as a whole are advanced in Chapter 8.

The evaluation criteria - efficiency, equity and effectiveness - while not capable of being expressed in rigorous operational form for present purposes, are utilised in the comparative United States/United Kingdom analysis presented in Chapter 9.

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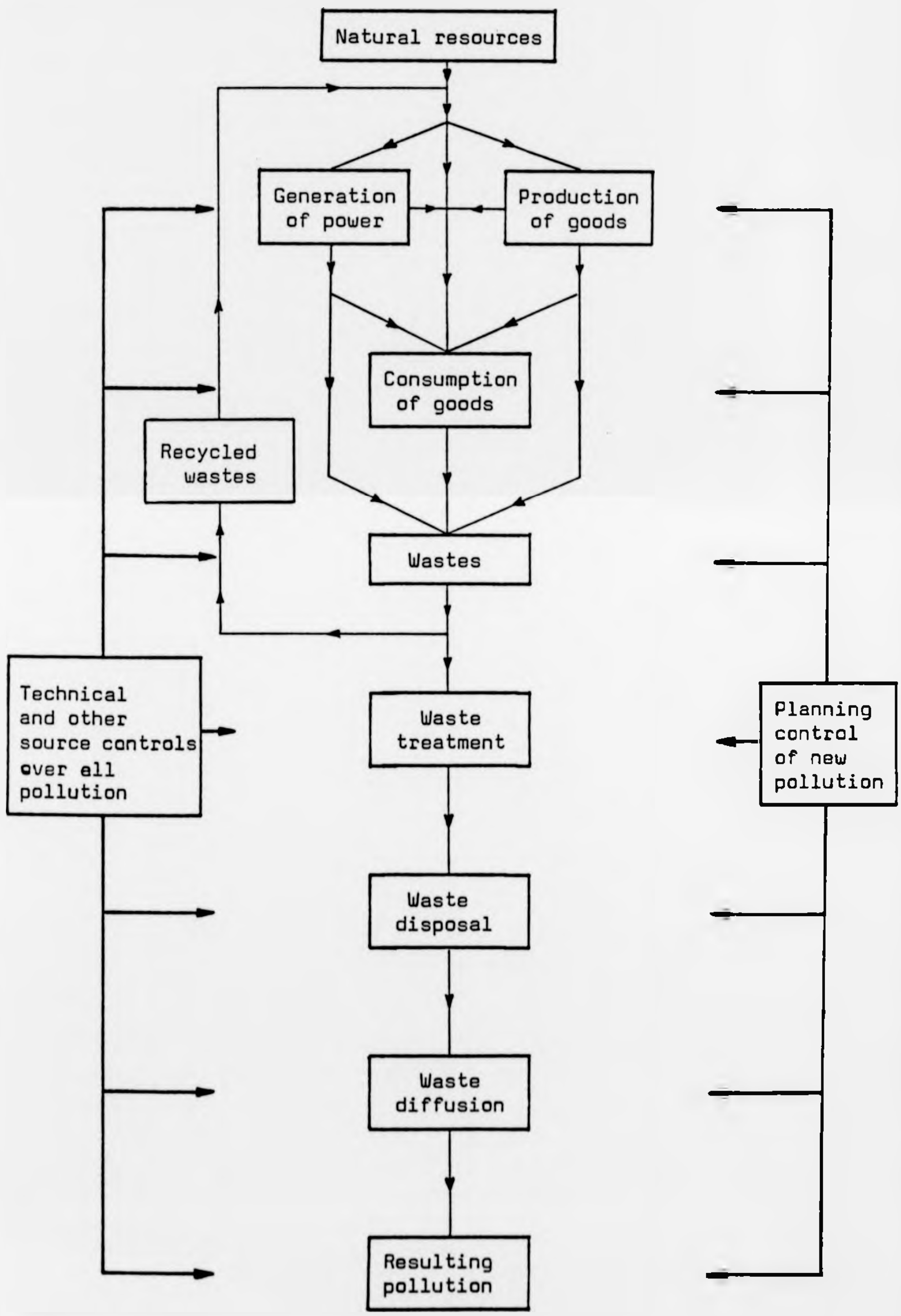
3. <u>ANTICIPATORY CONTROLS OVER AIR POLLUTION</u>

Figure 3.1 makes it clear that pollution is the result of a process originating in the generation of waste.[1] As mentioned in Chapter 1, there are two main methods of abating air pollution. The first, and most important, involves using technical and other source controls to reduce emissions. The second is the use of locational or design controls to reduce the effect of a given level of emission: land use planning control.

As Figure 3.1 demonstrates, both technical and other (eg housekeeping) source controls and land use planning controls can be applied at various stages in the pollution process. In principle, at least, both types of control may be applied both retrospectively (once a pollution problem has been shown to exist) and prospectively (to prevent a pollution problem from arising or to limit its magnitude). In practice, however, only technical and other source controls can usually be used retrospectively (on existing sources) and then perhaps to a more limited extent than might be expected because of the very high costs of installing control devices after commissioning plant, rather than at the outset (Chapter 2). Land use planning controls tend, by their very nature, to be anticipatory though examples of their retrospective application do exist.

The distinction between these two types of control may sometimes be blurred. For example, controls imposed under land use planning legislation may involve the use of technical controls, as where a condition attached to a planning permit for the development of certain types of industry may specify a maximum level of process emission. Similarly, the use of ambient air quality standards (below) may

FIGURE 3.1 THE POLLUTION PROCESS AND ITS CONTROL



involve the utilisation of both technical and locational methods to ensure compliance: for example, by demanding stringent control technology to limit emissions and by forcing the source to another location where the capacity of the air to accept the given level of emission without breaching the standards is greater. Environmental impact assessment, the evaluation of the likely environmental effects of a development before the decision is taken to commence construction, allows the impact of air pollutants (and other project characteristics) to be anticipated and thus can be a precursor of both technical and land use planning controls.

This chapter is devoted to a discussion of the various anticipatory controls available for abating air pollution. It is obviously essential to understand the nature of these control techniques before studying their role in the US and UK air pollution control and land use planning control systems and in the implementation of anticipatory controls. The making of recommendations for improving the utilisation of prospective pollution controls presupposes a knowledge of the control techniques available.

The chapter commences with a brief description of various air pollutants and their effects, together with a discussion of the difficulties of quantifying the costs and benefits of control. The next two sections explain why air pollution standards and environmental impact assessment are relevant in pollution prevention or amelioration. The various methods of technical and other source controls available to reduce pollution damage are then briefly mentioned and the role of land use planning controls in anticipating pollution problems is examined. Finally, the various land use planning techniques available for controlling air pollution are discussed in some detail and a brief assessment of them is presented.

Air pollutants and their effects

Wastes are emitted into the atmosphere as either gases or particles, and are eventually removed by natural self-cleansing processes. The wastes mostly originate from the burning of fossil fuels and the processing of materials. Transport (especially the motor vehicle), industry and the domestic sector are all important fuel users and hence sources of pollution (Table 3.1).[2] In addition, industry emits large quantities of air borne process wastes. Institutional and commercial sources may be significant, particularly in city centres, and agriculture may generate high dust concentrations under adverse, windy conditions.

As Figure 3.1 indicates, the pollutant concentrations to which the emitted wastes give rise (usually measured by the amount of pollutant per unit volume of air at ground level) are determined by the way in which the pollutant is dispersed, one of the main factors being the height at which emission takes place. Gaseous pollutants are generally quickly and uniformly mixed with a large volume of air. The important common gaseous pollutants include oxides of sulphur, nitrogen and carbon, hydrogen sulphide, hydrogen fluoride, hydrogen chloride, hydrocarbons and ozone. Particulate pollutants consist of finely divided liquid or solid matter which may be small enough to remain suspended in the atmosphere for some time. The mainly solid

TABLE 3.1 A SUMMARY OF AIR POLLUTION EFFECTS

POLLUTANT	MAJOR SOURCES	HEALTH	SUSCEPTIBLE POPULATIONS	VEGETATION	MATERIALS	AESTHETICS/ NUISANCES	COMMENTS
Carbon monoxide (CO)	Transportation, industrial processes	Reacts with haemoglobin reducing mental attentiveness, physical exertion, and exacerbating cardiovascular disease symptoms	Persons with cardiovascular disease and others	None	None	None	Past knowledge was based on study of high exposure for short periods with healthy, young individuals. New data show possible health effects for susceptible persons at CO levels in the blood found in urban populations.
Nitrogen oxides (NO_x)	Transportation, space heating/cooling, power generation	Interfere with respiratory functions producing long-term (chronic) disease symptoms	Persons with respiratory or cardiac disease, the young and the elderly	Reduction in growth of plants with broad leaves (eg. beans, tomatoes)	Accelerated deterioration of dyes and paints	Creation of a brownish colouring in urban air	Conclusions are based on limited exposure of healthy adults to low doses, extensive animal studies, and only limited data relevant to ambient conditions.
Hydro-carbons (HC)	Transportation & industrial processes	See photo-oxidants	See photo-oxidants	None	None	None	Indirectly polluting through the production of photochemical oxidants upon reaction with NO and NO_2 in the presence of sunlight
Photo-oxidants (O_3)	See nitrogen oxides and hydrocarbons	Interfere with respiratory functions & cause eye irritations	Persons with chronic respiratory diseases, especially bronchial asthma	Severe reduction in growth and eventual death of leafy vegetables, field and forage crops, shrubs, fruit and forest trees caused by ozone and PAN	Ozone causes the cracking of rubber and the accelerated deterioration of nylon, rayon dyes and paints	Ozone has a distinct although not terribly offensive odour	Ozone (O_3) is the most common type and the key indicator for photo-oxidants. Health effects are based on limited and inadequate data. Ozone, peroxyacetylnitrite (PAN), etc are formed by atmospheric reactions
Particulates	Power generation, space heating/cooling, industrial processes, soil erosion	Interference with respiratory functions, possible contribution to lung cancer	Persons with respiratory disease, the young and the elderly	Reduction in plant growth by physical blockage of light when deposited on leaf surface	Soiling of fabrics and buildings and corrosion of metals when combined with SO_2	Creation of smoke plumes, scattering of sunlight to produce haze and colourful sunsets, and formation of hydroscopic nuclei to produce fog	The effects of particulates are difficult to separate from those of sulphur dioxide.
Sulphur oxides (SO_x)	Power generation, space heating/cooling, industrial processes	Little effect in the pure gas form: similar effects as particulates when combined with them	Persons with respiratory or cardiovascular disease, the young and the elderly	Reduction in growth of plants with broad leaves	Corrosion of iron, metals, accelerated deterioration of building stone, cotton paper, leather paints and other finishes	Scattering of sunlight to produce haze, production of unpleasant odours	Sulphur dioxide is readily converted to SO_3 and then to sulphuric acid (a particulate). Determining which effects are due solely to SO_2 is difficult.
Heavy metals, radioactive agents, others	Power generation, industrial processes	Specific to each pollutant	Specific to each pollutant	Fluoride causes long-term damage to selected field crops (and animals)	Tarnishing of metals by hydrogen sulphide	Hydrogen sulphide produces extremely unpleasant odours	Pollution from these agents can be intense at the source, but tends not to be widespread.

Source: adapted from reference 2

particulates are roughly classified by size as smoke, fume, dust and grit. Their composition varies from unburnt carbon to complex compounds, and they include such toxic elements as lead, beryllium, cadmium and certain radioactive elements, as well as various other substances, for example asbestos.(3)

Air pollutants vary in their effects (Table 3.1). Air pollution is, however, associated with bronchitis, emphysema and lung cancer, with the corrosion of metals and with the soiling of, and damage to, stonework, painted surfaces and fabrics. Air pollution is also known to affect farm animals and crops adversely, to diminish the number of bird species in a given area, and to reduce visibility. While most of these effects are encountered relatively close to the source of pollution, acid rain (caused by the wet deposition of oxides of sulphur and nitrogen as dilute acids) may occur hundreds of miles from the source, resulting in reduced forestry yields and fishery decline. Photochemical smog, on the other hand, is a regional phenomenon caused by the action of sunlight on hot stable air masses containing oxides of nitrogen and hydrocarbons.(4) Air pollution cannot, therefore, be described as being only a local, regional or supraregional problem. It is frequently all three.

There are considerable difficulties associated with the establishment of damage (dose/response) functions.(5) It is generally extremely hard to determine precisely what degree of damage to a particular receptor is associated with a given concentration of pollution. The accurate identification of the source or sources of a particular pollutant is also very hazardous. Further, the estimation of these effects in terms of measurable parameters (number of days off work, percentage drop in crop yield, etc.) is uncertain and the fixing of money values to these parameters involves additional assumptions and controversy.[6] Nevertheless, approximate threshold concentrations (below which most types of damage are minimal) have been established for several air pollutants[7] and various attempts have been made to assess the cost of air pollution.

These are prone to substantial error and must be treated with great circumspection. The monetary costs of air pollution are, however, known to be very high.[8] In the United States, for example, the range of economic benefits from existing air pollution control based upon improvements to human health, reduced soiling and cleaning costs for households, reduced damage to vegetation, crops and materials was estimated to be in the range of $4,600 - 51,200M per annum in the late 1970's.[9]

In principle, it should be less difficult to obtain estimates of expenditure on pollution control than it is to put a monetary value on damage. In practice, however, figures are by no means readily available and those that do exist are prone to substantial error. The figures involved are again large. In the United States in 1979, for example, the total costs of capital expenditure related to air pollution control have been officially estimated at $20,000M, of which over 40% was expended on stationary source control.[10]

As mentioned in Chapter 2, the economic rationale for environmental policies generally, and for pollution controls on new stationary sources of pollution in particular is that their net benefit is positive. There is a considerable literature on the relative costs and benefits of controlling pollution from an individual source.[11] This subsumes the concepts of efficiency and an optimal level of pollution control (Chapter 2). It has to be remembered, of course, that most pollutants are not only generated by man's activities but occur naturally and that the total elimination of pollutants is consequently quite impossible.

Standards

While the concept of an optimum level of pollution control is very attractive, its identification is inhibited by both conceptual and empirical measurement problems. These are more acute in the case of an individual source than in the measurement of air pollution costs and benefits generally. The difficulties inherent in operating a system of control based upon an 'optimum level of pollution' from each source have rendered it impractical. Accordingly, control based upon standards, which may be set either to attempt to achieve the general optimum level of control for a pollutant or to attain some empirical objective, such as the avoidance of health effects,is more useful and is widely employed. Standards may relate either to air pollution concentrations or to the emissions of wastes and may be determined nationally, regionally or locally. It is possible to classify the various types of standard as:

environmental quality standards;

source emission standards;

area emission standards.

Environmental quality standards

Environmental quality standards refer to limits of ambient environmental quality that cannot be exceeded without infringing statutory law.[12] It is apparent that if an area has pollution levels higher than the environmental quality standard, then no new emissions in that area should be permitted and strenuous action should be taken to reduce existing emissions. In other words, no new sources should be constructed. Such standards therefore have a very profound impact upon land use.[13] In practice, a mixture of both stringent technical controls and land use planning controls are normally employed to attempt to attain and maintain air quality standards. The use of air quality standards, of course, implies an extensive monitoring system to record ambient concentrations on a regular basis.

Because of the profound implications of air quality standards for both existing and potential polluters, the use of air quality targets or guidelines has become quite common. These are not legally enforceable and hence cannot be regarded as standards. They are suggested desirable targets at which pollution control authorities should aim and in relation to which improvements in environmental quality can be measured. The World Health Organisation[14] and the Commission of European Communities,[15] for example, have promulgated target concentrations for suspended solids and sulphur dioxide. In

Britain, the Royal Commission on Environmental Pollution reported that:

> We have reached the view... that there is now a need to focus attention openly and specifically on air quality. We do not think that air quality standards would be a sensible way of achieving this. ... Such a system would not only be impracticable at present, it would also not be justified by current knowledge of the effects of pollutants and the social costs they cause. We propose the establishment of air quality guidelines. (16) (Emphases in original)

Source emission standards

Source emission standards refer to a numerical limit to the amount of a particular pollutant which may be discharged from a specific source. They may apply to new or to existing sources but are most frequently utilised in their most stringent form for new or reconstructed sources. National emission standards for industrial process or heating emissions will not have any land use implications, but locally determined emission standards obviously may, since they could encourage industry to locate in an area where standards are lowest. Source emission standards normally require some agreed level of technical control.

Source emission standards may be determined in terms of concentration of pollutant per unit volume of air, in terms of weight of emission per ton of product, weight of emission per ton of raw material, weight of emission per unit of time, percentage removal of emission, etc. The American 'new source performance standards' (Chapter 4) are source emission standards, frequently specified in terms of either weight of emission per unit of time or per unit volume of air. Emission standards require the measurement of concentrations of pollutants in the effluent gases from a process and this is frequently difficult to achieve accurately.

Environmental quality standards, in theory at least, form the basis of emission standards, since only by limiting or adequately dispersing emissions can concentration targets be met. The relationship between the two types of standard is normally quantified by means of mathematical models which are becoming relatively accessible with modern instrumentation and more accurate, often yielding plume dispersion estimates to within 50% of measured results.[17] In practice, the relationship between the standards is less rigorous, because environmental quality standards may be derived politically, rather than on the basis of scientific analysis of dose-response relationships and risk-benefit considerations.[18] Emission standards may then be determined according to a general set of objectives which is adjusted in accordance with the best means of control available at a realistic cost.

<u>Area emission standards</u>

Area emission standards relate to the total emissions from a given area of land (ie a collection of sources). One variant is emission density zoning, in which the maximum legal rate of emissions of air pollutants from any given area (perhaps an acre) is limited by the size of the area.[19] The relationship to land use is obvious: new facilities can be evaluated within the context of emissions from existing facilities and benefits can be derived from locational controls and the provision of open space. Another variant is emission allocation in which a maximum legal emission rate is assigned to a large area (often the area controlled by a local jurisdiction) with provisions for sanctions, such as a construction ban, to ensure the area's allocation is not exceeded.[20] Here the precise distribution of pollutants within the overall total is not of crucial concern, but a detailed emission inventory and a clearly formulated land use plan are both essential.

A third variant is the specification of land use, or zoning. By allocating a particular area for residential use or for industrial or commercial use an emission standard is, albeit very crudely, implicitly specified. This concept is refined in 'performance zoning'. Performance standards define the maximum amount of smoke, dust and other pollutants that an industry in a given area may produce. The maximum levels of emissions from such a zone should thus, at least in principle, be accurately known:

> Performance standards for industrial districts should be viewed with caution, however, as some jurisdictions do not have the technical capabilities within the planning or zoning department to enforce the standards. ... In other areas the local air pollution control agency can and does enforce performance standards. (21)

Monitoring of emissions will clearly be necessary, as with the use of source emission standards.

It is, then, quite apparent that area emission standards are closely interwoven with land use and with land use planning. The use of technical controls on the sources will also be necessary. There are clearly inequities involved in area emission standards, as in environmental quality standards, in that an existing polluter may be given a continuing licence to emit, whereas a new source, however potentially well controlled, may be prohibited from locating in the area concerned. For this reason area emission standards, with the exception of the implicit specification of emissions by determining the land use for an area, have not been widely employed.

Environmental impact assessment

The necessity to anticipate potential environmental problems so as to avoid them or to reduce their effect requires the thorough appraisal of an environmentally significant action before it is taken. The formalisation of this concept is embodied in the environmental impact assessment process.

The term 'environmental impact assessment' stems from the US National Environmental Policy Act 1969. Because of the generally (but not universally) recognised success of environmental impact assessment (EIA) in the United States,[22] it has provoked widespread interest elsewhere, not least in the European Economic Community, which has recently approved a directive.[23] Basically, EIA involves evaluating the impacts of a proposed development or action on the environment it is likely to affect and the publication of these for widespread review before the decision to proceed with the action is taken. Thus the US system includes provisions for the preparation of a draft and a final environmental impact statement, for consultation, for public participation and for the evaluation of alternatives.[24]

The original intention of the National Environmental Policy Act (at least in principle) was to ensure that all the major impacts of an action significantly affecting the environment were evaluated so that the decision to proceed with, to abort or to modify the action could be taken on the basis of full information. In practice, it is rare for environmental impact statements to be written for projects that are likely to be refused permission so the whole emphasis of EIA has turned to mitigating the impacts of the proposal to make it more environmentally acceptable.[25]

EIA normally involves a thorough investigation of both the air pollution and land use impacts of a proposed development.[26] It can therefore be a useful tool for helping to anticipate the likely effects of air pollution from new industrial sources. While the EIA may indicate either that the project should be approved as proposed or refused out of hand, it is more likely to prove the precursor of both technical and other source controls and of land use controls to allow the development to proceed but to render its environmental impacts acceptable. Mitigation measures may be suggested by the developer, in anticipation of the preparation of environmental impact documentation, or by those carrying out the assessment, as the impacts become clear, or by those responsible for granting the appropriate permits for the development, on receipt of the draft environmental impact statement. While many environmental impact statements have led to the imposition of more stringent controls, EIA has also been utilised, at least in the United States, as a form of de facto land use planning leading to the amendment of the design of a development to make it more compatible with surrounding land uses.

EIA is not confined to projects but may be extended to programmes, plans and other types of action. It is thus possible to envisage a tiered assessment system in which the EIA of any particular project takes place within the context of a broader EIA for the area or for a series of projects of which that of current interest is but one.[27] Again, the relationship between EIA and both air pollution control and land use planning is apparent. EIA, then, can be seen as a valuable technique in the armoury of anticipatory controls over new stationary sources of air pollution, as it encourages the use of preventive technical and land use planning controls.[28]

<u>Technical and other source controls over air pollution</u>

As shown in Figure 3.1, controls over air pollution may be imposed at various stages in the pollution process. For example, the production process may be altered to a less polluting one, ie. one in which fewer waste products are generated or in which the wastes are more effectively controlled. Such changes may be implemented either for purely process efficiency reasons or, more usually, because the imposition of environmental controls forces a reconsideration of the process to be made. Another method of control involves the amendment of the way in which goods are consumed (for example, by limiting the use of products) to create fewer wastes.

It is at the waste treatment stage that most 'technical' controls are applied. The use of pollution control technology includes filtration, electrostatic precipitation, scrubbing, absorption and combustion techniques.[29] Briefly, filtration involves passing air through fabric or other types of filter to remove most of the entrapped particles. In electrostatic precipitators an electric field is used to charge particulate pollutants, attract them to a plate and cause them to fall out of the air stream. Scrubbing is usually used to remove gaseous particulates such as chlorides or sulphur oxides which are soluble in water. The plume is cooled substantially in this process and dispersion may be adversely affected. Absorption involves the removal of gaseous pollutants by trapping them onto sensitive surfaces. Activated carbon, for example, will absorb many malodorous gases. Finally, combustion involves igniting the gaseous pollutants in air at a high temperature to convert them from active chemicals to routine combustion products such as carbon dioxide and water vapour.

The method of control may be specified by the air pollution control agency, by insisting on certain types of equipment which meet specified performance standards, or it may be left to the polluter to choose that equipment which will meet the control authority's emission or air quality standard requirements. The control authority may also insist on various 'housekeeping' methods to control fugitive emissions, which are frequently a source of serious pollution problems. Dust suppression, by damping wind-blown material, covering and enclosing processes, equipment maintenance procedures, etc, is frequently specified.

Several techniques of source control remain at the waste disposal stage. Abatement can be achieved by maintaining the plume at high temperature to ensure that it is a given maximum lift, by discharging only at times when the atmosphere is not heavily polluted (meteorological control) and by making sure the emission takes place at a height well above that of nearby buildings to prevent the plume being caught up in eddies.[30] Chimney height controls are particularly popular in Britain and can have a profound effect on ground level concentrations (Chapter 6). Meteorological control is not widely employed but has been used in both the United States and in parts of Europe.

Reliance solely upon technical controls may not prove the most efficient method of achieving particular pollution control objectives. Recently, and particularly in the United States, there has been a trend away from the 'command and control' approach to air pollution abatement, which essentially involves specifying the level of waste treatment to be achieved at various points of emission, towards 'bubble' and other types of aggregate control (Chapter 4). In the newer aggregate approach the industrialist is left free to determine how best he can reduce emissions from the whole complex (or perhaps more than one complex) to some agreed overall level. This forces him to consider process changes and waste disposal changes instead of relying solely on technical controls and a number of substantial savings in industries' pollution control costs has resulted.[31]

While this type of control may prove impressively cost-effective and may have no adverse impact on equity, the control agreement between the polluter and the air pollution control authority will need to be very carefully worded if it is to prove enforceable. In other words, the effectiveness of this method of control may prove to be lower than that of the more traditional approaches. The 'bubble' and its parallel concepts are by no means confined to existing or modified pollution sources, but can be applied equally well to development on a green field site with emissions for the total plant, rather than for individual discharges, being specified. Whatever types of control are employed, once an air pollutant has been emitted, there is very little further technical control possible: it is here that land use planning controls must take over from the air pollution control agency's controls.

The role of land use planning controls over air pollution

Land use planning controls can never be as powerful as technical and other source controls or provide a substitute for them. They apply almost exclusively to new or modified development, rather than to existing pollution emitters, and can be a valuable adjunct to technical and other controls at source. A given level of emission will cause quite different pollution problems if it occurs well away from sensitive receptors than if it takes place close to them in an area with poor dispersion characteristics.

The land use planning agencies or authorities exert control at most stages in the pollution process (Figure 3.1) but their most powerful potential contribution is in determining the nature and location of new development and of redevelopment. Because pollution originates as waste from production and consumption activities, one of the key variables in pollution control - the geographical point at which additional waste is created - is determined once the location of these activities has been established. Therefore, because of their control over land use, planning agencies exercise an important influence on the spatial origin of wastes and consequently upon pollution levels and their distribution. These agencies are undoubtedly the principal controlling authorities in deciding the location of the pollution process, whether they recognise their position or not.

Control over the location of the pollution source is much more fundamental than other types of planning control over the pollution process. The new locations at which power is generated and at which goods are produced, and hence the locations at which the associated wastes arise, are largely determined by grant or refusal of land use planning permits.

The locations at which products are used can be directly controlled by planning authorities. Apart from allocating land for the consumption of goods (eg. residential areas), agencies have at least a voice in the determination of new road alignments (and also possess some indirect control over the use of existing roads) thus influencing air pollution arising from vehicular traffic. Further, and more fundamentally, by granting permission for certain types of seemingly relatively non-polluting development (such as sports stadia, commercial buildings and shopping centres) agencies are permitting so-called 'indirect pollution sources' to arise as the large numbers of motor vehicles used in travelling to and from them will emit significant quantities of air pollutants. Land use planning authorities can also exert some direct control over the treatment of various wastes emitted from stationary sources by, for example, insisting upon particular air pollution emission levels (ie. requiring technical controls) or by specifying the discharge height or by demanding certain building types for containment of pollutants.

The place at which the waste matter is disposed of is generally determined once a development is approved, although the precise location (and height) of, for example, a new chimney stack associated with the development may be subject to planning approval. Planning authorities have some control over waste diffusion, apart from the specification of stack heights or locations. They may, for example, insist on buffer zones and/or planting to remove pollutants from the atmosphere.

Land use planning agencies have a crucial role in controlling the damage arising from the resulting pollution, since they control the nature and location of receptors. In other words, apart from protecting the environment around a proposed new source of pollution, authorities can control damage from an existing source of pollution by determining the nature of new developments close to it. This may be achieved either through the granting or withholding of land use permits (eg. refusal of housing close to an oil refinery) or by the attachment of conditions (eg. that a school building be constructed so as to be separated from a major air pollution source by its playing fields).

It must be stressed that there are two stages in the planning process, the preparation of a plan and its implementation in the form of decisions on the use of specific areas of land. While all the controls mentioned above can be exercised in the absence of an overall land use plan, the potential role of the land use planner in ameliorating air pollution is not restricted either to attempting to ensure that the best anticipatory controls are imposed when development is permitted or to preventing such development. Rather, it extends to planning the future use of land to reduce air pollution by the preparation of implementable plans. Only at this stage can some of the most powerful planning techniques be brought to bear on the air pollution problem.

One final role must be mentioned. Apart from their controls at different stages in the pollution process, land use planning agencies are in a unique position - as a focus for consultation on both plan making and land use decision-taking - to play a central co-ordinating role in the control of pollution.[32]

In general, land use planning is not a particularly sensitive method of controlling pollution because planning decisions relating to a source tend to be inflexible. Unlike the systems of control which it complements, planning does not have a continuing interest in and control over the pollution arising from a particular activity. Once a planning decision about a new source has been made, it can be altered only with the greatest difficulty, no matter what technological changes affect the pollution arising from the source over the years. Further discussion and evaluation of the role of land use planning agencies in using planning controls over air pollution are presented in Chapters 8 and 9.

Land use planning techniques for air pollution control

There are numerous techniques available to the land use planning agency for controlling air pollution from new stationary sources or for ameliorating the effects of existing air pollution on new receptors. These can be classified as:

1) controls over the detailed location and design of individual development projects;
2) controls over the intensity of use of areas of land;
3) controls over the location and spatial distribution of major urban development;
4) controls over the size of settlements (growth limitations).[33]

At first glance, it might appear that only the first type of technique is directly relevant to controlling air pollution from new stationary sources. However, if effective control of air pollution levels is to be maintained by land use planning agencies over a period of time, then numerous siting decisions, concerning both new sources and new receptors, will be involved. Consequently, it will be necessary to consider applications to develop new sources within the context of the other types of planning control available. To complete this review of planning techniques it will also be necessary to mention controls over mobile sources, since these may contribute significantly to air pollution in the area where new stationary sources are considered.

Source location and design techniques

There are several of these detailed design techniques available to the planner:

siting of industry with respect to terrain;

siting of industry with respect to sensitive receptors;

control of land uses around pollution sources;

use of buffer zones;

design and arrangement of buildings;

planning to facilitate the use of district heating;

road traffic mitigation.

The siting of new industry with respect to topography is an important technique for controlling air pollution. Exposed, windy sites will allow maximum dispersion of air pollutants to occur and most commentators suggest that such locations, especially for low-level sources, should be chosen in preference to valleys and basins where pollution is liable to be trapped by temperature inversions.[34] Chandler has summarised the position:

> Exposed hilltop and upland sites are preferable... although detailed local analyses will have to be made of the frequency, location, depth and intensity of temperature inversions in relation to the point of emission, to make sure the plumes are not brought down by eddies set up by the topography or trapped beneath an inversion. (35)

It is generally accepted that valley sites should be avoided wherever possible and that, if development of such sites is essential, very high chimneys discharging pollutants above the level of inversions are advisable.[36] If pollution sources are to be constructed in valleys, it is thought preferable to locate them on the windward slopes of hills rather than the leeward slopes as they are subject to less air pollution owing to wind-generated dispersion.[37]

The siting of industry with respect to residential uses and other sensitive receptors such as schools, hospitals, children's and old people's homes and intensively used recreational facilities, is another effective technique. Separation is especially valuable in reducing the effect of particulate pollutants since these tend to fall out in a localised manner. Similarly, high stacks for the dispersal of gaseous pollutants may be employed with less aesthetic difficulty well away from receptors than adjoining them. There are obvious advantages in siting an offending industry at the centre of a large tract of ground to minimise concentrations at the periphery but the use of less polluting types of industry to surround the principal source is also effective.[38] The location of industrial pollution sources to the leeward side of a town is only really satisfactory when considering tall chimneys emitting large quantities of pollutants at high velocity.[39] Despite the fairly common advice that such industries should be located so that the prevailing winds carry pollutants away from high concentrations of people[40] this is not always an effective policy. For lower-level emissions wind speed is of more significance than wind direction and the worst pollution levels often accompany calm conditions or very light winds from non-prevailing wind directions.[41] The location of industry to the windward side of a town or city may indeed be preferable if the prevailing winds are strong and provide adequate dispersion of pollutants.[42] The selection of industrial sites to minimise pollution concentrations should thus be a matter for detailed analysis.[43]

If an existing stationary source gives rise to pollution which cannot be effectively controlled or relocated it is possible to limit the effects of that pollution by controlling land uses around the source. Several measures are possible: ensuring that only industrial uses are permitted in the environs of the source; ensuring that only low density development of limited height is permitted in the affected area; providing planted buffers around the source in the form of open land; reducing the population of the affected area (or preventing it increasing) by various spatial remodelling or density control measures (including demolition). Particular attention can be paid at this stage to the necessity to avoid locating very sensitive receptors (schools, hospitals, etc.) close to the pollution source, although no specific distance standards are available.[44]

The use of buffer zones between industrial uses and sensitive receptors follows from the notion of separation. Such zones are usually, though not always, kept free of development and may be dedicated to recreational use. Apart from producing a distancing effect (they emit no pollutants), open spaces planted with trees, shrubs and grasses alter local climate, increasing wind speeds and reducing temperatures, thereby encouraging air circulation and thus increasing dispersion of pollutants. Vegetation also directly absorbs pollutants on its foliage, thus reducing air pollution levels directly.[45] While some exaggerated claims for the efficacy of green areas planted with trees in reducing pollution have been made,[46] there is no doubt that the average concentration of a pollutant (particularly particulates) declines with increasing proportions of planted open space.[47] For example, concentrations of particulates at the centres of parks are normally much lower than at the margins. Beneath tree canopies the air contains a relatively low proportion of the pollution found above the foliage and in surrounding built-up areas.

There is conflicting evidence on the width of such 'sanitary clearance zones' necessary to clear the air but it has been suggested that 'buffer zones between basic industries and dwelling areas should, in many instances, have a width of more than 2km'.[48] This distance seems unrealistic in most urban situations and probably assumes only rudimentary technical control. Other distances of the order of 500m have been quoted[49] but smaller, planted zones can be surprisingly effective and are quite widely advocated.[50] Tree barriers between industrial and residential areas can thus reduce air pollution considerably, a plantation 30m deep giving a high degree of dust interception and significant reductions in gaseous pollutant concentrations.

Even a single row of trees can reduce particulate concentrations perceptibly if planted on a green verge.[51] Similarly, very small areas of open space in an urban area can reduce particulate pollution levels. Coniferous trees are more effective than deciduous trees in filtering out particulate pollutants as well as being evergreen and hence effective all year round. They are, however, more easily damaged, especially by gaseous pollutants.[52] While the quantifiable advantages are not yet documented with any precision, the use of planted open spaces appears to be justified on air pollution control grounds, even if their size is very limited. (This is as true of planting in car parks as around buildings.)

The design and arrangement of buildings may have a considerable effect upon local concentrations of pollution since local temperatures and winds, the two principal determinants of atmospheric diffusion, are affected. Two aspects are involved: the effect of a new building or structure upon airflows and hence the distribution of pollution from other sources; and the effect of airflow around a building upon the pollution released by it.[53] While the intermixing of high and low buildings may elevate some sources and improve dispersion, there is a danger that emissions from low rise sources will cause high pollutant concentrations to affect the upper floors of high rise buildings. Wind tunnel experiments to test alternative arrangements have been recommended.[54]

To lower pollution concentrations, buildings should generally be sited to encourage the movement of air, and to avoid street canyons (high buildings and relatively narrow streets), the creation of enclosed courts, or 'V' shaped arrangements which trap air pollutants. Lifting buildings on stilts and incorporating breaks in long building frontages also encourages circulation. It has been suggested that verandahs, sitting areas, balconies and play areas should be sited away from pollution sources, particularly heavily trafficked streets.[55] Similarly, structures in much frequented areas of the site should be set back from major roadways, but setbacks should be varied to increase turbulence and dispersion and thus reduce concentrations.[56] The variation of building size and heights and the diversion of people from low areas on sites which trap pollutants will also ameliorate contaminant levels.[57]

Pollution from residential areas, and to some extent from commercial areas, may be reduced by the use of district heating. District heating utilises centralised fuel-burning in a limited number of large, efficient and relatively easily controlled units, rather than the use of multiple low level poorly controlled sources of pollution. The arguments for district heating on pollution grounds are less convincing if relatively clean fuels such as natural gas are burned in individual dwellings.

Air pollution from road traffic can be abated in a number of ways.[58] 'Indirect source review', the assessment of air pollution from traffic attracted to new developments, will frequently increase the utility of these measures.[59] Equally, as well as considering the air pollution directly generated by a new stationary source it may also be necessary to predict and take account of the pollution generated by vehicles travelling to and from the source when designing it. Several of the following measures for mitigation may thus be useful in reducing the overall pollution attributable to a new stationary source.

There are numerous traffic management methods available, such as improving traffic flow by synchronised traffic signals, limiting access and parking limitations to facilitate the use of higher traffic speeds (the optimum speed for abating several pollutants appears to be around 65 kph),[60] the avoidance of through traffic in residential areas[61] and the encouragement of public transportation utilisation by fare subsidies and car restraint policies. Similarly, the use of longer block lengths (intersection distances), the construction of by-passes to enable smoother traffic flows and the pedestrianisation of city-centre areas ameliorate air pollution levels by reducing emissions.

Air pollution concentrations can also be reduced by appropriate road and street design. Other things being equal, the more open and less canyon-like the roadway configuration, the lower the resultant concentrations of pollutants.[62] The leeward sides of city streets exhibit the highest pollutant concentrations as wind velocity is the most important factor in dispersion. Diffusion can sometimes be increased by orientating city streets in the direction of the prevailing wind.[63] In general, the broader and more open the roadway, the greater the turbulence and the lower are the levels of pollution. Orientation of the street with respect to the sun (which warms air masses and frequently causes them to move if they are not trapped) will also have an effect on dispersion. Elevated roadways and the horizontal separation of roads from adjoining structures are both effective in increasing dispersion and reducing concentrations.

Despite the large number of transportation control measures available, vehicle emission controls together with inspection and maintenance systems are found to be far more effective than any of the land use planning techniques, though the latter, in combination, can provide valuable reductions in concentrations (2 or 3% for ozone and perhaps 20% for carbon monoxide).[64]

Controls over the intensity of use of land

It is apparent that if a city of given population and industrial composition is spread out, allowing emissions to be dispersed in a larger volume of air, concentrations of air pollutants should be reduced in comparison with its higher density counterpart.[65] However, the relationship between pollution levels and density is complex. Higher density developments require less energy for heating, because of the 'heat-island' effect, and stimulate less automobile use. It has been claimed that the high density community can generate about 45% less emissions than the equivalent low density 'sprawl' community.[66] The effects of these emissions, however, will be felt over a small area, perhaps causing higher local concentrations than in the low density settlement.

An analysis of the role of control of density of development as a land use planning tool for air pollution control was conducted by Keyes.[67] He found that sulphur dioxide and particulate concentrations, attributable primarily to stationary sources, would be much lower (perhaps by 10 - 50%) in low density than in high density settlements, other things being equal. In the case of carbon monoxide, which is emitted mostly from mobile sources and which diminishes rapidly in concentration with distance from roads:

> ...low density, dispersed development may lead to increased emission levels (especially if employment is not decentralised to the same extent as population) but reduced exposure levels. Spreading out sources and receptors more than compensates for the increase in emissions. (68)

These findings, at least as far as they relate to particulates, have been confimed by other researchers.[69] Thus, for example, Altshuler et al reported that 'the claimed benefits of higher density development, such as... air pollution reductions, are very modest at best'.[70]

Keyes' conclusions in relation to ambient concentrations of hydrocarbons and oxides of nitrogen were that 'dispersed, low density patterns show increased concentrations in suburban areas and reduced levels in the central city, as compared with a higher density, more compact arrangement'.[71] He was unable to estimate the exposure to photo-chemical oxidants. The US Department of Housing and Urban Development, however, has suggested that the effect of density on ozone concentrations is ambiguous:

> More dispersed patterns... can reduce exposure by better utilising the atmospheric dilution capabilities. However, dispersed patterns... result in more vehicular emissions... and increased ozone levels. (72)

More localised forms of pollution (such as lead from industry) would not be expected to vary with density, but the number of people affected would obviously be greater in higher density developments.

Keyes concluded that dispersed settlements would benefit from reduced exposure to most pollutants by comparison with more concentrated cities. This was true whether existing population and stationary sources were decentralised or whether new suburban areas were added to existing cities, provided other factors (eg the total amount of manufacturing industry) were kept constant. He found that the effects of such land use controls could be equivalent to more stringent technical controls over air pollution and were thus potentially a useful supplement to them.[73] However, Berry et al concluded that, holding other variables (city size, etc) constant, both nitrogen and sulphur were 'greater problems in the dispersed city, which is consistent with greater use of the automobile'[74] and Voorhees et al found at the time of their research that 'density changes on a broad scale appear to be somewhat neutral in effect'.[75]

In general, with the exception of particulates and, possibly, of carbon monoxide, there appears to be no consensus as to whether the concentration or dispersion of land use activities leads to lower levels of the various air pollutants within cities which are similar in other respects (especially population size and industrial composition). As Hoch has stated, in discussing the relationships between pollution levels and urban characteristics: 'the limited results for density are much less convincing: this may reflect high correlations between density and population size'.[76] Controls over the intensity of use of land are obviously one way of meeting area emission standards, as they can be used to reduce the quantity of emissions for a given area of land.

Location and spatial distribution controls

The greatest impact on air pollution can obviously be made in the overall design or redesign of a town or suburb (or in redevelopment programmes) when all these control techniques are brought together. Firstly, and perhaps most importantly, the location of new towns or town extensions (new shopping centres, suburbs or other major developments) can be chosen with regard to topography and meteorology to ensure that wind directions and speeds govern air circulation patterns so as to diffuse pollution generated by the town and avoid that originating elsewhere. New development can also be separated from other sources of pollution by large areas of open space. Secondly, through careful consideration of the area's internal design, it is possible to reduce the effect of locally generated airborne wastes. This can be accomplished by the methods outlined above: better location of stationary sources, the use of internal open space and the reduction of reliance upon vehicular traffic.(77) It has been suggested that the most effective open space strategy is the use of open wedges or corridors radiating from (or penetrating towards) the centre of a metropolitan area since almost all development tends to be close to such spaces and the diffusion of pollutants is consequently enhanced.(78)

There is striking empirical evidence that urban form can have a very significant effect on air pollution levels. The results of Berry et al were based upon a comprehensive analysis of data for 76 American cities.(79) They confirmed the work of others(80) in finding that the most important determinants of atmospheric pollution were city size, scale of manufacturing industry, concentration, population density and affluence (an inverse relationship). However, they found that land use was the crucial intervening factor: correlations of air pollution levels were much stronger with the proportion of the area of a city allocated to different uses than with its population or with its total employment in manufacturing industry.

The data collected during this study were also used to analyse relationships within cities. The results were consistent with the findings for whole cities: pollution levels were strongly correlated with the same variables.[81] A study of Greater Manchester found that, among the 71 (pre-local government reorganisation) authorities, air pollution concentrations were positively correlated with population density and industrial employment density and were inversely proportional to social class.[82] Hoch also reported that 'there is strong within-city evidence that increasing levels of density are associated with increasing levels of pollution'.[83] The inverse relationship between pollution levels and social class has also been observed elsewhere.[84]

When the effects of city size and manufacturing concentration were held constant, Berry et al found that:

> 1. The core-oriented urban region with a radial transportation network and steep density gradient a) displays greater intensity of land use, a lower percentage of land developed and used for residential and commercial purposes, and more open space, and b) as a consequence of this land use mix and pattern, has superior air... quality to:
>
> 2. The dispersed urban region, which has a less focussed transport network and lower, more uniform population densities. This urban form

a) displays urban sprawl, with a higher percentage of residential and commercial land use and less open space than in the core-oriented case, and
b) as a consequence of this land use mix, has inferior air... quality. (85)

These analyses are obviously somewhat artificial in that many factors are mutually dependent (for example, density will depend on the limitations of topography to a considerable extent). Nevertheless, since it is known that air pollutant concentrations are directly proportional to population density, and to be (somewhat nebulously) related to the intensity of use of land, the effect of urban form in explaining variations in pollution levels is marked.

Growth controls

It is very difficult to classify the most important determinants of urban pollution concentrations accurately. However, there is no doubt that, apart from the effect of background air quality, the location of the settlement in relation to local topography and meteorology and to other pollution sources, the density of population, the urban form of the settlement (the mix and relative location and design of land use activities) and the size of the settlement all affect air quality.

It has been suggested that limiting the size of settlements is perhaps the most effective land use planning tool available.[86] Thus Hoch reported that 'there is generally a pronounced urban scale effect for major pollutants'[87] and that 'it seems clear that city size is generally associated with increasing levels of air pollution'.[88] The National Science Foundation confirmed that 'bigger cities... tend to have higher concentrations of air pollutants'.[89] These findings were supported by Berry et al in their comprehensive analysis of US cities: 'pollution levels increase with city size for air quality measures'.[90]

It is therefore apparent that limiting the physical size of a community, and providing for displaced growth elsewhere, should lead to an overall improvement in air quality. There does not appear to be any reliable specific advice on the optimal size of settlements though population figures of the order of 100,000 - 200,000 have been suggested.[91] It seems clear that developed settlements should be as distinct and isolated from each other as possible if air pollutant concentrations are to be minimised. Growth controls are therefore a method of reducing emissions from a given area and could be utilised to meet certain types of area emission standard.

Overall it is clear that the greatest impact on air pollution can be made by land use planning techniques when all the various methods are employed together, for which a land use plan will obviously be a necessary framework. Growth controls, for instance, presuppose the existence of a plan for an area and its implementation, rather than ad hoc decision-making in relation to a particular parcel of land. This is also true for location and spatial distribution controls since only through the formulation of an implementable plan can controls over urban form be administered. Intensity of use controls also require a plan for at least the area under consideration, if not for the whole conurbation, if they are to be applied meaningfully. Detailed design controls work most effectively if a plan exists, but can be utilised in its absence, unlike growth controls. While the location of a new stationary source can thus, if necessary, be considered in isolation from any plan for the wider area, any such decision should preferably be made only after its effects on its immediate neighbours and on more distant receptors have been taken into account.

It is possible to evaluate the effects of alternative land use plans on air pollution by a number of methods. Some of these require the quantification of land use and its conversion to pollutant emissions, the projection of emissions into the future and the use of air quality diffusion models to convert these into pollutant concentrations. It is usual to employ a combination of area sources (for example, for residential emissions), point sources (for example, for power plants) and linear sources (for major roads).[92] The state of the art, however, leaves much to be desired, relying as it does on so many assumptions and conversion factors, quite apart from the inaccuracies of the models. (These models are much more complex than the single source models mentioned above in the discussion of emission standards.) Thus, it is known that land use and employment are rather poor surrogates for predicting emissions from industrial sources.[93] It is therefore usual to calibrate models of air pollution for developed areas using historical monitored data to calculate future concentrations. This is obviously not possible where much of what is specified in a plan is still to be constructed. Other plan evaluation methods are more intuitive.

Evaluation

There is very little reliable published quantification of the reductions in concentations of different pollutants achieved, or even anticipated, as a result of employing land use planning techniques in controlling air pollution. The importance of land use controls of whatever type in ameliorating pollution problems by themselves should not be exaggerated. As Berry et al have stated of the American situation 'if environmental pollution is to be changed by changing urban form, nothing less than reversal of present urban development directions must be achieved'.(94) Nevertheless, land use planning controls can be a valuable adjunct to technical and other source controls, as Kaiser et al have stated:

> Source control alone fails to take advantage of the assimilative capacity of the atmosphere which offers a possibility for spreading out emissions over a given area, thereby diluting their impact. Strategically locating sources may be a least-cost alternative to source control and may not conflict with economic objectives as greatly as source control regulations. (95)

It has been hypothesised that the usefulness of the various techniques in reducing urban air pollution levels descends from growth controls through location controls and density controls to detailed source design controls and that the cost of administering these techniques is inversely proportional to their utility.(96) While there is little evidence to support this statement, it is conceivable that design controls over an individual source might sometimes prove expensive to implement and, in certain circumstances, could result in the marginal overall cost of control exceeding the marginal benefits. The outcome would depend on the expense of the controls required by the air pollution control agency and of the other controls imposed by the land use planning agency. In general, however, it is probably true that all four types of technique can increase the efficiency of siting decisions by reducing the need to rely on technical and other source controls.

The use of various land use planning techniques can result in lack of equity. For example, the use of a buffer zone or other area of land to protect the receptors surrounding a pollution source is perfectly fair if the land concerned is owned by the polluter, but may be manifestly unfair if it is not, since others will be deprived of the opportunity to use the land as they wish. This, of course, is a problem which also arises in the use of location and distribution techniques of control and, indeed, in the use of planning controls generally. While it can be argued that individuals should lose development rights for the benefit of the many (for example by not being able to construct a pollution source in an area zoned for another use), it is less supportable that individuals should be penalised for the benefit of another individual (the polluter). Some problems of lack of equity are also apparent in density, distribution and growth controls, since they tend to favour the existing polluter at the expense of the developer who may seek to construct a source with a much higher degree of pollution control.

There is little doubt that detailed design controls on a source can be implemented more readily than other types of technique, because of their relatively short-term nature. Thus, refusal of permission to develop is bound to be <u>effective</u> in preventing additional pollution, provided enforcement action is taken to prevent illegal construction.

In general, most of the land use planning controls requiring source location and design techniques can be built in from the outset (ie. at one time) though later events, such as alterations, may erode them. The effectiveness of pollution control techniques specified in conditions attached to a permission for a new or modified source will, however, depend on a number of factors described in Chapter 8.

If source location and design techniques can often prove effective, at least in the short-term, the same is true of intensity of development, location and spatial distribution and growth controls implemented by means of land use plans. However, by their nature, these are longer term planning techniques and they will all be subject to pressure for change in the future, as conditions alter, even if they can be implemented in the first instance. This is probably the reason so little evidence exists as to their effectiveness.

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4. ANTICIPATORY CONTROLS OVER AIR POLLUTION IN THE UNITED STATES

This chapter describes the context of, the legal and administrative arrangements for, and practice in, the anticipatory control of new stationary sources of air pollution in the United States. It is not possible to appreciate the philosophy of environmental regulation without understanding some of the factors which determine it. Thus, the sheer physical size, the climate and the government system have all influenced the approach to environmental regulation in the United States. These factors and some of the others they help to explain, such as the land ethic, the concern with profit, the concern with process, the individualist concept, the distrust of government, etc. are briefly described in the context section of the chapter. There follows a description of environmental regulation generally and a summary of the recent arguments for and against the burgeoning of environmental controls in the United States.

The next part of the chapter is concerned with air pollution. The main air pollution trends are briefly presented. There follows an outline of the legal framework for air pollution control and, in particular, for stationary source control. The provisions relating to new source performance standards, prevention of significant deterioration and nonattainment areas are explained. Practice in utilising these provisions is then discussed and the main arguments advanced in the air pollution control debate which has raged in the United States for some time are mentioned.

The final part of the chapter is concerned with land use planning control. An outline of the legal framework of land use control is presented, an attempt being made to explain the complexities of zoning and subdivision control. The land use control picture is complicated in the United States by the growth of state land use controls and by the advent of environmental impact assessment. Practice in utilising these controls is then discussed and an analysis of the role of land use planning controls in achieving air quality goals is presented.

CONTEXT

Physical characteristics

Perhaps the most obvious difference between the US and the UK is the relative size of the two countries. The United States has an area of nearly 10,000,000 square kilometres on which to house its population of over 235,000,000.[1] While this population is growing at over 1% per annum, the average population density, at 25 persons per square kilometre, is very low. In 1980, over 70% of the population of conterminous USA (the 48 states, excluding Alaska and Hawaii) lived in 318 standard Metropolitan Statistical Areas (SMSA's, areas of over 50,000 population) occupying 16% of the total land area.

Geographical differences account for the divergence of the United States from many of the social traditions of its erstwhile colonial master. As Williams puts it:

> 1. The sheer distance between the US and Europe minimized the danger of large-scale invasion by foreign powers and contributed to a certain fluidity and openness in social relations and to the development of a decentralized, nonsecretive, nonmilitary structure.
>
> 2. The existence of a frontier meant expansion, opportunity, economic growth, and social mobility.
>
> 3. A great expanse of a contigious land mass gave a loose, amorphous quality to the whole society while abundant natural resources guaranteed a certain degree of independence. (2)
> (emphasis in original)

The seemingly limitless land area led to the American myth of superabundance of land and natural resources. The legacy of the early settlers has been the pioneer mentality in which nature was seen as something to be fought, not something to work in harmony with. This 'frontier ethic', in which every individual seeks to live in his own house on his own (preferably large) piece of land, and to use that land as he chooses, is an abiding part of the American psyche. (It has now been joined by a desire to own a motor car and use that as he chooses.) Land is generally seen, therefore, as 'a commodity to be possessed, exploited and conquered'.(3) While there are indications that this ethic is slowly beginning to change,(4) it is important in explaining the fundamental reluctance of politicians to limit personal freedoms in the use of land. It also helps in comprehending the capitalist values of American society and why America has remained very much a business culture.

In turn, these private capitalist property interests, in Mumford's view, explain the characteristic American gridiron city plan:

> On strictly commercial principles, the gridiron plan answered, as no other plans did, the shifting values, the accelerated expansion, the multiplying population, required by the capitalist regime. (5)

Somewhat surprisingly, perhaps, the federal government owns about 33% of the land in the United States, much of it unproductive areas in the western states which were never claimed by settlers.(6) The states and local jurisdictions own another 6% of the land. Land ownership (rather than land use controls) has been, to a large extent, the preferred method of ensuring the 'appropriate use' of land in the US. The national parks are the outstanding example of this power to exclude unwanted land uses from areas managed in the public interest. Because much of the most scenically attractive land in the US is in public ownership, the pressure for land use controls on the remainder has been less than might otherwise have been the case. Another reason for the absence of widespread demand for effective controls is probably that much land is neither farmed nor in urban use : it is simply not utilised, even in apparently urbanised regions like the north east[7]: generally the development of such land is unlikely to provoke conflict.

The physical characteristics of the United States may help to explain the concern with means rather than ends which is so characteristic of the country. Kouwenbouen advanced the thesis that 'America is process':

> Our history is the process of motion into and out of cities; of westering and the counter-process of return; of motion up and down the social ladder - a long, complex, and sometimes terrifyingly rapid sequence of consecutive change. And it is this sequence, and the attitudes and habits and forms which it has bred, to which the term "America" really refers. (8)

This concern with process or means can be seen in the lack of emphasis in planning on fixed target populations or on the physical distinction between city and country, and in the organisational arrangements for land use control, in zoning ordinances and in the complex air pollution regulations in the USA.

The United States is cross-cut by religious, ethnic, racial and regional differences. For example, about 12% of the total US population is black and there is also a substantial Hispanic population (about 2%).[9] The various waves of immigration and regional differences mean that there are numerous interest groups which any national legislation must take into account, each having its own goals. The US is a classical pluralist or 'individualistic' (utilitarian) society,[10] in which there is little pretence at seeking common interest and where the design of environmental protection regulations must, perforce, leave little discretion to the individual.

Climate

The climate of the United States exhibits marked variations, both geographically (from the deserts of Nevada to the lakes of Maine, from the southern 'sunbelt' to the northern 'frostbelt') and seasonally (temperature ranges of well over 50°C are common). This climate exacerbates the sensitivity to change of many unique land areas in the United States. For example, many wetlands and coastal barrier islands are prone to radical disturbance and even destruction by the effects of development which might have less unacceptable consequences in other parts of the US or in Britain.[11]

A common feature of the United States climate is the propensity in many cities towards high summer temperatures and stagnant air. This, together with the bordering of many western cities by mountains that interfere with air movements, leads to the frequent formation of inversions. An upper, cooler layer of air prevents the dissipation of the rising air with its burden of pollution, which builds up until the inversion breaks down. High levels of car ownership and usage thus lead to serious photochemical smogs of the type characterised by, but by no means confined to, Los Angeles. Further, air pollutants exported from one region tend to cause damage in other regions of the USA, as well as in Canada. Acid rain is regarded as a real threat to the environment. Air pollution is seen as a serious political issue and has received a great deal of attention.

In the United States, as in Britain, widespread changes in heating patterns have taken place (including changes to wood burning with consequent smoke pollution in Oregon and other states). However, the general perception is that pollution is industry's affair, not the people's. Thus the solution to automobile exhaust pollution is seen not to be vehicle restraint but stricter initial controls, preferably without subsequent inspection and maintenance programmes. This view that pollution is caused by industry is coupled with a feeling that many pollutants are 'unsafe at any concentration' and naturally colours opinions about the siting of new sources of air pollution.

Government system

The United States has essentially three levels of government: federal, state and local. The state is the fundamental source of sovereignty in the United States. The federal government is responsible for such matters as defence and foreign policy and for overseeing the provision of services and the imposing of controls by the states. This oversight is achieved mainly by passing legislation, subsequently formulating regulations and providing funding. There are 50 states, of which 48 constitute the conterminous USA. The states each have their own legislatures, generally consisting, like the federal government, of upper and lower houses and a governor (a state from one region tend to cause damage in other regions of the USA, as well as in Canada. Acid rain is regarded as a real threat to the environment. Air pollution is seen as a serious political issue and has received a great deal of attention.

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Generally, pollution control responsibilities are shared between federal and state levels, with the states usually being responsible for implementation. Thus, each state is responsible for air pollution control, in conjunction with the regional offices of the federal Environmental Protection Agency. EPA was formed in 1970 to centralise the control of environmental problems. It is worth noting that EPA is solely concerned with environmental problems and that staff lawyers are under some pressure to bring successful prosecutions, which are used as a measure of personal prowess. Many states also undertake some form of land use control.

There are numerous local governments and special purpose authorities. Indeed, it is remarkable just how numerous these counties and municipalities are, and how little has been done to reform them. In 1982, the United States contained 3041 counties (of which 725 had populations of less than 10,000), 19,076 municipalities (of which 16,879 had fewer than 5,000 people), 16,734 townships (of which 15,715 had fewer than 5,000 people), 14,851 school districts and 28,588 other special purpose districts, making a total of over 82,290 local governments, an increase of 2,428 since 1977.(12) Each of these governments has its own officials and elected representatives. They vary in population from a handful to seven million and in size from a few city blocks to 20,000 square miles.

The regulation of land use is normally carried out by county, municipal and township governments. These local authorities are far more independent of state and federal governments than their British equivalents and they gain directly from attracting new industry because local property taxes accrue to them alone.

It is, in the circumstances, unsurprising to note that local government corruption is by no means uncommon and that land use and building regulation is second only to the letting of contracts in the number of reported instances. Some 83 incidents of corruption in land use regulation were reported in the newspapers between 1970 and 1976.[13]

There has long been recognition of the rapid growth of the metropolitan areas and the increasing spread of population across existing jurisdiction boundaries, with a polarisation between the working classes (frequently coloured) remaining in the central city and the middle classes living in suburbia. There have similarly been many attempts to reform local government, most of which have failed because the political advantages of the status quo are too attractive to the constituencies. There have been some notable exceptions: New York City in the early years of the 20th Century and the Greater Miami Metropolitan Area in 1957 - though this latter is still a relatively weak coalition.[14] There appear to be three main reasons why the bewildering complexity of metropolitan government remains:

> These are (1) the underlying cultural norms of Americans concerning local government, (2) the resulting legal-constitutional structures, and (3) the political-governmental system built upon them. ...Based upon a deep distrust of governmental

> officials and a faith in the competence of the ordinary voter, they also lead to such corollaries as "that government is best which governs least" (and more important <u>costs</u> least). (15)

Recently, the Reagan administration has handed more responsibilities back to the local governments by increased use of block grants, while not increasing their budgets, causing problems of cuts or revenue raising in many areas.[16]

Because of the difficulties of re-organising local government, a quasi-regional level of government sprung up. This is known as the council of governments or the regional planning commission, and its principal purpose was to try to overcome the inefficiencies of local governments, which:

> Suffer from multiple, overlapping jurisdictions, bureaucratic proliferation, and wasteful duplication of local-regional-state-federal agencies, each presumably designed to resolve the same problem but competing for increasingly hard-to-get public funds. (17)

There are now councils of governments for almost every one of the SMSA's, their activities largely being funded by federal agencies such as the Department of Housing and Urban Development and the Department of Transportation. They are normally charged with the preparation of advisory land use plans and were nominated as 'clearing houses' by the federal Office of Management and Budget to receive and disseminate information about proposed projects. These bodies have traditionally carried out federal mandates under water quality, urban development, transportation and other legislation. The councils provide a mechanism for the urban areas to by-pass the largely rural-dominated state legislations and obtain federal finance. However recent actions by the Reagan administration have cut the budgets of the councils and both their functions and their staff have been severely pruned. Some are realigning themselves with state governments while others are seeking and finding greater local support to replace federal funds. Others, however, are disappearing. It appears that the hopes for councils of governments as a means of improving urban governance(18) were over-optimistic.

In their analysis of land use in the Washington-Baltimore area, Ackerman et al noted that:

> If land-use development in a metropolitan region is seen as an activity in which multi-purpose planning is unavoidable and action in one jurisdiction or geographical area effects others, then the present system must be regarded as seriously faulty. The problem then becomes one of determining the metropolitan equivalent of institutions that have been able to produce outstanding results in river basin planning and water development. (19)

The Washington Council of Governments (which includes over 100 local governments and is widely regarded as one of the more effective in the USA) was not seen by Ackerman et al as fulfilling metropolitan requirements, even in its prime. The plans of regional councils of governments have seldom had any influence.

Another attempt to overcome conflicts between federally assisted projects and the plans and activities of states, regions and localities was the A-95 project review system established by the federal Office of Management and Budget. Essentially, state clearinghouse agencies (often councils of government) reviewed federal assistance to development projects. Though the A-95 system was abolished by the Reagan administration, many states found the lines of communication established between the different levels of govenrment and the fostering of co-ordintion valuable and have retained their clearinghouses.

Hagman has advocated a through-going reorganisation of American local government, involving much larger counties and constituent cities of a size up to 250,000 persons. He believed that 'massive reorganisation of local governments is the priority land use planning need in America'.(20) While not agreeing that the British reorganisation of 1974 achieved all the objectives he put forward, he did regard it as a model of what could be done, given the will.

In the United States, big government has been viewed with just as much suspicion as big business and big unions and the modification of urban electoral procedures through nonpartisan ballots, referenda and recall procedures have been seen as the way to revive individualism, by giving every man an equal chance to govern.(21) This suspicion has led to the creation of the freedom of information provisions in the United States, together with formal rights of objection and appeal against many government decisions. This extends considerably beyond the right to be elected or nominated to government bodies and includes rights of speaking at hearings into, and third party appeals against, air pollution control and land use planning decisions.(22) While some participation may be little more than a meaningless formality, it can provide a valuable check on official abuses.

The United States not only has numerous government agencies, it also has, because of the desire to codify and the separate state legal systems, numerous laws and, as a consequence, a multitude of lawyers. It is reputed to have more lawyers per 1000 inhabitants than any other country in the world and is remarkably litigious.

The traditional concern of each individual to participate in his own government, together with the sheer size of the United States, and the capitalist culture, probably help to explain the large number of local papers, local radio stations and local television stations across the country. These are frequently much more confined in their geographic coverage and more numerous than in the United Kingdom. They consequently tend to give far greater attention to, and to be more likely to take positions on, local environmental controversies than their British equivalents.

There is one further relevant consideration in explaining the high level of concern about environmental affairs in the United States. The income tax system encourages many higher income earners to donate money to charitable organisations like the Sierra Club. This, together with a career structure which encourages participation by the able (at least for a period) in environmental issues, ensures that pressure groups can often mount thorough, well-researched and well-argued opposition to a wide range of new pollution sources.

Environmental regulation

As a result of its national characteristics the United States has developed a centralised regulatory system of environmental standards based on specific criteria (eg. health impacts) with explicit administrative procedures. This heavy reliance on formal rules and procedures has the advantage of being visible and being subject to public participation but frequently entails excessive legal confrontation and is cumbersome.

There has been an explosion of environmental regulation in the United States since the 1960's.(23) New regulations and regulatory agencies have been added to old ones at federal, state and local level. Noble et al stated in 1977 that there were some 137 federal programmes having a direct impact on land use, including the Clean Air Act.(24) States have acquired regulatory powers over numerous types of land use (eg power plants) and have set their own environmental standards (eg air quality levels). Thousands of local governments have established control programmes to achieve goals such as environmental protection and growth management.

This process has been mainly one of addition rather than substitution and developers have had to adjust to the task of reconciling the satisfaction of not only multiple objectives, but of conflicting institutions (since these agencies are each independently capable of vetoing development proposals). Not only have regulations changed rapidly in recent years and the staff of the various agencies administering them has also been subject to very high turnover. As a result of public involvement in many of the processes, there have been many thousands of environmental law suits. The transaction costs of winning a permit to develop have obviously escalated.(25)

Environmental policy has been criticised from two directions: environmentalists accuse it of being ineffective, while industrialists, and others concerned with the costs of regulation, attack it for being inefficient. Indeed, a fierce and controversial debate about environmental regulation has been waged in the United States.

General arguments have been advanced that environmental regulation: is not cost effective; is based on inadequate scientific evidence;[26] is complex and cumbersome; is restricting initiative in reducing pollution;[27] is forcing industry to flee abroad; is preventing industrial growth; is absorbing too high a proportion of America's resources; and is too time consuming. As one recent EPA report put it, citing the 715 permit requirements for the SOHIO pipeline from southern California to Texas which was ultimately abandoned:

> The complex of environmental laws that exists today was formed incrementally over time: each new law was passed to address a specific single purpose or need, and subsequent laws were passed to fill in gaps left uncovered by the old. Moreover, organisationally separate agencies and programs also developed incrementally at the local, state and federal levels. As a result of this history, these agencies frequently have overlapping, duplicative, or contradictory regulatory authority as well as inadequate communication networks. (28)

There is clearly a regulatory problem in the United States. A general consensus exists that the environmental protection process is cumbersome and time consuming and that some regulations, especially local rules, are not cost-effective.[29] There has been an increasing willingness on the part of EPA to utilise measures which give business the opportunity to decide how to achieve reductions in pollution itself, so long as amelioration is achieved. It is encouraging industry to follow the 'command, counterproposal and control' regulatory path, rather than the traditional 'command and control' route.[30] It is thus going some way towards meeting the suggestions of economists for greater flexibility and for the use of taxes on residuals in controlling pollution.[31] It has also encouraged the streamlining of the state regulatory process.[32]

There is a distinct lack of trustworthy evidence on the actual locational effects of environmental regulation on industry. However, Duerkson's major study of the topic, utilising interviews, case studies, reviews of the literature, workshops and seminars, found little to support many of the assertions:

> The right to pollute is not an important locational determinant. No evidence of migration of industry from one state to another in search of 'pollution havens' was unearthed.
>
> A significant number of industrial facilities have been built relatively quickly over the past decade with few or no serious environmental problems. These success stories are often overlooked in the clamor over celebrated siting battles.
>
> A good deal of the regulatory delay of the 1970's can be attributed to 'teething pains' that are likely to be eased as the players in the siting game learn the new rules. (33)

He found no evidence that environmental regulations were causing a flight of industry abroad or that other countries were better at reconciling environmental regulations with industrial development.

Leonard has confirmed these findings:

> Relaxation of regulatory standards, by reducing incentives for technological progress and manufacturing process changes, would not have the desired effect of restoring the long-term competitiveness of US industries experiencing pressures for industrial flight. (34)

Storper et al came to much the same conclusion: because of local eagerness to attract new growth, 'industrial corporations ordinarily make their siting decisions on economic grounds and deal with regulation as a secondary considerion'.[35]

Stafford, following a series of in-depth interviews with industrialists responsible for recently completed new developments, reached broadly similar conclusions:

> For the majority of [locational] decisions investigated, environmental regulations did not rank among the leading location factors.
>
> Environmental regulations have had no systematic effects on either the size of the search area or on the number of sites seriously considered. Nor have they systematically influenced the sizes of facilities built or altered decisions to expand existing plants versus building new plants. The study does not support the contention that environmental regulations will lead to major shifts in the location of industry within the United States. (36)

It would thus appear that many of the accusations levelled against environmental regulations have been inaccurate or exaggerated.

Healy observed that environmental blockage of greenfield plants may have had the salutary effect of channelling investments toward modernisation or expansion at already industrialised sites. He further stated that for several 'pollution intensive sectors' new investment will probably result in net environmental gains and suggested the possibility of a less adversarial relationship in the future between environmentalists and industrial developers.[37]

Although the Reagan administration has made strenuous attempts to reduce environmental regulation, these have proved markedly unsuccessful and, indeed, the power of environmental lobbies has increased rather than decreased.[38] However, there appears to have been a marked decline in the standard of enforcement of regulations, largely as a consequence of the budget cuts, which have affected federal, state and local environmental control agencies.[39]

AIR POLLUTION CONTROL

Trends

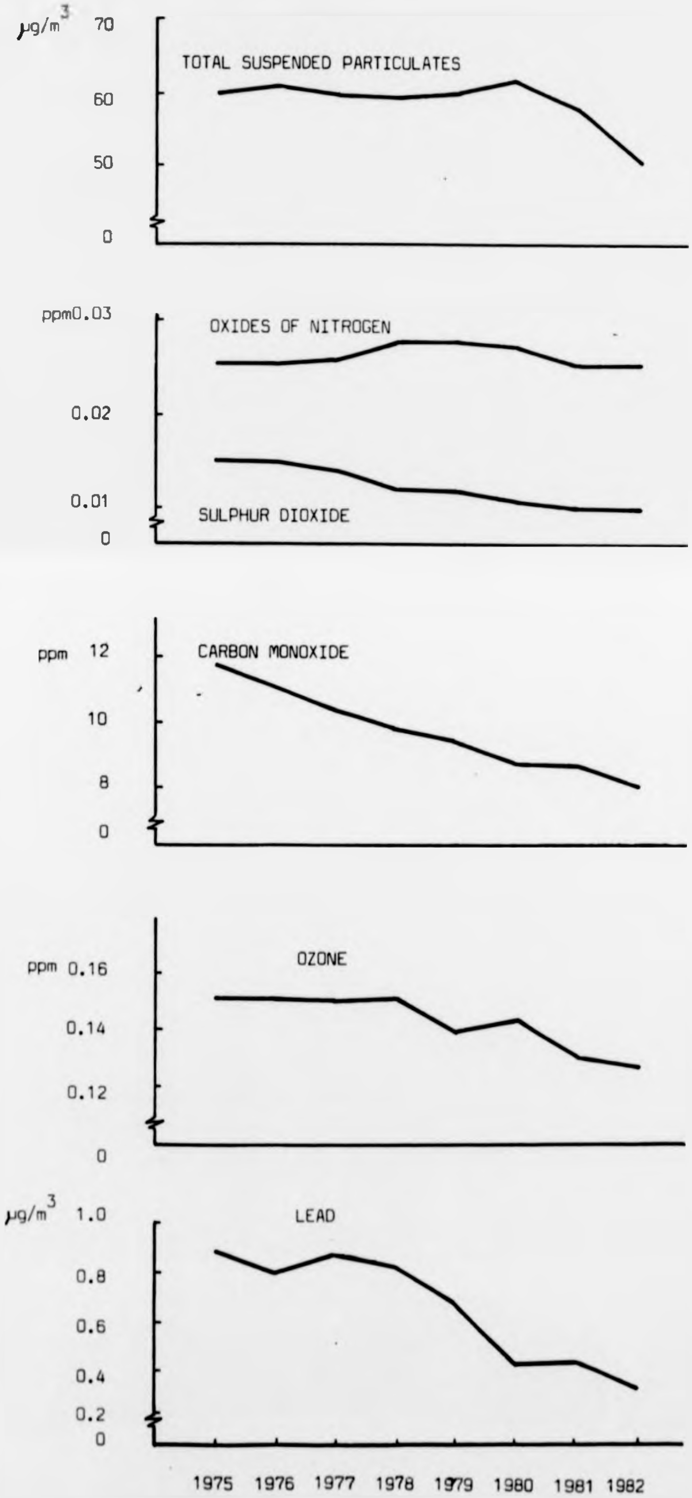
The United States has experienced a significant improvement in air quality since 1970:

> Air quality has been improving. The number of air pollution alerts has been reduced. The large amounts of chemical pollutants coming from industry have been reduced, and emissions from the worst offenders have been markedly curtailed.
>
> But much remains to be done in cities and elsewhere. There is growing evidence that wilderness, parks, and other pristine areas may be threatened by air pollution. (40)

Figure 4.1 shows the ambient pollution trends over the last few years.[41] While emissions of carbon monoxide generally remained fairly constant, concentrations fell by 35% between 1972 and 1977. Ozone concentrations increased outside California during that period but decreased there as a result of specific state controls. However, the number of days during which the ozone air quality standard was exceeded declined in most areas, in some cases quite substantially.[42]

An increase of 18% in emissions of oxides of nitrogen between 1970 and 1977 was matched by an increase in concentrations. Emissions of hydrocarbons, the other precursor of photochemical oxidants, fell only slightly between 1970 and 1977. On the other hand, an 8% fall in emissions of sulphur dioxide during that period was more than matched by a 16% fall in the national ambient sulphur dioxide level between 1972 and 1977. The most marked fall in emissions, a 40% drop in total suspended particulates during 1970-1977, however, resulted in only an 8% fall in concentrations between 1972 and 1977. This was probably

FIGURE 4.1 US AIR QUALITY TRENDS 1975 - 82



Source: reference 41

due to the prevalence of fugitive emissions (not emitted through stacks) and windblown dust, rather than stack emissions, in total arisings. Lead concentrations fell between 1970 and 1974, before the use of lead-free gasoline became widespread,[43] since when they have fallen further.

These falls in ambient concentrations were reflected by a significant fall in the Pollution Standards Index. This index is determined by the particular pollutant having the highest concentration relative to its primary air quality standard (below). From 1974 to 1980, the average number of days of elevated risks (alerts) declined by 39%, from 97 to 59, in the 23 most populous cities in he United States.[44]

Much of this improvement can be attributed to the Clean Air Act 1970. As the National Commission on Air Quality has stated:

> It is impossible to determine precisely the extent of additional air pollution that would exist if Congress had not enacted the Act, but it is certain that the quality of the country's air would be far worse now than it was in 1970, rather than substantially better. (45)

Legal framework

The United States has suffered from many air pollution problems, including the notorious incident at Donora, Pennsylvania, in 1948 when a large number of people were taken ill and several excess deaths were recorded, but none appear to have provoked a direct legislative response of the type observed in Britain. The continuing automobile exhaust-derived smogs of Los Angeles have a world-wide reputation.

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Concern about air pollution has a lengthy history: several cities enacted their own air pollution control legislation in the 19th century and 23 of the 28 largest cities had passed such laws by 1912.(46) The first federal legislation was passed in 1955, and the Clean Air Act appeared on the statute book in 1963. This act only assigned the function of identifying harmful pollutants to the federal government, leaving action to the states, but the 1967 Air Quality Act authorised the federal government to develop standards and implementation plans for states that failed to adopt these. The results of this act were disappointing, mainly due to the fact that the major responsibility for implementation had been left with the states with little federal coercion. The 1970 Clean Air Act, passed in the heady days of peak environmental concern, was much stronger and laid the main burden for federal oversight on the newly created Environmental Protection Agency.

EPA was required to develop and promulgate national ambient air quality standards for various pollutants (based upon health effects) to protect the most sensitive segments of the population. The country was divided into about 250 air quality control regions and the states had to prepare 'state implementation plans' to meet the air quality standards in these regions by a set date. EPA had the power to take over this task if the states failed to respond and to impose sanctions where necessary. The Act specifically provided for citizen enforcement through the courts. Crucially, the standard setting process was not to be delayed or watered down by cost or other non-health considerations.

The Clean Air Act of 1977, while not departing significantly from the 1970 provisions, reflected the new concerns about the cost of regulation and the energy crisis. This act attempted to replace the health-only rule of 1970 with one which balanced economic factors with the need to protect public health and welfare.[47] It was about to be reauthorised, at the time of writing, and further changes can be anticipated. The 1977 Act provides a comprehensive statutory framework, dealing as it does with pollution from motor vehicles (requiring certain emission standards to be met on new cars and to be sustained through an inspection and maintenance programme), with transportation control plans, with hazardous pollutants, with visibility protection,[48] and with the preparation of state implementation plans. It also, of course, contains provisions relating to emissions from existing sources of air pollution, as well as from new or modified stationary sources of air pollution.[49]

EPA has set and subsequently somewhat modified national air quality standards for six pollutants, and designated several hazardous pollutants, in order to protect human health and welfare. Sulphur dioxide and total suspended particulates originate mainly from stationary sources and carbon monoxide, ozone, nitrogen dioxide and lead mainly from motor vehicles. The standards for these criteria pollutants are summarised in Table 4.1.[50] The primary air quality standards are based on human health effects and the secondary standards on damage to public welfare, vegetation, property, scenic value, etc. The dates set for the attainment of both sets of standards have been moved progressively further into the future.

TABLE 4.1 US NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Standards	
	Primary	Secondary
Carbon monoxide (CO)	8 hour: 10 mg/m^3 (9 ppm) 1 hour: 40 mg/m^3 (35 ppm)	8 hour: 10 mg/m^3 (9 ppm) 1 hour: 40 mg/m^3 (35 ppm)
Photochemical oxidants (O_x)	1 hour 240 μg/m^3 (0.12 ppm)	1 hour 240 μg/m^3 (0.12 ppm)
Sulphur dioxide (SO_2)	Annual (arithmetic mean) 80 μg/m^3 (0.03 ppm) 24 hour: 365 μg/m^3 (0.14 ppm)	3 hour: 1300 μg/m^3 (0.5 ppm)
Total suspended particulates (TSP)	Annual (geometric mean) 75 μg/m^3 24 hour: 260 μg/m^3	Annual (geometric mean) 60 μg/m^3 24 hour: 150 μg/m^3
Nitrogen dioxide (NO_2)	Annual (arithmetic mean) 100 μg/m^3 (0.05 ppm)	Annual (arithmetic mean) 100 μg/m^3 (0.05 ppm)
Lead	3 months: 1.5 μg/m^3	3 months: 1.5 μg/m^3

Stationary source control

To say that the United States provisions relating to the control of air pollution from stationary sources are arcane would be too generous. They are so labyrinthine that it has been claimed that no one understands fully both the Clean Air Act and the various regulations promulgated to implement it.(51) The following summaries provide brief explanations of the new source performance standards (NSPS), prevention of significant deterioration (PSD) and offset requirements of the new source review programme.(52) Any given source may be subject to all three types of regulation.

Most of these requirements have to be written into the state implementation plans, which may also contain additional new stationary source control requirements. Each state has promulgated plans which contain procedures for reducing pollution from existing stationary sources by requiring the use of reasonably available control technology (RACT) and/or 'bubble' provisions. In this latter approach the whole of a plant, factory or complex may be considered to be a 'pollution source' rather than the individual sources of emissions within the whole, leaving the operator free to choose how best to implement controls.(53) These need not be of a purely technical nature but might, for example, involve process changes (Chapter 3). State implementation plans, most of which have been repeatedly revised, may contain air quality standards which are more (but not less) stringent than those required by the federal government.

Any new or modified source will be subject to the requirements of the state implementation plan. This normally specifies both limitations on allowable emissions and procedural requirements for preconstruction review. Thus nearly all new pollution sources require prior review before operation can commence. This is true even for changes of use of existing buildings or for changes of ownership of a continuing operation. Construction and operation permits are usually required, the latter being renewable periodically. The decisions made by the relevant air pollution control agency are generally open to public participation, sometimes in the form of a hearing. The anticipatory arrangements for control in the United States are thus comprehensive, virtually every new or modified source being subjected to a preconstruction review of some type.

New source performance standards

Quite apart from any individual requirements in the various state implementation plans, EPA is required to set national new source performance standards (NSPS) for individual industrial categories. These require new plants to utilise the best system of emission reduction that the agency determines has been adequately demonstrated. If an NSPS has been issued, or proposed, for a particular type of plant, EPA regulations impose requirements that the owner must give advance notification to the state before beginning construction, with further notification due before actual start-up.(54) There is no minimum source size limitation on the relevant requirements.

New source performance standards have been promulgated for pollutants emitted by 18 types of industrial facilities (including incinerators, cement plants, petroleum refineries, iron and steel mills, etc.). These are effectively national standards for all new stationary sources in these classes, reflecting the degree of emission limitation and percentage reduction in emissions achievable taking into account control costs, the health and environmental consequences of emissions reductions and energy requirements.(55)

Prevention of significant deterioration

The prevention of significant deterioration (PSD) programme applies to areas of the country which are already clean enough to meet the ambient air quality standards. The provisions were included in the 1977 Clean Air Act to prevent a possible flight by industry from the polluted areas to areas where little or no previous development had occurred, with a risk of downgrading the pristine air of such areas. There is an area classification scheme, in which most national parks, national monuments and national wilderness areas are designated as Class I, the rest of the country (including the industrial regions) is designated Class II (areas of moderate growth) with complicated and onerous requirements should states wish to reclassify areas as Class III (areas of major industrialisation) or, for that matter, as Class I.(56) To date there have been only one or two reclassifications from Class II to Class I, but there are still no Class III areas.

The Clean Air Act 1977 established 'increments', the numerical definition of the amount of additional pollution which may be allowed through the combined effects of all new growth in a particular locality. These are shown in Table 4.2 and are specified both for short and long time periods for the two stationary source pollutants: sulphur dioxide and particulates.(57) The effect of the increments is

TABLE 4.2 PSD INCREMENTS FOR AIR QUALITY CLASSES

Pollutant		Maximum allowable increase ($\mu g/m^3$)		
		Class I	Class II	Class III
Particulate matter	Annual geometric mean 24-hour maximum	5 10	19 37	37 75
Sulphur dioxide	Annual geometric mean 24-hour maximum 3-hour maximum	2 5 25	20 91 512	40 182 700

NOTE: For specified non-annual periods (eg. 24-hour, 3-hour) the allowable increment may be exceeded during only one such period per year at any receptor site.

to create a whole set of de facto air quality standards varying throughout the country, since the same increments added to varying background levels (fixed in or after 1977) yield varying limits, though none may exceed the national ambient air quality standards.

Because the available increments might be utilised by the first firms moving into an area, EPA specified that each major new plant must install the best available control technology (BACT) to limit its emissions of those pollutants exceeding certain annual tonnages (below). The statute specifies that energy, environmental and economic impacts and other costs must be taken into account in specifying BACT, which must be determined on a case by case basis. (It is thus not dissimilar from the British 'best practicable means' for an individual works.) The BACT requirement is at least as stringent as an applicable NSPS.

To implement these controls, EPA imposed a requirement that each new source should undergo a preconstruction review. It prohibited a company from commencing construction until this review had been completed and demanded that, as part of the review procedures, public notice should be given and an opportunity provided for a public hearing on any disputed questions of fact.

Twenty-eight industrial categories of plant are required to meet the PSD requirements if potential emissions (ie the maximum capacity of a source to emit pollutants under its actual physical and operational design, which includes any air pollution control equipment) of any regulated pollutant (ie the pollutants for which air quality standards apply or the hazardous pollutants) exceed 100 tons per year. The plants specified include large municipal incinerators, petroleum refineries and the other types of source included in the NSPS listing, together with other operations such as chemical process plants. In addition, a new plant in any other category is also covered if its potential emissions of any regulated pollutant would exceed 250 tons per year.

If a new source is to be subject to the PSD requirements, the preconstruction review includes:

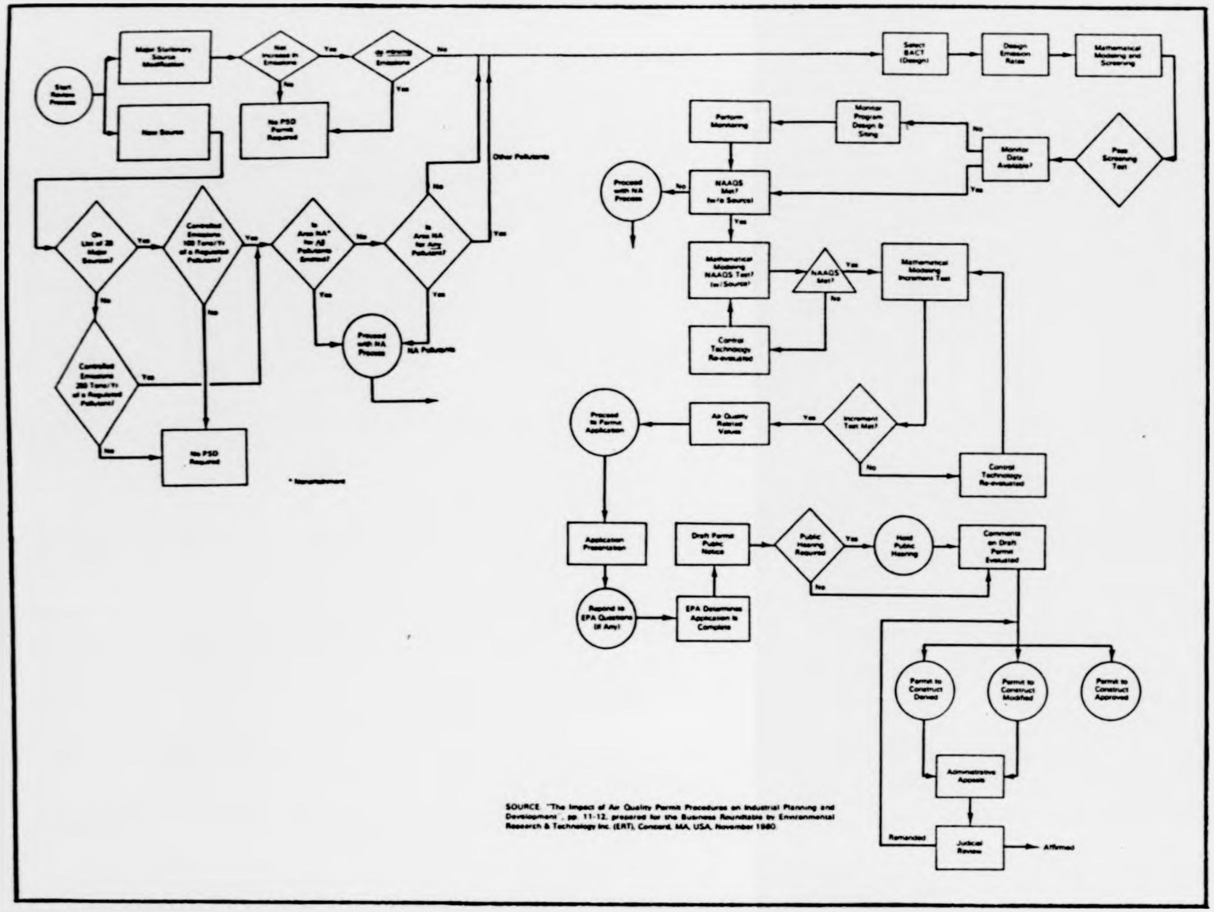
1. a case-by-case determination of the controls required by BACT;
2. an ambient impact analysis to determine whether the source might violate applicable increments of air quality standards;
3. an assessment of effects on visibility, soils and vegetation;
4. submission of monitoring data;
5. analysis of air quality impacts projected as a result of growth associated with the new facility;
6. full public review.

It should be noted that the impact analysis is based upon a modelling procedure using assumed ambient baseline concentrations (because certain sources such as construction activities are not taken into account in the calculations but new sources about to come on-line are included) rather than actual measurements of current air quality. The models endorsed by EPA tend to be conservative,ie they overestimate the effect of a new source on the increments. It is up to the air pollution control agency to keep track of changes in emissions (eg from minor stationary sources and road traffic) and the consumption of the increments.[58]

Modifications to major existing plants require a PSD permit if the net emissions increase due to the modifications will exceed the values on a 'de minimis' emissions list (100 tons per year of carbon monoxide, 40 tons per year of oxides of nitrogen and sulphur, and of volatile organic compounds, and 25 tons per year of particulate matter). A modification to an existing minor source would not require a PSD permit unless the proposed addition would be major in itself. If the predicted expected ambient impact at locations outside the plant property of increases in emissions from modified sources are lower than the values on another de minimis list, this time of significant air quality limits (for example, 24 hour levels for particulates and sulphur dioxide are 10 and 13 $\mu g/m^3$ respectively), an exemption may be granted from the requirement to obtain the preconstruction monitoring data which normally has to be provided.

The elements of this procedure are set out in Figure 4.2.[59] It perhaps needs to be added that there are intense disputes not only over the types of models to be employed,[60] but over the air quality standards themselves. The determination of BACT, too, is fraught with difficulties relating to the definition of just what is reasonably practicable.

FIGURE 4.2 THE PSD REVIEW PROCESS



SOURCE: "The Impact of Air Quality Permit Procedures on Industrial Planning and Development", pp. 11-12, prepared for the Business Roundtable by Environmental Research & Technology Inc. (ERT), Concord, MA, USA, November 1980.

The PSD programme is intended to be carried out by the state through the mandated state implementation plans but many states have neither approved plans nor delegated authority to administer all the federal regulations. PSD regulation is therefore frequently undertaken, in whole or in part, by the ten regional offices of EPA. This duality of control merely confuses what is already a complex and onerous permitting process, as Figure 4.2 amply demonstrates.

Nonattainment

If the PSD provisions set the requirements for new projects in 'clean' air areas, the 'nonattainment' provisions of the Clean Air Act apply to the 'dirty' air areas which have failed to attain compliance with the ambient air quality standards. Where they apply, and they apply in most of the industrialised parts of the country, the nonattainment provisions are even more restrictive than the requirements under PSD.(61) They are that:

1. The new source must be equipped with pollution controls to ensure the lowest achievable emission rate (LAER), which in no case can be less stringent than any applicable new source performance standard;
2. All existing sources owned by an applicant in the same region must be in compliance with applicable implementation plan requirements or under an approved schedule or an enforcement order to achieve such compliance;
3. The applicant must come up with sufficient 'offsets' - reductions in emissions from other existing sources- to more than make up for the emissions to be generated by

the new source (after application of LAER); and

4. The emission offsets must provide a 'positive net air quality benefit in the affected area'.(62)

The LAER requirement demands individual determinations as to what emission control technology can achieve in each case. This is a complex and uncertain process, usually relying on the determination of the most stringent technology in commercial operation for at least a year. LAER is a technology-forcing standard, since energy use and costs are not supposed to be considered in specifying it. As well as never being less stringent than the relevant new source performance standard, LAER can never be less stringent than the best available control technology requirement.

The offset provision is novel. Liroff has explained its purpose clearly:

> The trading of pollution offsets allows industries to site or expand in areas currently violating national ambient air quality standards established by the Clean Air Act. The industries must compensate for the new pollution they will add to an area by either cleaning up emissions from existing polluters (including their own operations) or by buying and shutting down existing polluters, so that the emissions eliminated are greater in quantity than the new emissions added. In other words, the new pollution added is 'offset' by the old pollution eliminated. The offset policy allows industrial development while permitting continued progress toward achievement of national standards for ambient air quality. (63)

Offsets must represent emission reductions, from the developer's own plants or from other plants, which would otherwise not be required and they must be greater than one-for-one. There is a great deal of discretion in the way in which an agency carries out its offset accountancy, but the offsets must be legally enforceable. The net air benefit requirement has generally been taken to mean that there would be no serious detriment anywhere due to the new source. This frequently involves modelling the anticipated concentrations, utilising data on existing concentrations and on other emissions in the area, in a similar way to PSD simulations.

Nonattainment provisions apply to new and modified facilities which have the potential to emit 100 tons per year of particulates, sulphur dioxide, nitrogen oxides, carbon monoxide or volatile organic compounds. LAER, offsets and related conditions do not apply to smaller plants. However, if certain equipment in an existing plant is replaced, the new equipment may be subject to the nonattainment requirements (including the obligation to install LAER) even though there is a net reduction in total emissions from the overall plant. The same emission limits apply to modifications as to new plants. There are provisions for banking offsets on both a formal or informal basis, and a limited number of banks has been set up.(64)

Practice

The public in the United States has persistently supported controls on environmental pollution generally, and on air pollution in particular, despite general support for reducing regulatory burdens on industry. A 1982 survey, confirming earlier results, found: '55 per cent of those interviewed favour maintaining present air pollution standards "even if some factories close as a result"'.(65) There has been continuing debate over the degree of environmental regulation to which business should be subject, with industrial interests (though frequently sympathetic to the basic tenets of environmental protection) arguing for deregulation and environmentalists arguing for further regulation.(66) The Clean Air Act has been at the centre of these arguments.

Although EPA has numerous supervisory or oversight responsibilities, the Clean Air Act is basically administered by the states, some of which delegate some powers to certain regions or to counties and municipalities. The states, rather than the more local agencies, are usually responsible for stationary source controls. There has, however, been much dispute about the relative federal and state roles. Many states have felt that there is too much duplication of effort between the EPA regional offices and the state air pollution control agencies and even that federal pre-emption of state perogatives has sometimes occurred. States have demanded a clearer definition of roles, especially as they have been asked to do more on lower federal budgets. National EPA programme management grants vary from 20% of the overall air pollution control budget in the smaller states to 60% in the larger states.

The necessary air pollution control legislation to implement the Clean Air Act has now been passed in every state but progress on state implementation plans varies. The precise administrative arrangements for air pollution control differ. Some states use health departments, some have created 'little EPA's', and many have so-called 'super agencies' (very large departments having a wide range of responsibilities). Citizen involvement also varies between states.[67] In general, the air pollution agencies tend to be somewhat remote from public control, though not so remote as the British Industrial Air Pollution Inspectorate.

Apart from their PSD responsibilities, the regional offices of EPA have sometimes taken their oversight functions over the agencies charged with the administration of the Clean Air Act very seriously and caused widespread resentment at the lower tiers of government by insisting on audits and time-consuming reviews of new regulations.[68] However, EPA regional offices have frequently failed to go beyond the minimum requirements for BACT when acting for the states on PSD permits, rather than considering the full range of energy consumption, environmental and economic impacts specified in the regulations.[69]

Various estimates of the cost of implementing the Clean Air Act have been made. Apart from the Bureau of the Census's figure of $20,017M for 1979, mentioned in Chapter 3, the Commission on Air Quality has also made estimates of the costs of control. The total cost of capital expenditure in 1978 was put within the range of $1800-7500M with operation and maintenance costs being rather more.[70] Recent figures published by the Council on Environmental Quality indicate total spending on air pollution abatement and control in 1981 was $29,494M, of which $28,142M was on pollution control, $334M was on regulation and monitoring and $1018M was on research and development. Business expenditure on pollution control was $18,630M and personal consumption costs were $9011M.[71]

No estimates of the total number of people involved in air pollution control appear to exist. However, it is known to be very large. The manpower involved was of the order of 1350 in the Environmental Protection Agency, 9000 in state agencies and 3300 in local government agencies in the early 1980's.[72] This, of course, excludes those employed in air pollution control within the private sector. Fines levied by air pollution control agencies can be very substantial. It is not uncommon to find states levying a total income from fines of over a million dollars per annum, with individual fines sometimes extending to hundreds of thousands of dollars.

The air pollution control debate

Many of the general arguments relating to environmental regulation in the United States discussed earlier apply to the siting provisions of the Clean Air Act. In particular, the national ambient air quality standards, the new source performance standards, the nonattainment area offset requirements and the prevention of significant deterioration requirements have all attracted criticism. Much of this has been directed at the PSD programme, and particularly at the dual federal-state permitting procedures that apply in many states carrying out NSPS and nonattainment analyses, and perhaps part of the PSD programme, with EPA issuing the PSD permit.

The National Commission on Air Quality was set up to report to Congress on several questions relating to air pollution control. It spent almost $9M and 30 months deliberating and funding research and found that many state and local air pollution agencies appeared ill-equipped to accept substantial additional responsibilities without further financial resources and personnel. It reported that these agencies were not demanding LAER because of inadequate resources and information exchange, that offsets (at least 'paper' offsets) have generally been available and that companies were reluctant to 'bank' emissions reductions because they wished to retain them for their own possible future expansion.

In relation to industrial expansion, the Commission stated:

> The nonattainment and prevention of significant deterioration programs have allowed, and are projected to allow, the location of most new or modified facilities. Commission studies also indicate that new plant sitings and industrial expansion in the areas studied have not been significantly affected by the cost of air pollution requirements in the past. (73)

It found that only two PSD permits had been denied (both of which were eventually approved) but that the PSD permit procedure was too complex. Nevertheless:

> Factors other than the PSD program - such as the location of raw materials, demand for the product, and costs other than those associated with meeting air pollution control requirements - are the principal factors in industry decisions on the locations of new facilities.(74)

This accords with the findings of the various researchers reported earlier.[75]

The Commission believed that the effect of the Clean Air Act's requirements on national economic indicators had not been significant, and was not expected to be significant. It was reluctant to make direct comparisons between the costs and benefits of control, because there was no sound basis for comparison. On its own ranges of figures, however, it is apparent that both costs and benefits are very substantial and that net benefits may run into billions of dollars annually.[76]

The Commission recommended that public participation be further provided for and encouraged. It suggested that LAER be eliminated and replaced by BACT, that sources emitting less than 500 tons of a pollutant per year should be subject only to the relevant NSPS and that fees should be payable in nonattainment areas instead of offsets having to be provided. On PSD, it recommended that Class III be abolished, that an increase in de minimis emission levels be made, that monitoring requirements be weakened, that NSPS, rather than BACT, apply to sources emitting less than 500 tons per year and that time schedules for permit decisions be imposed. All in all, the Commissioners (who were by no means all in agreement with each of the recommendations) favoured the retention of the basic provisions of the Clean Air Act, but with some simplification and relaxation.[77]

The views of the regulators, of industrialists and of environmentalists were aired at great length before the Senate Committee on Environment and Public Works.[78] Almost uniformly, the industrial interests argued for the streamlining of the permitting process, and especially for reform of the PSD procedure.[79] The environmental groups pleaded for the retention of all the substantive provisions of the Clean Air Act, while accepting that some simplification was necessary.[80] Previous administrators of EPA, as well as the current acting administrator, testified that the act was basically sound but required simplification.[81] This was the position taken by the state and local air pollution controllers also. They wanted the replacement of LAER by BACT and the elimination of increments in Class II and Class III areas.[82] Many of those testifying had commissioned research to support their views.

Perhaps the most prestigious research report was that of the National Academy of Sciences on PSD.[83] The authors reported that the allocation of increments had been on a 'first come, first served' basis and that BACT determinations had only been stringent when emissions had directly threatened that increments would be exceeded. They believed that, eventually, the existence of Class I areas might constrain the siting of new major facilities in the West and that proximity to other sources subject to PSD might constrain siting in some Class II areas in the East. Their main conclusion was that:

> The PSD part of the Act is basically sound but is being interpreted too narrowly by the US Environmental Protection Agency (EPA), state air regulatory agencies, and affected industrial concerns. These interpretations are resulting in the program being implemented with a rigidity which is contrary to Congressional intent and which, in the long run, will defeat the Act's purpose of striking a balance between economic development and values associated with clean air. (84)

The Business Roundtable commissioned two consultants' reports on air quality. The first found that PSD resulted in significant complexities and costs, relative to a simplified control technology approach, without substantial air quality benefits and that PSD increments represented potential constraints to industrial development. The consultants recommended eliminating increments, except in Class I areas, limiting case by case technology reviews, and increasing the thresholds for plant modifications.(85) The other report stated that:

> There is wide recognition that the air quality permitting process is highly complex both administratively and technically. The complexity causes significant uncertainty and loss of flexibility in planning for both individual facilities and entire regions. (86)

The consultants recommended merging PSD and nonattainment processes, the replacement of multiple control technology definitions with a single set of standards, the use of realistic instead of conservative screening models (above) and the use of available monitoring data to demonstrate background levels rather than artificial, calculated baselines.

Yet another report on PSD, commissioned by EPA, found that the programme had been successful in effectively reducing particulate emissions by about 25% and sulphur dioxide emissions by about 13% without imposing heavy burdens on industry. The average permit processing time was eleven months, and only seven months after the application had been deemed complete (ie all the requisite information had been supplied).(87) This report was released by a Congressman who accused EPA of suppressing it.

The Senate Committee on Environment and Public Works, at the end of its massive investigation, concluded:

> 1. Except with respect to the issue of interstate pollution, the Act provides a sound legal

framework for dealing with air pollution problems in the nation. As with any complex law, as more experience is gained in its implementation, modifications to improve its operation and clarify Congressional intent are desirable.

2. Additional provisions are needed if the Act is to provide adequate means to address problems arising from air pollution that originates in one state and adversely affects health or welfare in another state. (88)

The Committee reported a bill that contained a large number of clarifications, reduced the overlap between EPA and state and local air pollution controllers, simplified the PSD provisions and required sweeping reductions in emissions of sulphur dioxide. In recommending the clarification, without significant weakening, of the 1977 Act and, in proposing measures to reduce the acid rain problem, the Committee appeared to have followed the prevailing opinion in the country.

The Environmental Protection Agency has encouraged cities to find ways of promoting economic development and air quality through a series of demonstration grants to various older conurbations such as Boston, Chicago, Philadelphia and Portland. The results, at least in Portland[89] and Boston[90] (but not in Chicago[91]), appear to have been disappointing in breaking down institutional barriers but the major conclusions are of interest:

> Air pollution control requirements are not major considerations in the location, expansion, and production decisions of most firms. Other factors such as the labor supply and transportation facilities are more important.
>
> ...Extensive public programs to create and allocate offsets for major new industries or industry expansions are generally not needed for urban areas of the type participating in the demonstration program. The number and

> types of firms locating in these areas do not generate a sufficient demand to justify extensive offset programs. Large firms also appear to be able to create or find offsets without assistance from public agencies. (92)

The worries of cities about the impacts of stationary source controls (normally administered by the states rather than the cities) on their competitive position in retaining and attracting industry[93] thus appear to be unfounded.

Whatever the opinion held about the Clean Air Act, it is apparent from the size of the air quality control regions (which often extend for hundreds of miles) that, insofar as locational considerations are important in air pollution control decisions, these are regional rather than local in nature. The rules of the agencies, and the federal provisions relating to new stationary sources, take almost no account of the immediate neighbours of a new source. Thus, the PSD and nonattainment provisions are designed to protect regional, not local, air quality. It appears not to rest with the air pollution control agency to determine, for example, whether or not a new source should be located close to housing.

LAND USE PLANNING CONTROL

Legal framework

Land use controls developed late in the history of the United States. Before the 1920's there were few attempts to control land use, other than the elimination of slaughter houses and gun powder storage areas from residential neighbourhoods.[94] It was in the cities that it became apparent that regulations were needed to prevent one man's use of his land from depreciating the value of his neighbour's property. Rudimentary ordinances limiting the location of Chinese laundries appeared in San Francisco in the last years of the 19th Century and regulating building height and land use in Boston and Los Angeles in the first decade of the 20th Century.[95] In the next decade several cities passed local ordinances dividing real estate into districts which permitted some uses and excluded others. As Babcock put it: 'zoning was no more than a rational and comprehensive extension of public nuisance law'.[96] In a landmark decision (Village of Euclid v Ambler Realty Corp[97]) the Supreme Court gave its blessing to this form of limited control on the use of land without payment of compensation in 1926.

The federal government has the authority to impose land use controls on state and local government directly. However, it has followed a permissive course and promulgated a Standard Zoning Enabling Act in 1924 which was readily followed in some form by most state legislatures, delegating zoning powers to the counties and municipalities. An enabling act to encourage the preparation of land use plans followed shortly after but was not so widely adopted by the states. During the period following World War II the techniques of zoning became more selective and flexible (and rather more closely related to land use planning criteria) while not greatly extending the discretionary powers of the planning agency. In the 1960's and 1970's, as well as concern about growth controls, there was increasing interest in various states in centralising some land use decisions. A federal land use planning act almost became law in the mid 1970's. Many of these initiatives appear to have foundered and the smallest units of local government retain most control over land use decisions. Garner and Callies stated that:

> The complexity of the new techniques cannot obscure the fact that local zoning remains essentially what it was from the beginning - a process by which the residents of a <u>local</u> community examine what people propose to do with their land and decide whether or not they will permit it. (98) (emphasis in original)

Each state has the power to enact legislation for the promotion of the public health, safety, morals and general welfare of its citizens. This so-called police power is the authority upon which state and local statutes regulating the use of land are based.[99]

The courts have played a prominent role in the development of land use regulation in the United States. A series of court cases indicated that the concept of 'taking' (almost analagous, perhaps, to compulsory purchase in the UK) applied to government regulation of land. This limited the severity of land use controls which could be applied in the name of general welfare without requiring that the owner be compensated for the taking. Interpretations of what constitutes a taking have varied between the states but, as Bosselman et al pointed out, 'the popular fear of the taking clause is an even more serious problem than actual court decisions'.[100] Further, they reported that 'the most recent court decisions...strongly support land use regulations based on overall state or regional goals'.[101] Callies, writing some years later, found that 'the taking issue is being resolved in favour of environmental protection and land use control across the country'.[102] It is perhaps symptomatic of the fluid land use regulatory context in the US that this may no longer be true. Two recent cases (San Diego Gas and Electric Co v City of San Diego[103] and Williamson County Regional Commission v Hamilton Bank of Johnson City[104]) suggest that regulatory takings may often occur and that monetary compensation will usually be the remedy. However, the taking issue is still judicially unresolved.[105]

Even now, although all states permit the promulgation of local zoning ordinances very few require all their constituent local governments to pass them. Some states even prohibit certain local governments from zoning. For example, Texas will not permit its counties to pass zoning ordinances. The result is that, in many states, only the urban agglomerations are zoned. Huge areas of land, many of them in agricultural use, outside the boundaries of cities and villages remain wholly without land use controls.

Local jurisdiction land use controls

Land use planning

In theory, at least, land use regulation should follow comprehensive planning. The national standard City Planning Enabling

Act 1926 contemplated the establishment of local planning commissions whose duty it was to adopt a 'master plan' or comprehensive scheme for the physical development of the city. However, the plan was to be advisory to the elected representatives of the city. While many states have adopted legislation permitting the preparation of plans and their adoption by local legislative bodies, few require plans to be prepared and fewer demand conformance to these plans after adoption, though they can be enforced through sub-division controls on the land development process. Even where they do, the local elected body can overrule the finding of a non-elected planning commission that a proposed project is not in accordance with the plan (but this rare). Thus the comprehensive planning which is undertaken is largely advisory in nature. In certain states, California, Hawaii and Oregon, for example, there is a requirement that zoning adheres to the goals and principles set out in the plan.[106] There is enormous variation in the role land use planning can play in a local community, ranging from guiding all public and private investment decisions to having no effect on such decisions.[107]

The broad process for adopting and updating comprehensive plans is similar for all jurisdictions. A planning staff (or a consultant) conducts studies and develops a draft plan for review by the public and by government agencies. A planning commission (of nominated - not elected - members) holds at least one public hearing and receives comments. The plan may then be revised and is forwarded to the elected representatives who then normally hold at least one public hearing before officially adopting the plan.

Although comprehensive planning has existed as a concept for over 50 years, it began to assume importance only when the federal government started to make funding for urban redevelopment and the construction of public facilities conditional upon conformance to a local comprehensive plan and to provide monies for the preparation of such plans. Two of the chief sources of this type of planning grant have been Section 701 of the Housing Act 1954 (the '701 Program') and transportation planning grants under the Highway Act 1962 (the '3C Process').

The comprehensive plan presents development proposals for public and private land within the planning area. It also specifies the allocations and locations of various land use categories including transportation and community facilities. The plans generally include sections on residential, commercial and industrial areas, recreation and public utilities.(108) Notwithstanding the withdrawal of much federal funding, the use of comprehensive plans is growing.

Zoning

Together with subdivision control, local zoning is the principal means of controlling land use in the United States. Most ordinances consist of a zoning map, district regulations, non-conforming use regulations and means of administration and enforcement. The zoning map for the local jurisdiction shows the various district classifications (industrial, commercial and residential and their sub-categories) together with each exception or variance granted.

The most important part of any zoning ordinance is the allocation of land use districts and the establishment of permitted uses in each. These districts have their roots in the interests of the community in the use of land so as not to injure adjoining land. A modern zoning ordinance might have as many as 30 different classifications including light and medium manufacturing and heavy industry, single family residential and multi-family residential. It may specify population density in the various districts. Some zones are progressively inclusive so that, for example, in the industrial zone any type of use is allowed; in a commercial zone all but industrial uses are permissable, while the residential portions (the 'highest use') are the only exclusive areas.

Each zoning category contains an exhaustive list of permitted uses together with permitted accessory and special uses. A special use is generally an intrusive use which is only permitted in a district where it would not normally be allowed subject to meeting specified standards established by the local elected body and to certain articulated conditions (eg. a grocery shop in a residential area open for certain hours). Each district will also have a set of bulk regulations limiting, for example, the size of plot per unit, the permitted height of structures, minimum garden sizes and off-street parking requirements. In theory, the most intense use of the higher use district forms a buffer zone between the least intense higher use district and the 'lower' use districts. Thus a row of apartment buildings in an R-3 zone might separate single family R-1 districts from a business or industrial zone. Once a district has been zoned pre-existing non-conforming uses are permitted to continue in operation but not to be enlarged or to re-commence after a period of abandonment.(109)

Once land is zoned in a particular category, a developer can develop a property as of right for the appropriate use, but subject to the conditions in the zoning classification, to subdivision laws and to other local regulations. He must also have a building permit, which must conform to the zoning classification, but this permit is ordinarily allowed as a matter of right if the compliance with zoning is clear.(110)

Because the Euclidean zoning system has proved arbitrary and clumsy, the concept of the planned unit development has been adopted to guide development of large tracts of land in a unified manner while leaving the developer freedom to be innovative. The developer presents a detailed land use and development plan to the local legislative body and pledges to build only in accordance with the site plan. The area concerned (which may be several hundred acres in extent) is then re-zoned or granted a special use permit which overlays existing zoning regulations. Numerous uses within the overall area of the planned unit may be permitted by this means, reducing the uniformity of conventional zoning.

The 'floating zone' is a special use district which is defined by standards but which is not applied to any particular area until a developer asks for land to be rezoned in that category. For example, an authority might wish to establish a district for carefully planned multiple-family dwellings to serve a cross-section of income groups but leave the location to be decided by a developer. 'Cluster' zoning provisions permit landowners who plan to subdivide their parcels to build on a smaller portion of the subdivision, ie to cluster the houses, thus leaving the rest of the land as open space.

The local elected legislative body is responsible for enacting the zoning ordinance in its original form and for adopting amendments to the regulations and maps. Applications for amendment are filed with the local government, then often referred to the planning commission which makes recommendations to the elected officials (with or without a hearing). The elected officials must give public notice and schedule a public hearing before deciding on an application. Local governments may also grant 'variances'. A variance is special relief granted to an applicant from the strict requirements of the provisions of the zoning ordinance due to practical difficulty in meeting code requirements and where compliance would result in an unnecessary hardship for the applicant. Both special exceptions (uses which are either small or unobtrusive) and variances are normally granted by a nominated board of appeals or zoning board of adjustment. Appeal is then sometimes to the local legislative body but more often directly to the state courts or (exceptionally) to the federal courts.(111) The appointed zoning administrator is generally the person responsible for seeing that the provisions of the ordinance are carried out. Increasingly, minor modifications to local land use controls are also delegated to this official. Zoning controls appear to be increasing in use and to be becoming more sophisticated and flexible.(112)

Reflecting the fact that their origins lie partly in nuisance, most zoning controls are in effect performance standards, or proposed ways of distinguishing between different types of uses. Technical performance standards have been developed to deal with smoke, odour, dust, etc.(113) (See Chapter 3.)

<u>Subdivision control</u>

Most states have enacted statutes which require the preparation and governmental approval (often in both preliminary and final form) of a scaled and precise map (a plat) whenever a landowner proposes to subdivide a parcel of property into a number of smaller pieces. The purpose of this is to establish and enforce standards for public facilities (streets, sewers, water mains etc.) by depicting lots and blocks together with streets, alleys and utility easements. It is also a vehicle for requiring various dedications and donations (a form of 'planning gain'). Most state enabling acts permit municipal corporations to elaborate on the platting requirements by setting minimum design standards, including the width of streets and pavements, the materials to be used in their construction and the placement of street lights, etc. The plat is usually submitted to the planning commission for review and then formally approved by the elected body, subject to the developer providing all the necessary infrastructure without public expense.(114)

Subdivision control (or development codes as they are now often called) are often very similar to certain of the more flexible zoning controls, such as the planned unit development. Concurrent applications for zoning and subdivision permits can sometimes be made.

State land use controls

The local land use decision-making process in the United States has been roundly condemned because 'the criteria for decision-making are exclusively local, even when the interests affected are far more comprehensive'.[115] Pelham believed that:

> Thus, unfettered by broader areal policy considerations, local governments have systematically excluded locally undesirable development of state and regional benefit while actively promoting other types of development without regard for its adverse impact on state and regional values. (116)

Almost every local government has sought to maximise its tax base and minimise its social problems,[117] and there are thousands of local governments. Manifestations of the local control of land use have included urban sprawl, loss of farmland, degradation of the natural and physical environment, limitation of housing opportunity as well as fiscal inequity and discrimination.[118] There has often been little public involvement in sensitive land use decisions.[119]

It is small wonder that a movement was started in the 1960's to rationalise land use decisions: 'the quiet revolution in land use controls'.[120] This sought to achieve a broader perspective in land-use decision making by reclaiming for the states the regulatory power previously delegated to local governments. One manifestation of this movement was an attempt to pass national land use policy legislation to ensure that planning was implemented throughout the United States.

The debate over national land use legislation began in 1970 and continued for more than five years. Legislation was first introduced by the Democrats, proposing the imposition of state planning. The

Nixon administration also supported land use provisions to transfer some regulatory authority from local to state government. Ultimately the two approaches were combined into one piece of legislation which would have given funding for state planning programmes. The states would have been required, as a condition of receiving this federal funding, to introduce first a planning process and then a land use implementation programme. This was intended to focus on areas of critical environmental concern (eg. prime agricultural lands), key facilities (eg. airports), developments of regional benefit and large scale development (eg. industrial parks). While consensus was reached on the general proposition that urban growth should be controlled, that consensus quickly disappeared when the implications of control were probed. While several versions of the bill were passed by the US Senate, it was ultimately defeated very narrowly in the US House of Representatives in an emotionally charged atmosphere, amid accusations about intentions and doubts about who stood to gain and who to lose.

The debate over national land use policy played an important role in stimulating many states to assume greater responsibility for land use.[121] Some of the objectives of the proposed legislation have been achieved by the passing of separate statutes dealing with issues having land use implications such as the Resource Recovery Act, the Coastal Zone Management Act, etc. As Lyday stated :

> In the final analysis, it is probably not wise to search for comprehensive rules to deal with land use conflicts nor to attempt to define comprehensively what land should be preserved and what kinds of development are 'needed'. These must be evaluated in terms of who benefits and who

> pays, and the trade-offs will vary according to the specific competing claims being made. (122)

Rosenbaum felt that, while there was a need for federal legislative action on surface mine siting, critical environmental areas protection and shorelands protection, there was none for power plant siting, industrial plant siting, wetlands protection and mandatory local planning, zoning and sub-division control:

> The coverage of controls differs so widely among the states, and the state-local relationship is so sensitive that stronger federal support for these innovations seems inappropriate and unnecessary. (123)

Quite apart from passing acts with land use implications, such as the Clean Air Act, the National Environmental Policy Act, etc., direct federal involvement in land use planning is not unknown. The federal government holds vast areas of land in public trust and ownership. These lands have been under some type of land use management and regulation by various federal agencies throughout the history of the United States.

The use of state land use planning powers appeared to offer a number of advantages. Popper felt that such control:

> ...seems to offer a constructive way to get around the small scale, inactivity, incompetence, parochialism, shortsightedness, penury, corruption and racism of many local governments. [It] also seems to offer an excellent means of achieving co-ordination and resolving disputes between competing local governments. (124)

Healy and Rosenberg argued that there was a role for state land use regulation, even if strong local controls existed, for the following types of uses and types of land:

1. Areas of critical state concern - places that have scenic, historic or environmental value of more than local concern

2. Developments of regional impact - developments that because of their size or location produce spillovers affecting more than one locality

3. Developments of regional benefit - projects, including power plants, landfills, and low-income housing, that are shunned by localities but produce significant benefits for larger areas

4. Unregulated areas - places where local government has not yet instituted planning, zoning, and subdivision controls. Here state intervention should be only temporary, pending local adoption of such controls

5. Developments affecting or affected by major state investments - here the state should use its power to further the aims of local government, except when there are spillovers to other jurisdictions or to the investment itself. (125)

As in the earlier zoning movement, the preparation of model legislation (by the American Law Institute) advanced the cause of reform. The Model Land Development Code 1975,[126] with a provision for increased state participation in land-use decision making, formed the basis for several state acts, including the Florida Environmental Land and Water Management Act 1972. There was clearly a trend towards considering land as a resource as well as a commodity in evidence in the 1970's.

Most state land use regulation falls into one or more of four categories:

1. Direct state assumption of responsibility for regular zoning and/or subdivision control sometimes in areas otherwise unzoned

2. Statutory provisions designed to ensure that most new development should not cause any serious environmental damage, by means of a (a) state-level administrative review under general standards, and (b) the issuance of permits subject to conditions

3. General requirements for regional-level review and permits, applying generally to specified geographic areas

4. Special requirements for protection of particular types of landscapes. (127)

Thus the land use mechanisms adopted by various states include state land use planning programmes, coastal zone management programmes, wetlands protection and management programmes, critical areas designation programmes (these areas usually contain scientific, historic or natural resources), power plant siting programmes, surface mining regulations, new towns legislation, environmental impact statement processes and regulation of developments of regional impact (because of their size, environmental problems, traffic generation, etc). The adoption of such measures varies from well over 40 of the 50 states having a land use planning programme (some of which include state comprehensive planning or state enforcement of local comprehensive planning of some type) to less than 10 with programmes controlling developments of regional impact.[128] Rosenbaum has ably described the process of diffusion of many of these measures.[129]

The typical pattern under a state permit programme for, say, its coastal zone is for an inventory and map of the area to be prepared, boundaries to be established (usually with public hearings), the adoption of permit regulations requiring a review of the proposed development and, in some cases, the adoption of more detailed land use restrictions. It is not unusual for states to have a dozen agencies with one kind of land use planning or regulatory responsibility or another, most set up as a consequence of receiving federal funds in return for the institution of a federally approved control system.[130]

In the 1970's, there was a trend towards proposing more comprehensive land use plans and regulatory systems to control development over the whole area of a state. Hawaii, Vermont, Maine and Oregon have probably enacted the closest approximations to comprehensive state land use planning controls embracing formulation of policies, information requirements, co-ordination, participation, a central implementing agency, areas where development is precluded and an administrative appellate process.

This trend terminated around 1975 as, with the exception of the California Coastal Act 1976, no major state land-use laws have been passed since then and concerted efforts have been made to repeal newly enacted land use legislation in some states. The reasons may include the ravages of the economic recession and the energy crises of the 1970's, the defeat of federal land use legislation, the lessening of growth pressures and political opposition to the centralisation of land regulatory power at the state level.[131] In addition, characteristic American attitudes: the spirit of individualism, the private property ethic, the prestige of the corporation and the entrepreneur, the veneration of the market, the contempt for bureaucracy and the desire to limit government, militated against further reform of land use controls.[132]

Despite the various innovations, state controls have not been entirely successful. There has been a lack of co-ordination between state functions and none of the available state techniques (environmental plans, policies, co-ordinating councils, impact statement reviews, etc) have been sufficiently powerful to regulate land use effectively. Popper stated that the defects of state land use agencies turned out to be much the same as those of the zoning agencies they were intended to supplement. They did not have jurisdiction over large amounts of important development and were understaffed and under-financed.[133] Similarly, state efforts to impose some controls over the land use decisions of local governments, such as setting maximum processing times, have been fiercely resisted and have therefore had only limited success.[134]

However, while formal reform of land ;use regulation at the state level might have been halted, the panoply of state controls over coastal zones, industrial siting, environmental impact, pollution control etc. gave another means of control. While the environmental co-ordinative potential of these powers has been recognised,[135] vastly improved co-ordination would be necessary to achieve the potential effectivess of a comprehensive land use planning law.

Nevertheless, as Healy and Rosenberg pointed out:

> Over time, the movement toward greater state involvement in land use matters has had two

persistent themes. First, it has increased the general level of consciousness of the environmental and other impacts of land development and has shown that stringent controls can indeed make a difference. In many cases, local governments and developers have responded, improving their own land use practices. Thus, this role for state government has been an important, but probably temporary one. Second, the experience of the states has shown that there are indeed non-local interests in how land is used. Such interests arise in only a small proportion of all land use decisions, yet their protection must be a permanent responsibility of higher levels of governments. (136)

Much of the legislation was typically concerned with means, not ends. As Pelham stated, a

> ...characteristic of much of the selected activities and critical areas legislation is the predominance of process over policy. While such legislation has usually created a new process for making land-use decisions, it has generally failed to provide substantive criteria for making such decisions. (137)

He reported that the effective implementation of the comprehensive planning approach required adequate funding and staffing and that penetrating the traditionally autonomous local regulatory system continued to be a difficult problem. The exponential increase in citizen participation since the 1960's was one reason why :

> Ironically, therefore, the chief legacy of the quiet revolution, which has become a code word for state recoupment of land-use regulatory power from local governments, may be the strengthening of local land-use controls. (138)

Callies, one of the chroniclers of the 'Quiet Revolution' agreed that local government had re-emerged as a major force in the shaping of land use decisions and that local planning had regained impetus. He put this down to the proliferation of permits required (from numerous agencies at various levels of government) to undertake development, the federal incursion into the business of land use control (through the Coastal Zone Management Act, the National Environmental Policy Act, the Clean Air Act, etc) and the increased - and increasingly organised - citizen participation in land use decisions. He concluded:

> Indeed, it is a local, and not a state or regional, law which seems to have moved the country along the land use continuum to the preservation of the...natural environment as a valid goal of land use regulation, provided private property is not altogether stripped of value. (139)

However, the Supreme Court may curtail the local planning impetus if it eventually decides the still unresolved taking and compensation issues.[(140)]

Environmental impact assessment

In its fifth report, the Council on Environmental Quality (CEQ), reflecting the difficulties of using zoning to control US land use change effectively, stated:

> Traditional zoning ordinances attempt to control land use by determining before development occurs what every piece of land will be used for. As long as any proposed development satisfies the designated land uses, it is allowed. But to assure that it does, most communities have also adopted laws for the review of major development proposals. These laws vary from the simple requirement to file a map of platted acreage for a new subdivision to highly sophisticated techniques and reporting schemes with guidelines, regulations, and provisions for public review. There is an increasing recognition that development proposals must be examined on an individual basis under a system of review that has both clearly defined standards and the flexibility to take into account changing community values and the special characteristics of each project. (141)

Environmental impact assessment (EIA) is perhaps the best known 'sophisticated technique' for project appraisal. The EIA system was introduced in the United States on 1 January 1970, under the provisions of broad enabling legislation, the National Environmental Policy Act (NEPA). Since then the system has been substantially refined by judicial findings and by the issuance of new guidelines in the form of regulations by CEQ.(142) These regulations have been adapted and supplemented to meet their own needs by the various federal agencies responsible for the preparation of environmental impact assessments.

The first step in the EIA procedure is the identification of the proposal leading to the action by the agency (construction of, or funding, or permit granting for a project). The agency itself, or the developer, will then undertake a preliminary scoping and environmental analysis to determine whether there is an obvious need for an environmental impact statement (EIS), whether the environmental impacts are clearly so minor as to permit a categorical exclusion (for which documentation is optional) from the EIA process or whether an environmental assessment should be prepared so that the impacts can be more clearly identified. Depending on the findings of the assessment, an EIS may be required or, as in the majority of cases, the agency may decide that none is necessary. If it is decided not to prepare an EIS, a finding of no significant impact must be written, summarising the reasons for this decision.(143)

When an EIS is required, scoping (a procedure intended to bring about agreement as to the environmental impacts requiring investigation) commences. These issues are then addressed in the draft EIS. This is written by the agency though the developer will provide a great deal of the relevant information upon which it can be based if funding or permitting is involved. The draft describes the existing environment, explains what the proposed project is and analyses the effects of the project on the environment. It is these effects which constitute the substance of the draft EIS.

The draft EIS is sent to the Environmental Protection Agency (EPA) and is forwarded to all the relevant federal, state and local organisations and groups likely to wish to comment. Once the lead agency has received comments it is in a position to prepare the final EIS.

The final EIS describes the amended form of the proposed project, including any modifications that have been made since the draft EIS was published. The document normally contains quite extensive proposals for mitigation of impacts. A record of decision has also to be prepared, indicating the decision that has been made and the reasons for it. The final EIS should not normally be more than 150 pages long, according to CEQ regulations. Over 1000 EIS's have been produced most years since 1970.[144]

There are somewhat inadequate provisions for monitoring the environmental impacts arising from an action and for ensuring that the various conditions or mitigation measures that have been included in the final proposal are implemented. This may be done in the form of conditions appended to permits that have to be obtained from the lead agency or in the form of conditions attached to grants that are made by the agency. If the agency itself is carrying through the measures there is usually a system of inspection to ensure that the project is actually constructed as described in the final EIS.

It is normal for the EIS to address the procedural requirements of NEPA, as refined in the agency guidelines, and to rely on scoping for the identification of issues, rather than to use any 'comprehensive EIA methodology'.[(145)] Widespread use is, however, made of specialised technical methods for assessing particular impacts (eg. air pollution modelling). The trend is to make greater use of the information generated for other purposes (for example, the granting of an air pollution permit) in preparing the EIS and to combine the granting of permits to reduce the number of steps an applicant must make.

Overall, it would appear that the methods and procedures used in the environmental impact assessment process have improved the quality of environmental decision making in the United States. There have been costs, of course. In particular, delay and the expenditure of manpower and financial resources have resulted from the EIA process. Many environmental documents have been characterised as being little more than 'boiler plate' (excessively verbose). On the whole, however, it would appear that this boiler plate mentality is declining and that the utility of EIA is being more widely recognised, despite its categorisation as a 'standard administrative reform measure' by some commentators.[(146)] Moreover, some of the net costs have been positive, with real savings resulting from careful prior consideration of environmental impacts and delays being minimised.[147]

There is no doubt that the EIA process is biting. Several projects have been aborted as a result of the adverse impacts revealed in preparing an EIS and it appears that a majority of projects are modified as a result of the assessed impacts. This mitigation of impacts appears to be 'where the action is' and is widely cited as one of the main justifications of the process. There has been substantial EIA litigation, initially by environmental groups but increasingly by industry which has begun to view the EIA system favourably.[148] The volume of litigation is now beginning to decline as many issues have been clarified.

Despite the generally accepted improvement in the quality of EIS's over recent years, there is scope for further amelioration in the analytical content of EIS's[149] and for closer adherence to the spirit, rather than the letter, of NEPA.[150] Environmental impact assessment has been mainly confined to projects and probably owes its success to the general weakness of the US land use planning system. Reilly has stated that the impact statement process:

> Reflects a more realistic understanding of the way major development is sited. No one any longer expects comprehensive plans to detail precisely the nature and location of new development. (151)

A number of states have enacted environmental impact assessment legislation, as have some counties and cities. Over half the states have initiated state-level EIA systems. Eight require EIS's only for projects proposed within specific areas, four require them for actions undertaken by state agencies or using state funds and seven require them for these categories together with actions requiring state permits. Another four states' requirements apply to all these types of actions plus a number of actions taken by local agencies and three states (including California) have a comprehensive system covering local government and private activities as well as those of the state itself.[152] The various legal requirements differ from the federal system and most have proved weak and ineffective, the comprehensive systems being among the exceptions.

This extension to state and local actions from federal actions has meant that EIA can complement the land use planning process, though it should not be considered either as an additional, unnecessary burden or as a substitute for effective policy making in land use planning.[153] Environmental impact review has been referred to as an underutilised process of great potential in environmental management at the local level.[154] However, only a few cities have adopted EIA procedures.

Environmental impact assessment of plans and policies is potentially invaluable but has not been widely practised. The assessment of local comprehensive plans could be useful in determining where the proposed location of polluting industries was environmentally appropriate as well as whether the proposals were consistent with the relevant state implementation plan for air pollution control.

Practice

It is very difficult to gain a comprehensive picture of the numbers of professional planners employed on land use matters in the United States but the number must be very substantial, even though many agencies employ none. There are also numerous lawyers employed on land use matters. Many 'planners' are, of course, engaged in single sector planning with land use ramifications, rather than comprehensive land use planning. It is clear that the land use activities of many local governments have been severely affected by budget cuts over the last few years: both the quantity and (often) the quality of staff leave much to be desired.

There are, as has been discussed, also shortcomings in the land use control system. Delafons remarked that:

> It is hardly more than an historical accident, a singularly fortunate one, that there is any system of land-use controls available to American communities today. ...The wise use of land and the orderly development of the community were little considered, beyond the elementary principle of separating grossly incompatible uses... (155)

The zoning systems is supposed to afford a specific set of controls. However, there is considerable discretion in the writing of zoning ordinances and they vary significantly from local government to local government. Zoning is used as an inadequate device to guide urban development, not usually to stop it or even to encourage it: it is essentially a mechanism for protecting private property. Thus, in a developed area, zoning will enjoy widespread support but in a developing area there will be little support from the powerful, who wish to develop when and where there is money to be made from development.(156)

Furthermore, the administration of zoning ordinances belies the seeming predictability of the system. There are few certainties, despite all the rules, even if there is an apparently strong presumption in favour of a particular development. A developer may be granted a permit subject to numerous conditions or be refused as a result of specially invoked rules.[157] It is not unknown for a jurisdiction to pass special legislation prohibiting a particular type of project anywhere in the locality, even if some permits have already been granted. Thus, notwithstanding the inability of a zoning system to prevent development in general, it is usually possible for a local legislative body to prevent a development it considers particularly undesirable by delaying or refusing minor permits until the developer abandons his application. Much land is zoned agricultural to allow discretion as to which types of development, if any, should be permitted and to keep property taxes low.

It is much more common for applications for zoning variances or exceptions to be approved regardless of their impact on adjoining areas (unless neighbourhood opposition is aroused) than for projects to be stopped. Thus, in the 1960's, about three quarters of applications for variances were granted.[158] Some of these variances have been used to permit massive changes in land use and density, particularly in southern states. This abuse of the intentions of the variance has allowed developers to apply to nominated boards to modify zonings and increase the value of their land without any say by elected representatives in the granting of the permission. Unpredictability and ineffectiveness appear to be fostered by the absence of technical expertise and the presence of vested interests among the laymen who sit on zoning boards of appeals and by the numerical and technical inadequacy of planning staffs. Business interests and political factors tend to dominate zoning and rezoning decisions taken by the elected councils: 'Rezoning decisions are typically ad hoc, parochial, and based on narrow considerations'.[159] Again, about 75% of rezoning applications were granted in the 1960's.[160]

Failure of land use regulation to shape growth has led to attempts by several communities to slow or stop growth in their vicinity. Some municipalities have decided that they will limit the annual rate of growth (eg Petaluma, California). Such an approach to growth management, of course, tends to have the effect of merely redirecting growth elsewhere and many court cases have been brought by developers. Such attempts to control growth have seldom had any air pollution control objectives (Chapter 3). Several communities have imposed moratoria on various phases of development[161] and a number of new concepts of slow growth or timed development have been successfully implemented.[162] However, growth controls tend to be vehemently opposed by developers, to be highly sophisticated and hence to be difficult to administer. One celebrated example of the timed development approach; by the community of Ramapo, New York, has been abandoned recently.

It is apparent that land use planning controls vary enormously across the United States. They have proved generally inadequate for the task of shaping growth and it might therefore be anticipated that they would be able to make but little contribution to controlling air pollution.

Relationship with air pollution controls

The potential importance of the relationship between land use planning and air pollution control has been recognised in some quarters in the United States for some time. Thus, in 1970 the Council on Environmental Quality recommended that

> Land use planning and control should be used by state, local and regional agencies as a method of minimising air pollution. Large industries and power generating facilities should be located in places where their adverse effect on the air is minimal. (163)

The then administrator of the Environmental Protection Agency believed that the 'formulation of land use policy has become indistinguishable from the formulation of environmental policy'.[164] He stated that, in air pollution control, the fundamental process to be followed was a combination of emission limitations and land use planning, notwithstanding the comprehensive nature of air pollution controls in the USA. According to Hagevik et al:

> assuming that regional and statewide land use control programs are widely adopted <u>and implemented</u>, the comprehensive framework of the land use regulation process is a better legal and policy making setting in which to resolve the many problems created by the interaction of air pollution and land use control strategies [than the preconstruction review programme for new air pollution sources] (165) (emphasis in original)

There are two distinct aspects of the relationship between land use and air pollution controls : the effect of air pollution controls on land use and the effect of land use controls on air pollution. It has been stressed repeatedly that the Clean Air Act would force land use planning decisions to be made by air pollution control agencies.(166) 'The act, by demanding that ambient standards be met everywhere, necessarily demands land use controls'.(167) In particular, the prevention of significant deterioration (PSD) and nonattainment programmes, neither of which was anticipated in the 1970 Clean Air Act, have been considered to have profound land use implications.

Initially, it was believed that the designation of areas, often the longer established industrial areas, as 'nonattainment' for various pollutants might force industry to look elsewhere, reinforcing a trend towards growth in the south and west which was already strong. Similarly, it was thought that the PSD regulations might lead to urban growth of a very dispersed kind as increments were consumed:

> Any PSD policy, stringently enforced, will not only affect regional growth patterns and the siting of major industrial facilities, but will place states in the role of regulating land use through their air quality responsibilities. (168)

Indeed, it has been suggested that the PSD programme was itself developed to forestall the rush of industry from the north and east of the USA.(169) However, as demonstrated in the earlier sections of this chapter, the widespread concern that the Clean Air Act has been responsible for preventing or restricting growth appears to have little basis in fact. Remarkably few applications to develop in nonattainment areas, or in areas where PSD applies, have been turned down. Thus, of the eight states visited as part of this study, only Californian air pollution controllers could aver that offsets for major developments had ever proved unobtainable.(170) In no case had PSD permits not been forthcoming.

While fears about the de facto implications of the Clean Air Act for land use have proved unfounded to date, the 1970 Act quite specifically stated that land use controls were to be one of the tools for implementing national ambient air quality standards, together with transportation controls.(171) Indirect source review was another land use related element. However, the implementation of land use controls, notwithstanding a great deal of research financed by EPA, became an extremely political issue as a result of an attempt to introduce parking controls in nonattainment areas through the use of indirect source regulations.(172) These required a preconstruction review of shopping centres, stadia and other indirect sources to ensure that health related standards would not be violated because of increased vehicular traffic. This led to a Congressional backlash against federal intervention in local land use affairs and spending allocations for the programme were discontinued. EPA was forced to retreat by withdrawing the relevant regulations.(173) As Manners and Rudzitis said:

> The transportation controls (including compulsory car pooling and restrictions on gasoline sales proposed) [in 1973] for the nation's most polluted cities reached the most profound implication of the Clean Air Act for the average citizen - the impact of the law on his relation to his own automobile. (174)

As the US Conference of Mayors rather mildly put it: 'Air quality alone is not usually a sufficiently strong incentive for local governments to undertake growth management programs'.[175] The 'land use controls' requirement was deleted in the 1977 Clean Air Act. The other land use-related requirements remain, of course, and general land use controls are not precluded. Some 13 states had themselves adopted indirect source review provisions in 1980.[176] The local government associations expressed the reasons for the reluctance to employ area-wide land use controls over air pollution in state implementation plans (SIPs) well:

> The paucity of comprehensive landbased emission strategies in the SIPs is hardly surprising. Land use responsibility is for the most part an activity of local government, while air pollution authority, particularly for stationary sources, is concentrated at the state level. Air pollution control must generally be addressed from a regional perspective, while land use authority is usually fragmented among many municipal powers. Institutionally, local zoning authority and air pollution control authority derive from different legal bases. Since the use of land determines the economic and social character of a community, land use planning is fraught with political barriers. Finally, neither local nor state government may want to be bound by an EPA-approved SIP which contains politically sensitive strategies tied to the regulation of land. (177)

It is still, of course, perfectly possible for a state or local government to administer, for example, an emission density zoning programme.[178]

Turning to the effect of land use controls on air pollution, there is little evidence of the various planning techniques being utilised in environmental management.[179] Practice has lagged some way behind theory and land use planning in the United States has frequently been ineffective not only in preventing land misuse but in protecting environmental quality. This has probably been because, for the most part, protection of environmental quality has not been fundamental to the planning process. Further, single purpose planning has resulted in a lack of co-ordination and, as demonstrated above, the land-based tax structure and absence of centralised planning and implementation authorities have resulted in land use plans being ignored.[180]

It is apparent, despite the various initiatives to improve the situation, that the complexity of environmental problems, the absence of proven environmental strategies, the shortage of financial resources, the lack of staff expertise and the fragmentation of government continue to frustrate the efforts of local governments to come to grips with environmental management problems including air pollution control.[181]

By the mid-1970's very few local governments and councils of government had conducted air quality planning, or even included air quality as an element of a comprehensive land use plan.[182] The situation has not improved appreciably since, not least because of the decline of the councils of government and the reductions in budgets for planning. Where air pollution policies are included, they are often little more than pious hopes, such as expressions of the desirability of reducing car travel, encouraging car pools and staggering working hours.[183] Similarly, while there are exceptions, few zoning ordinances make any reference to air pollution control. In the circumstances, it is hardly surprising that land use permits have sometimes been granted to the developers of new or modified stationary sources of air pollution with scant regard to the pollution likely to ensue.

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164. Train, R E (1976) The EPA programs and land use planning Columbia Journal of Environmental Law 2 255-289.

165. Hagevik, G H, Mandelker, D R and Brail, R K (1974) Air Quality Management and Land use Planning Praeger, New York, NY, p 36. Their assumptions, made in 1974, turned out to be unjustified, as previously explained.

166. See, for example, Hagevik et al, op cit, Chapter 2, in which it is claimed that the provisions for preconstruction review in the Clean Air Act are essentially concerned with land use regulation.

167. Train, op cit.

168. Manners, I R and Rudzitis, G (1982) Federal air quality legislation : implications for land use in Hoffman, G (ed) Federalism and Regional Development University of Texas Press, Austin, TX.

169. Similar arguments have been advanced about new source performance standards : that the discrimination against the new may be a sophisticated form of protectionism by certain legislators and business interests. See Crandall, R W (1979) Environmental control is out of control Chemical and Engineering News April 23, 29-33 and Ackerman, B A and Hassler, W T (1980) Beyond the New Deal : coal and the Clean Air Act Yale Law Journal 89 1466-1571, in which the success of the coalition between eastern business, miners and environmentalists to impose uniform scrubbing standards on all power plants (whether burning low or high sulphur fuel) is criticised.

170. It is, of course, possible and indeed likely that some developers never reach the formal application stage when they learn the nature of the requirements demanded of them.

171. Clean Air Act 1970 s 110(a)(2)(B).

172. Moss, op cit, pp 40-67.

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5 IMPLEMENTATION OF ANTICIPATORY CONTROLS IN THE UNITED STATES

This chapter presents eight brief case studies of the implementation of United States land use planning controls and air pollution controls over new stationary sources of air pollution. The first seven studies are summaries of original case histories presented in considerable detail in the Appendix. The eighth is derived from a published case history.[1] Table 5.1 attempts to condense some of the features of the studies further.

The Louisiana creosote storage facility

Palmer Barge Line Inc sought to construct a storage tank on a coastal 0.8 acre site in St Tammany Parish so that creosote could be transferred from barge to truck. A creosote manufacturing plant in the parish had previously burnt down, causing serious water pollution. The nearest dwellings to the site were some 300 metres away and the surrounding land was in low intensity industrial (mostly storage) use. Palmer felt that it would be a straightforward matter to obtain the necessary land use permit from the parish. It did not expect to have to obtain air pollution or coastal management permits from the state.

The company wrote to the parish and to both the Coastal Management Section and the Air Quality Division of the Louisiana Department of Natural Resources in May 1981. Within a few days the parish began to receive letters of protest about the risks of flooding, spillage and recurrence of the previous problems previous experienced with creosote. The parish zoning commission hearing was addressed by Palmer Barge Line's lawyer, who was able to state that the parish's was the only permit needed. Several objectors spoke out strongly and the commission denied the permit.

TABLE 5.1 SOME CHARACTERISTICS OF THE US CASE STUDY AUTHORISATION PROCESSES

	AIR POLLUTION CONTROL AGENCY				LAND USE PLANNING AGENCY					OTHER PROCEDURES		IMPLEMENTATION				USE OF THE COURTS
	No. OF AGENCIES	PRIOR OBJECTIONS	ACCEPT/ REFUSE	APPEAL (ACC/REF)	No. OF AGENCIES	PRIOR OBJECTIONS	ACCEPT/ REFUSE	APPEAL (ACC/REF)	AIR POLL CONT CONDS	PRIOR OBJECTIONS	ACCEPT/ REFUSE	CONSTRUCTION	SUBSEQUENT OBJECTIONS	APCA ENFORCEMENT	LUPA ENFORCEMENT	
LOUISIANA	1	✓	✓ ; -		2	✓ ✓	x x	x x		✓	-					✓
TEXAS	1	✓	✓	-	1	✓	x	x				✓	✓		✓	✓
NORTH CAROLINA	2	✓	✓		3	✓ ✓ ✓	✓ x ; ✓ -	✓ ✓		✓	-					
FLORIDA	3		✓		2		✓ ✓		✓		✓	✓	✓	✓		
MARYLAND Providence	1				1							✓	✓	✓	✓	✓
MARYLAND Childs	1	✓	✓		1	✓	x	x		✓	✓					
OREGON	2	✓	✓		1	✓	✓	✓	✓	✓	x					
CALIFORNIA: CHEVRON	2	✓ ✓	✓ ✓	✓	1	✓	✓	✓				✓		✓		✓
CALIFORNIA: DOW	1	✓	x	-	2	✓ ✓	✓ -	-		✓	-					✓

The company appealed against this zoning decision and mounted a more impressive case before the parish council, largely addressing the problem of accidental spillage. The plant was expected to produce $200,000 per annum in sales tax revenue. Again, objections were raised and, again, the appeal was rejected. Palmer appealed to the courts but judgement was postponed on a procedural point (the need for written assurance that no state permits were necessary). The council of St Tammany Parish then passed an ordinance specifically aimed to prevent the construction of premises for storing or manufacturing creosote anywhere in the parish.

The state air quality division wrote to Palmer stating that no permit would be needed on 27 May 1981. However, the officials later had second thoughts and asked the company to submit an application in July. This was prepared by consultants. Further information was requested and the officials decided that the decision to grant the permit (which was never in doubt) should be taken by the state Environmental Control Commission. This body held the decision over pending the sister Coastal Commission's deliberations.

The Palmer letter to the coastal management section indicated that all the site was more than five feet above sea level. As sites above this height are exempt from many coastal management controls, an oral indication was given to the company's attorney that no permit would be necessary. Letters of objection soon began to arrive in the coastal management section. In June more information was demanded of the company and a St Tammany parish councillor asked that no construction be permitted. The coastal management section officials began to change their minds as they learned more about the facility (including the fact that some of the site might be below the five foot level) and as opposition became more marked. The intervention of a state representative objecting to the use was important in this alteration of attitude. In July, without waiting for receipt of the information requested, the section decided that a permit would, after all, be necessary.

The public hearing into the coastal management permit application attracted some 30 speakers, the vast majority of whom were against the development, despite the tax revenues the facility would generate. The officials, after weighing the evidence, refused the permit.

Palmer Barge Line appealed against this decision and a hearing before the coastal commission took place in January 1982 with a hearing officer appointed to conduct the proceedings. The Palmer case was presented by several experts and was far more convincing than its earlier and less technical arguments to the St Tammany zoning commission. The objectors called the state representative, environmental scientists and a coastal management official. Despite being impressed with the Palmer case, the commission voted 12 to 3 to reject the appeal. A strong tradition of local autonomy prevailed, the commission declining to sanction a development so strongly disliked locally.

Although confident of the strength of its case, Palmer had already spent over $50,000 in presenting it and there was every expectation of more expenditure to come. (The state had by now decided that a water pollution permit would also be required.) Accordingly, the company decided to cut its losses and withdraw the proposal. Palmer then arranged to establish the storage facility in the state of Mississippi but, though it was welcomed there, the company never constructed its plant because of the downturn in the economic climate.

The history of the creosote storage plant demonstrates the high level of discretion available at state and local level to refuse and delay projects, even where land use controls are weak. The refusal of zoning approval, the passing of the local ordinance, the change of opinion about the coastal use permit, the refusal to allow the appeal and the referral of the air pollution permit to the commission after stating that no permit would be needed, all appear to have been motivated by strong and influential opposition to a minor industrial development which happened to involve a locally controversial substance. While air and water pollution permits would have been forthcoming, the outcome of appeals to the courts on the zoning permit and coastal management permits would have been much less certain. The benefits of the project (which was proposed by an out-of-state developer), in local revenue and employment terms, were not great.

The Texas asphalt plant

In 1982 Petroplex Land and Development Co Inc sought to erect an asphalt batching plant, which had previously been used in Alabama, just outside the city limits of Midland, Texas. Midland County had no zoning or building controls and no land use permit therefore appeared to be necessary. In July Petroplex applied for a standard exemption from the Texas Air Control Board's permit requirements on the grounds that the plant would be located more than half a mile from the nearest residence and that emissions would be below specified levels. The exemption was granted on the condition that the plant continued to comply with these requirements.

There was no indication that this decision would prove controversial and construction of the plant was duly commenced in the centre of a one mile by one quarter of a mile plot - just a few feet over half a mile from the nearest house. This was part of the Skyview Addition, a newly constructed group of expensive properties, also just beyond the Midland City boundary. Protests soon poured into the board from the Addition residents who demanded a public hearing.

The City of Midland was in the process of annexing land to expand its area at the time. While the residents of the Skyview Addition did not want their land to be annexed (they already had water and sewerage), they encouraged the city to annex the land on which the asphalt plant was being constructed, and to zone it (in accordance with the city ordinances) for 'agricultural estate' (low density residential) use but not for 'commercial' use. The city acceded to the residents' wishes and annexed the Petroplex site while construction of the plant continued, but excluded the Skyview Addition.

The city forced Petroplex to apply for a building permit and temporary use permit now that the site fell within Midland's jurisdiction, though it could have chosen to regard asphalt making as a non-conforming use. Petroplex reluctantly applied and, in the meanwhile, the city passed a resolution strengthening the existing ordinances and requiring cessation of building until the necessary permits had been obtained. At the hearing at the city council meeting (following much publicity), the lawyer for the residents argued that asphalt manufacture was inappropriate in an area zoned 'agricultural estate' and so close to existing housing. Numerous objectors spoke and Midland denied the use permit.

Petroplex continued construction, however, and in early December ran the plant at maximum output, producing a 'volcano-like' emission of dark smoke. The city decided that legal action to enforce its resolution was necessary and sought an injuction to force the cessation of operations. The company 'voluntarily' halted manufacture before Christmas.

The level of controversy and complaint over the Texas Air Control Board's permit exemption was such that the first hearing relating to an exemption in that state took place in January 1983. (Petroplex had been warned by the board in the autumn that they proceeded at their own risk, once the hearing had been conceded.) The residents, Petroplex and the board were all represented by lawyers at the three day hearing. The residents argued that polluting industry should not be permitted to locate so close to housing. This argument was not admitted because 'proper land use is not a criterion for an exemption or construction permit' but was a matter for the local zoning authorities. The company argued that emissions would be minimal and the board, presenting a separate case, quoted the results of modelling exercises to demonstrate that concentrations would be very low and that it had been right to grant the exemption. In the meanwhile, Midland County had imposed weight limits on the roads from the site running closest to Skyview Addition to divert heavy vehicles from the plant from local roads.

The opponents of the plant had spent some $15-20,000 fighting Petroplex and had won substantial TV, radio and press publicity. They expected their case to be rejected by the hearing officer and thought that Petroplex would be granted a special air control permit exemption with further conditions to limit emissions (for example, surfacing of roads).

Later in 1983 the previous owner of the asphalt plant removed it from the site without its operating again. Petroplex ceased to exist before the Texas Air Control Board could make a decision on the exemption permit or before the Midland City case went to court. The ability of a concerted opposition to influence a local government (in which they were not resident) to use its discretionary land use powers was notable. The annexation, the passing of the ordinance, the demanding of the use permit, the refusal of the permit and the taking of court action eventually led to the removal of the air pollution source, something that would have been almost impossible using air pollution control powers. The likelihood of further development in the vicinity of the plant, which had few employment or local revenue advantages, must have influenced the city council which has constantly annexed land over the years.

Petroplex took the position throughout that it would meet all its legal obligations (though it disputed the legality of the City of Midland land use resolution) but would not give an inch to the objectors, despite the ease with which it could have moved the plant. It is ironical that such controversy should have taken place over a permit exemption rather than a construction permit and that locating the plant in the first instance at the far end of the site, about a mile from the nearest houses, would probably have satisfied the residents.

The North Carolina oil refinery

The Brunswick Energy Company (BECO) sought to build an oil refinery in a sparsely populated area on the banks of the Cape Fear River in Brunswick County, North Carolina. The refinery was sited some distance from the river and was surrounded by a buffer zone of existing woodland. As this was a coastal county, the state's coastal area management act applied and a land use plan had been prepared for the county. No zoning provisions were in existence but, since the develoment was not in accord with the land use plan and was in an 'area of environmental concern' an amendment would have to be prepared by the county and approved by the state Coastal Resources Commission before the refinery could be constructed. An oil refinery, a major source of air pollution, would also require a prevention of significant deterioration (PSD) permit from the Environmental Protection Agency and state construction and operation permits. In addition, constructors of oil refineries in North Carolina must also obtain a specific facility permit. Further, because a Corps of Engineers dredge and fill permit would be necessary, an environmental impact statement would have to be prepared. Water pollution, waste disposal and other permits would also be required, making about a dozen in all.

BECO appointed a project engineer who took the approach of willingly endeavouring to satisfy every environmental requirement. He commissioned a firm of consultants to prepare the material required to obtain the air pollution permits and to undertake other environmental permit application work. Local residents and local and state officials were taken to visit other refineries.

The officials of the North Carolina Department of Natural Resources and Community Development endeavoured to take a neutral stance on the various permits required for this, one of the largest developments proposed in North Carolina. The Secretary of the department, however, appeared to have prejudged the issue by publicly assuming that it would be built. The department appointed co-ordinators to try to ensure that all the various permits were handled with the minimum of duplication, and on a critical path. It also set up a citizen's liaison committee to ensure that discussion took place between BECO and potential opponents of the refinery.

A local organisation, Carolina Coastal Crossroads, was set up to oppose the refinery, choosing its title to indicate the fundamental change in coastal environment and lifestyle its members felt the refinery would cause. They had the backing of a rich property owner, who made a film for them and encouraged them to use his Washington law firm to help prepare arguments. They not only organised petitions and appeared at public hearings but gave regular media interviews. (The Wilmington Star newspapers opposed the project.) They also used car bumper stickers and paid for outdoor advertisements. The majority of the local population was, however, in favour of the project.

Commencing in 1979, comprehensive monitoring of air pollution levels, both close to and some 35 miles from the site, was undertaken and a subsequent modelling simulation was carried out by the consultants. The submission of an application for the various air pollution permits consisted of two volumes of data and argument. The Department of Natural Resources and Community Development negotiated onerous air pollution controls which would have involved the utilisation of only a small PSD increment and, notwithstanding strong public protests, issued a preliminary notification of approval some 10 months after receiving the application and announced that a public hearing would be held before final approval was granted by the state. BECO was unable to accept one or two of the conditions, especially one requiring epidemiological studies.

BECO produced a voluminous environmental report as a basis for the Corps of Engineers' environmental impact statement. This served also to provide the information necessary for various other permits and revealed a number of matters requiring design modifications.

The elected representatives of Brunswick County were much in favour of the development, which would employ around 400 people in operation (2-3000 during construction) and yield a high tax revenue. They accordingly approved a county land use plan 'update' which redesignated the site (and other large areas) from 'conservation' to 'industry'. This approval followed a noisy public hearing at which the justification of the oil refinery became the main issue. The major last minute alterations to this plan betrayed an absence of concern for planning principles and the weakness of the local land use planning system. The Coastal Resources Commission, however, rejected the land use plan on procedural grounds (the county had not allowed adequate public notice of the changes to the plan before the hearing). A further county hearing was held and, despite official misgivings and the expression of objections from neighbouring New Hanover County and the nearby Town of Wrightsville Beach at a state hearing, the commission approved the plan in March 1981.

Shortly afterwards, in May 1981, BECO decided to withdraw its application because of declining demand for oil products. By then the estimated cost of the refinery had risen from about $400M to $1,000M; BECO had spent two and a half years and about $3M on the permitting process and was six months behind its anticipated schedule).

This case history illustrates the large number of permits that can be involved in building a major pollution source. While the granting of these is normally not at issue, delays can arise, as in the air pollution permit process. This project brought substantial local benefits and was welcomed by the local government. The refinery was carefully located away from the river and designed to make use of the existing woodland as a buffer zone to reduce air pollution. Even so, and despite strenuous public relations initiatives, the developer encountered well-organised opposition. Given its genuine willingness to meet environmental requirements by employing the appropriate technology, BECO would probably have received its remaining permits within relatively short order, despite the effectiveness of the opposition from Coastal Carolina Crossroads. Ironically, the decision involving the greatest use of discretionary powers, the amendment of the county land use plan, was the only one actually made when BECO withdrew.

The Florida resources recovery facility

Metropolitan Dade County had long had a severe solid waste disposal problem and turned for a solution to the resources recovery concept in which materials are recovered and electricity generated. The sale of bonds to finance the project was agreed in 1974 and a private company, Resources Recovery (Dade County) Inc (RRDC) was set up to manage the project and operate the facility. It was decided that it would probably be easier for Dade County to apply for all the relevant construction permits as owner of the facility.

A public hearing into Dade County's zoning application to construct the facility to the west of Miami, over a mile away from existing housing but close to an existing landfill site (tip) notorious for polluting ground water, took place in 1975. No member of the public wrote to object or appeared in person to make representations, presumably because nobody lived near enough to the site to be concerned. Dade County's planning department recommended approval and altered the comprehensive plan designation from 'agricultural and open land' to 'industrial land'. The net environmental benefits were expected to be substantial, as the existing landfill would be closed. Accordingly, in a markedly non-controversial decision, the Board of County Commissioners gave its permission to proceed.

Florida has a power plant siting law which applied to this plant as electricity was to be produced. A power plant certificate (a 'one-stop permit') subsumes most other state and local permits but, because of the length of time usually involved in certification and the necessity to obtain funding approval and to commence detailed design very quickly, Dade County decided to obtain these permits first. Permission would allow construction to start. Accordingly, Dade County applied for state air pollution construction permits in 1976 and these were granted in 1977, without any objection, on the assumption that the plant would operate six days per week. Particulate emissions were not to exceed 0.08 gr/ft^3. Application was also made for a federal prevention of significant deterioration permit which was granted, six months later, in 1978. Dade County, RRDC and the state and federal air pollution control agencies were anxious that the calculated hydrocarbon emissions would not cause the incinerator to be classified as a major source for hydrocarbons, as Greater Miami is an ozone non-attainment area and the offset provisions would apply.

Application for the power plant siting certificate was made in 1977. The consultants' documentation, which was similar to an environmental impact report, and took a considerable period of time to prepare, covered air pollution among many other topics. The state's power plant siting office reported that Dade County's sulphur dioxide standard (8.6 $\mu g/m^3$) might be violated but the state (60 $\mu g/m^3$) and federal standards for this gas and for particulates would not be exceeded. Following public hearings in 1977, at which there was again no objection from the public, a certificate was granted in 1978, five months after application had been made. This was subject to numerous air pollution control and other conditions to limit environmental problems. Because RRDC now decided that seven day per week operation of the plant was desirable, it became necessary to obtain a new state construction permit. This was applied for by RRDC and was rapidly granted.

There then arose a dispute between RRDC and Dade County about payment for construction and the price to be paid per ton of refuse treated. Construction of the plant was completed in 1981 and, although there was considerable doubt about whether any further permits were necessary (since a power plant siting certificate had been granted), RRDC applied for and received one of the several state air pollution operating permits required. The state's lawyers determined that, since the certificate had been issued to Dade County, RRDC would still have to obtain the various relevant permits, as operator.

In 1982 Dade County advised RRDC that it too required air pollution operation permits, renewable annually at a cost of over

$2,000. State and county solid waste facility operating permits were also needed. RRDC had either declined to apply for these or not been granted them in 1983 when the state reversed its earlier position and ruled that state and county solid waste or air pollution permits were, after all, subsumed by the power plant sitng procedure. The Corps of Engineers belatedly decided that a federal dredge and fill permit would be needed. This was rapidly granted.

Both the county and the state were becoming concerned about air pollution. Various letters were sent to RRDC from the county and the state (which the county constantly chivied to enforce its construction permit) about odours and visible emissions. These were always countered by RRDC stating that these problems were only sporadic and typical of most industries. Dade County was very disappointed by the plant's performance which the plethora of regulation seemed to have done little to mitigate. Numerous complaints from residents to the west of the plant now began to be received and these were instrumental in persuading Dade County to terminate its contract with RRDC. The new management company has improved the plant's pollution performance and achieved a reduction in the level of complaint.

The regulatory confusion that can arise in the United States is illustrated by this case. The 'one-stop' power plant siting process took only five months to complete and, in the end, was ruled to subsume most of the other overlapping state and local permits. The power plant siting permit was notable for the numerous air pollution control conditions attached to it. However, neither these nor the

state and local air pollution permit conditions proved particularly helpful when the resources recovery facility started to cause pollution problems. Indeed, it took a change of management, and therefore of attitudes, not the enforcement of land use or air pollution control powers, to achieve any real improvement in pollution levels.

The Maryland solvent recycling plant

In 1961 the Galaxy Chemicals Company opened a small solvent recycling plant on the site of a former paper mill at Providence, Cecil County, Maryland, in the steep-sided, sparsely populated valley of the Little Elk River. This was before the county's 1962 zoning ordinance was passed, in which the site was designated 'industrial'. Numerous complaints ensued, many of them from a local doctor, a resident in the valley, who claimed that he had detected benzene, toluene and other carcinogens in the air and in the river and that the level of cancer in the local population was much higher than expected. In 1970 the Maryland Department of Health and Mental Hygiene was granted an injunction to prevent the company from emitting odours and the plant was closed down for extensive refurbishment in 1971.

The doctor moved away but continued his campaign and attracted national publicity, through the Washington Post, for his findings about 'Cancer Valley'. A state investigation took place in 1974 but, though the presence of odours and elevated cancer levels were acknowledged, it was never possible to prove that these were due to the Galaxy plant. Galaxy Chemicals was declared bankrupt in 1975, but recommenced operations at Providence as Spectron Inc. Some 20 legal cases relating to pollution involving the company had taken place between 1969 and 1975, many of which it lost. The owner of the company, a chemical engineer, trained as a lawyer to lead his own cases.

Cecil County politicians and officials were obviously perturbed by the pollution incidents and by the gradual expansion of the plant. When a county-wide rezoning took place in 1979, it was decided (not without considerable controversy) to rezone the area concerned 'agricultural', thus making the plant a non-conforming use and rendering legal expansion virtually impossible. Nevertheless, expansion continued, amid much bad feeling and with considerable legal activity, which began to affect Spectron's operations.

A new recycling contract was offered to the company in 1980. Because further expansion at Providence now seemed unlikely, the owner of the company bought a second disused paper mill site (zoned for industrial use) at Childs, about three miles down river and within a few hundred yards of some expensive houses. The owners of these determined to oppose the proposed operations. One resident set up a group called Residents for Unpolluted Neighbourhoods which waged an emotional campaign to prevent developments at all costs. Another pressure group, the Little Elk Creek Civic Association, was formed to oppose the facility but took the fall-back position that, if it was installed, it should be subject to stringent environmental controls.

The Air Management Administration of the Maryland Department of Health and Mental Hygiene was subjected to considerable public (and political) pressure to refuse Spectron a permit to construct at Childs. The principal arguments were the inappropriateness of the site, the likelihood of odours and the previous poor record of the company. While an official admitted that the site was 'still not a good location' and acknowledged Spectron's poor reputation, the agency insisted that location was a land use matter for the county to decide. Since total emissions under normal conditions were only expected to be around 0.5kg per hour, the permit was issued subject to various conditions, some (including a requirement to install an activated carbon filter to reduce odours) inserted as a result of oppostion from the residents.

Spectron felt that, since the Childs site was zoned for industry, no county land use permit was required. However, the county Office of Planning and Community Development insisted that a site plan containing a large quantity of information be submitted before a zoning certificate could be issued. Spectron appealed to the county Board of Appeals against this decision and was opposed by both the county and the residents, who also acted as liaison between the state and county agencies. After a heated hearing, the appeal was rejected and the residents' association attempted to buy the Childs site. Spectron lodged an appeal to the courts.

It had become apparent, however, that an accommodation would have to be reached with the county if the company was to fulfill its new contract. Accordingly, after protracted and frequently acrimonious negotiations, the owner signed a legal agreement with the county in 1982 to withdraw his appeal, vacate the Providence site by 1993, forego the Childs site and build a new one on an industrial park - in return for $3M in industrial revenue bonds which provided Spectron with low cost financing. The long-running pollution saga, which appeared to be resolved to the satisfaction of most of those involved, was however not yet over as the developer petitioned the county in 1984 to release Spectron from the closure date stated in the agreement. Needless to say, the county refused. Complaints have continued to be received and the state air management administration has had to take several further enforcement actions. Regrettably, the evangelically zealous chairman of Residents for Unpolluted Neighbourhoods could not accept that their legitimate opposition was bearing fruit. He was indicted on a charge of paying an undercover police officer to destroy the buildings on the Childs site just before Spectron's agreement with the county was signed.

Notwithstanding the earlier closure of the Providence site on air pollution grounds, the different degrees of discretion available under air pollution control and land use planning legislation can be seen clearly in this case. The air construction permit for the Childs site was amended to include extra conditions but the land use planning ordinance was interpreted to mean that the application should be refused on the largely procedural ground that no site plan was submitted. It was this refusal, and the use of similar discretionary powers at the Providence site, that paved the way for the negotiations leading to the agreement to relocate. While the burden of proving that pollution from Spectron's plant was causing cancer was beyond the state, the county was more prepared to accept that the relationship existed, or at least that the local residents believed it existed. The county arranged a relocation of the plant partly, no doubt, to retain the employment and property tax revenue benefits it conferred but largely to accommodate its persistent owner. The new location should, at the very least, allow much better pollutant dispersion than the confined valley site at Providence.

<u>The Oregon energy recovery facility</u>

The Portland Metropolitan Service District (Metro) obtained land use and air pollution permits to construct a resource recovery plant in Oregon City, near Portland, in 1977 and 1980 respectively, without difficulty. The EPA PSD permit specified that particulate emissions should not be more than 0.04 gr/ft^3. Following a reorganisation of Metro, the design of the facility changed to energy recovery, an agreement being signed with the Publishers Paper Company to deliver steam via a pipeline. The 10 acre site lay next to a landfill and about a quarter of a mile from numerous residential properties. The plant was to be privately constructed, owned and operated and Wheelabrator-Frye Inc were chosen as the operating company.

Metro applied to Oregon City for a conditional use permit for the energy recovery facility in October 1980. A joint meeting of the Oregon City Planning Commission and the Zoning Board of Adjustments was held in November, at which several members of the public spoke. More information was demanded. An independent report was commissioned which concluded that there would be no significant air pollution impacts and that 'present data on dioxin emissions is not sufficient to curtail the proposed energy recovery project'. The planning staff of Oregon City prepared their own report and recommended conditional acceptance of the project. Following three further joint meetings, at which vociferous opposition to the plant was expressed and petitions presented, the appointed planning commissioners voted unanimously to grant permission subject to 25 conditions.

The objectors appealed to the city council against this permission. Rival opponent (Oregonians for Clean Air) and proponent (Citizens for Common Sense) groups were formed and two further lengthy meetings ensued at which evidence for and against the proposal was presented by numerous speakers. Eventually, the permit was approved 4-1, the lone vote of protest being cast by a commissioner who had become a dedicated opponent of the scheme. 29 conditions were appended including nine relating to air pollution control. One of these, conceded by Metro, required a scrubber as well as an electrostatic precipitator to be fitted to reduce emissions of sulphur dioxide and other acidic gases by about 75%. Another related to payments in lieu of property taxes if Metro, rather than a private company, operated the facility. The objectors now appealed to the Oregon Land Use Board of Appeals against the unenforceable nature of certain of the permit conditions and against procedural improprieties. However, because they had not lodged their appeal within 30 days, it was dismissed in November 1981.

The application for a permit to discharge air contaminants was lodged in June 1981. It ran to several hundred pages and proposed that emissions of particulates (at not more than 0.02 gr/ft^3) would be about 150 tons per annum and of sulphur dioxide about 600 tons per annum. The treatment of the application by the Air Quality Division of the Oregon Department of Environmental Quality was complicated because, whilst the whole area was in attainment for sulphur dioxide, parts were not in attainment for particulates, ozone and carbon monoxide. Sulphur dioxide would thus be subject to PSD regulations administered by EPA but particulates and hydrocarbons would be subject to the more stringent non-attainment regulations and offsets would be required. The air quality division demanded more information and re-modelling.

Meanwhile, Oregonians for Clean Air organised a ballot in Oregon City against the facility but lost narrowly. Changes to the project took place and, to avoid being subject to power plant siting regulations (more than 25 MW was now to be generated). Publishers, the electricity user, obtained a special dispensation from the state senate. EPA reported that dioxin from incinerators posed no human health risk and its PSD permit was granted in June 1982. The air quality division determined that the lowest achievable emission rate for particulates was 0.015 gr/ft^3, giving 84 tons per annum. Metro agreed to provide offsets of 10 tons by landfill closure and 74 tons by operating a burnable garden rubbish collection scheme at an annual cost of $70,000, adjusted for inflation. Redefinition had shown that the locality was not, after all, subject to hydrocarbon offsets. The state weakened some of its other conditions at the developer's request.

A long established pressure group, the Oregon Environmental Council, was now pressing for a fuller analysis of sulphur dioxide impacts on state standards and a lengthy public hearing into the proposed state permit was held in July 1982 at which the problems of securing offsets, sulphur dioxide control and the health effects of dioxin were three of the main issues. The state consequently demanded 80% scrubbing efficiency, reducing sulphur dioxide emissions to 168 tons per year in its revised draft permit.

The one dissenting planning commissioner had meanwhile obtained enough names to have the energy recovery facility placed before the electorate in Oregon City and in the surrounding area once again. The neighbouring City of West Linn formally voted against the project. Publicity campaigns involving canvassing, press, radio and television were mounted by both sides, with impassioned and not always accurate statements being made by Oregonians for Clean Air. The Oregonian had been printing articles sympathetic to the objectors' position for some time. Now the vote was against the facility, even in Oregon City. Metro felt it had no alternative but to withdraw the scheme and revert to landfill elsewhere despite an expenditure by Wheelabrator-Frye and itself of over $2M on the permit application process. The commissioner had failed to prevent the grant of the land use permit and the grant of the air containment permit was in train, but he succeeded in killing the project on an initiative ballot, despite the substantial reductions in emissious conceded during negotiations.

This case demonstrates the complexity of the air pollution permit process, with the state both employing complex models and endeavouring to maximise the reductions of low level emissions in its particulate offset arrangements. It also illustrates the discretion available to air pollution controllers, as conditions were adjusted at the behest first of the developer, and then of the objectors. In the end, the air pollution control conditions would have been much more stringent than those imposed in 1980, when little controversy had arisen. The financial attractions of the energy recovery facility had persuaded most Oregon City representatives to approve the project and they ensured that revenue in lieu of taxes would be received if Metro operated the plant. While the city was thus bound to seek mitigation of impacts and not refusal in its land use permit process, its involvement in setting air pollution control conditions appears to have sprung directly from the nature of Oregon's comprehensive land use planning system. The uncertainties and fears associated with dioxin pollution undoubtedly helped the objectors to persuade the local population to vote against the project.

The California refinery modification

Chevron Inc has operated a refinery in Richmond since 1902. Chevron proposed to modify its existing plant, which is a very major pollution source in the San Francisco Bay area, in order to upgrade its output and add flexibility of operation. Chevron believed it needed permits only from the City of Richmond and from the Bay Area

Air Quality Management District. At first Richmond did not feel that an environmental impact report under the provisions of the California Environmental Quality Act would be required because no discretionary permit appeared to be involved for a use classified as 'non-conforming' in the city zoning ordinance. Chevron, however, was anticipating opposition to its project and was determined that no procedural objection could be sustained, and it was agreed to require an environmental impact report before a minor traffic permit could be issued.

Chevron applied for this traffic permit in September 1980 and submitted a project information form putting the cost at $390M with a construction workforce of 1,200 and a permanent workforce of 25 (later raised to 45). It was apparent that the main topic in the environmental impact report would be the effect of air pollution.

An agreement was reached with EPA and an application for authority to construct a pollution source was submitted to the air quality management district in March 1981, following preliminary discussions. The 200 page document was eventually deemed complete, following the provision of more information and $11,000 in fees, in August 1981. Chevron's position was that, because of emission reductions already banked or anticipated from the modification, there would be no emission increase and hence no need for complex modelling, and that no additional throughput would be involved. The district felt that a 25% increase in throughput, and hence emissions, was possible and that conditions would be necessary to control these. Eventually, the two sides agreed that a 'bubble' or 'cap' covering most of the refinery operations would be utilised and that 'no net increase' in emissions would ensue. A formal 'summary of analysis' was released in November which drew criticism from Citizens for a Better Environment, the local branch of a national pressure group, on the grounds that higher hourly, daily or weekly emissions might result and that the permit resulted from negotiation, which was 'inappropriate'.

The district decided to modify its objective to that of a 'net decrease' over the year by demanding offsets in a ratio of 2:1 against the annual base line emissions for refinery and wharf operations. A further summary of analysis was issued in March 1982 specifying emission reductions which, though only a very small percentage of overall emissions, were mostly considerably greater than the figures originally advanced by Chevron. Despite further protests from Citizens for a Better Environment about the lack of hourly, daily and weekly emissions limits, the authority to construct was issued in April 1982.

Scoping for the environmental assessment report started in February 1981 and the draft, prepared by consultants, was published in December 1981 and distributed for comment. A public hearing was held and the final report (which cost about $200,000) was released in March 1982. Citizens for a Better Environment raised numerous objections on the air quality section both in writing and at a public hearing before the City of Richmond Planning Commission. It had now been determined that a conditional use permit under the zoning code would be necessary and this was granted by the commission after Chevron had agreed to contribute $750,000 for traffic management measures and road plans. Conditions relating to road sprinkling and other matters raised by the EIA were also appended. Citizens appealed against the grant of this permit and, at a City Council hearing, stated that the project was a 'bad deal for air quality' and that the opportunity to control total emissions from Chevron had been squandered. However, once again, Citizens lost and the appeal was denied by the council at the end of March 1982. Citizens decided not to appeal to the courts as it felt it had a better chance before the Bay Area Air Quality Management District Hearing Board.

Despite several court cases originated by Chevron to deny the pressure group access to the board, Citizens appealed against the district's permit decision and the hearing commenced in May 1982. Only the pressure group's argument about increases in hourly, daily and weekly emissions was admitted by the board, which rejected the appeal in March 1983. The board felt that the district's rules allowed sufficient discretion for the permit to be procedurally correct. Citizens' application for a rehearing was refused and no appeal was made to the courts as the group was by now over-stretched. The lube oil project was completed in 1985.

Chevron stated that the new approach adopted by the district to 'bubbles' penalised the company but most observers felt that, partly because this was a relatively uncontroversial modification project, Chevron had been awarded a generous permit, even if it had conceded further emission reductions during negotiations. Without the involvement of Citizens for a Better Environment, however, it seems likely that only the 'no net increase' permit would have been obtained by the district. There was clearly enough discretion available to have obtained more stringent conditions. There was never, at any stage, the slightest hint that either the City of Richmond permits or the Bay Area Air Quality Management District permits would not be forthcoming. The attitude of the city to this important source of employment was indicated by its omission to recognise the need for a use permit. Negotiations (which appear to have been quite proper, despite Citizens' protest) were always geared to mitigation of impacts. These led, among other concessions, to the contribution to road plans and traffic management measures. The whole permitting process must have cost Chevron well over $1M. Though the outcome was never in doubt, the opportunities for protagonists to appeal and to take legal action were still very evident.

The California chemical production facility

In early 1975 Dow Chemical Company unveiled plans to build a $500 million chemical production facility on the banks of the Sacramento River 35 miles north east of San Francisco. Much of the complex was to be built on a 2,700 acre site in rural Solano County, and connected by submerged pipelines to the rest of the complex to be constructed in the industrialised town of Pittsburg, just south across the river in Conta Costa County where Dow had operated another chemical plant since 1940. The new works, designed to produce basic chemicals such as styrene, vinyl chloride and ethylene was expected to employ 1,000 construction workers and 800 permanent staff. The site was classified as non-attainment for particulates, hydrocarbons and ozone.(2)

Solano County, a small, fast-growing jurisdiction calculated that Dow would add 14% to its assessed valuation without bringing in many new residents. It was therefore much in favour of the project. Dow needed a total of 65 permits and approvals, including rezoning of the prospective site from agricultural to industrial; cancellation of an open-space designation and certification of an environmental impact report by the county and numerous air emission permits from the Bay Area Air Pollution Control District (now called the Air Quality Management District).

Dow engaged local consultants and lawyers. The consultants started work on the environmental impact report in 1974 and, in December 1975, the county certified the report, despite reservations expressed by several state agencies. The county zoning board then rezoned part of the site from agricultural to industrial use and cancelled a contract preserving the rezoned land for agricultural use. The county then started drawing up a specific industrial development plan for the area. However, Friends of the Earth, the Sierra Club and a San Francisco group called People for Open Space appealed against this decision to the county court, fearing that the rezoning and other county actions, which they believed to be contrary to California law, would establish damaging precedents.

On 4 May 1976, after months of negotiations, Dow formally submitted its request to the air pollution control district for permits to build the styrene plant. The district, though it had refused some permits in the past, had a reputation for flexibility in negotiating permits within the compass of its rules. The main pollutants were particulates, sulphur dioxide, oxides of nitrogen and hydrocarbons. Dow's air pollution control equipment was deemed to be more than adequate but, following modelling, it was determined that emissions of particulates and hydrocarbons exceeded the 'significance thresholds' set in the districts' regulations current at the time and the district, therefore, had to deny the permits under a rule which prohibited authorisation of any new facility 'which may cause the emission or creation of a significant quantity of any air contaminant which would interfere with the attainment or maintenance of any air quality standard'.(3) A preliminary denial was issued on 8 July 1976, and a public hearing into Dow's appeal took place on 19 July in Solano County.

Over 600 people attended this noisy hearing, most of them in favour of the project. However, it was explained that the district had no leeway to grant the permit under its rules. One moderate business leader in the Bay Area argued that 'economic and political factors deserved equal weight with air quality. The air district in effect has become the land-use agency for the Bay Area and probably put the lid on economic development'.(4) Notwithstanding, the district reaffirmed its earlier denial on 12 August. Dow had been a victim of the basic difficulty of articulating a balance between air pollution control and development inherent in the Clean Air Act.

Dow appealed against this decision to the district hearing board. Just before this was heard, the district's directors reconsidered the rule causing the difficulty but refused to amend it pending further study. The appeal hearings went on for several weeks and were technical and legalistic. They were adjourned on 28 October 1976, additional hearings being scheduled for the near future.

Dow also had difficulties obtaining the necessary approvals from state agencies who, even though they had already responded to the environmental impact report, kept asking for further information. A federal environmental impact statement was generating further questions. Governor Brown called for a consolidated hearing on Dow's applications for state permits and directed state agencies to submit a final list of questions about the project. These meetings resulted in the prospect of having completely to rewrite the environmental impact report and the company cancelled the project on 18 January 1977, blaming the state for bureaucratic delays and environmentalists for obstructionist tactics. The court case, the air permit hearings and the federal environmental impact statement were never completed. It is not clear, however, that Dow did not have its own additional reasons for cancelling the project.

In California, the effect of this decision was immediate and the regulatory pendulum swung back towards development. At the national level, the Environmental Protection Agency adopted the 'offset' policy to accommodate industry in dirty air areas. The Bay Area Air Quality Management District adopted similar regulations and, were Dow to have reapplied, it could have reduced emissions at its existing Pittsburgh plant to provide the offsets for the air pollution from its new complex and thus been granted its permit.

This case remains a very unusual instance of a serious developer being refused an air pollution permit. It is also interesting because of the attempts by various state agencies to investigate the impacts of the development further, after they had agreed to the relevant sections in the EIA, which obviously did not serve its desired anticipatory purpose. While most state officials were seeking mitigation of environmental effects, some were undoubtedly seeking delay or refusal. Solano County, because of the revenue and employment benefits, had precipitately granted the necessary local land use permits. The involvement of several major groups of objectors in a wide variety of permit procedures and appeals, which afforded adequate opportunities for frustrating Dow, was notable.

Notes and references

1. For histories involving the use of anticipatory powers (other than land use planning powers) over new air pollution sources not mentioned elsewhere in this work, see for example, Department of Energy (1981) 'Energy and Environmental Quality : Case Histories of Impact Management' Office of Environmental Assessments, Regional Impacts Division, DOE, Washington, DC; and Liroff, R A (1982) 'Oysters vs Oil - a Case Study of the Portsmouth, Virginia Oil Refinery Siting Controversy' unpublished account, Conservation Foundation, Washington, DC.

2. This account is derived from Duerkson, C J (1982) *Dow vs California : a Turning Point in the Envirobusiness Struggle* Conservation Foundation, Washington, DC. See also, Storper, M, Walker, R and Widess, E (1981) Performance regulation and industrial location : a case study *Environment and Planning A 13* 321-338; and Blowers, A (1984) *Something in the Air : Corporate Power and the Environment* Harper and Row, London, pp 317-318.

3. Duerkson, op cit, p 59.

4. Ibid, p 64.

6 ANTICIPATORY CONTROLS OVER AIR POLLUTION IN THE UNITED KINGDOM

This chapter is devoted to an explanation of the systems of air pollution control and land use planning in the United Kingdom. It follows much the same pattern as Chapter 4, which described the United States. The first section analyses the context for environmental regulation generally. There is a brief discussion of the physical characteristics of the United Kingdom and its climate. Together these explain the 'stewardship ethic', the unitarian view of the public interest, the trust of public officials and the consequent concern with ends rather than means. The local government system, which was completely reorganised in 1974, is chronicled and the relative independence of British planning officials is explained. The uncontroversial environmental regulation system and the nature of the collaboration between government and business in the UK are discussed.

The next part of the chapter, on air pollution control, follows the same pattern as the corresponding section in Chapter 4. Pollution trends are briefly described, the legal framework is again outlined and the provisions relating to both registered and non-registered stationary sources are explained. The section on practice is concerned mainly with the activities of the Industrial Air Pollution Inspectorate in implementing the Alkali, etc. Works Regulation Act 1906. There is, however, some emphasis on the role of environmental health departments in air pollution control.

The next part of the chapter deals with land use planning control. As in Chapter 4, the legal framework is outlined and the provisions relating to development plans and development control are explained. The next section includes a discussion on the extent to which air pollution goals have been considered in planning practice, and this is elaborated in the following section, which presents an examination of the role of land use controls in abating air pollution.

CONTEXT

Physical characteristics

The United Kingdom is only about the size of Oregon (244,000 square kilometres) but had a 1983 population of almost a quarter of the USA's (56,400,000),[1] giving a population density nearly 10 times that of America (229 persons per square kilometre). Thus, in comparison with the USA, Britain is a densely populated little island.

The 'stewardship ethic' which has long prevailed in the United Kingdom is in marked contrast to the US frontier ethic. The scarcity of land and the cultural appreciation of the British (and particularly the English) landscape and historical heritage has led many property-owners to acknowledge a 'public trust' component to their ownership of land. The aristocratic concept of managing land to leave it enhanced, or at least not degraded, for the enjoyment of heirs is quite different from the American land ethic. The result is that many property owners have been willing to accept stringent restrictions on the use of their land in the public interest. The postwar planning legislation of the late 1940's, which was genuinely radical, thus enjoyed widespread support from most sections of the population.

In the United Kingdom, about 19% of land is in public (central and local government plus statutory undertakers) ownership[2] but a public right of access exists only over a small proportion of this land. Although historic footpath rights exist in Britain, the desire to obtain a greater degree of public access to areas of outstanding scenic beauty while preserving private agricultural and estate management interests was one of the reasons for the setting up of the British national parks and the growth of land use controls. Another reason is the fact that very little of the UK land is neither farmed (even if this means grazing or forestry) nor in urban use. Prevention of change of use from agriculture in a country with recent experience of food shortages in two world wars has become, perhaps understandably, almost a national obsession.

The feudal history of Britain, which eventually led to the stewardship ethic, has also made British society more hierarchial and class conscious than American society. It is also far more culturally homogeneous, despite its recent racial problems. (Persons of West Indian, Indian, Pakistani and African birth only constitute about 3% of the total population.[3]) In short:

> Relative to the United States, the United Kingdom is a society which appears to exhibit a high degree of consensus and agreement on certain basic values as well as mechanisms for engendering acquiescence. (4) (emphasis in original)

In contradistinction to the United States, the homogeneity of British society has led to a concern with product or ends rather than process or means. This may be seen in the concept of fixed target populations in the master plans for cities, in the emphasis in planning on the physical distinction between town and country and in the discretion allowed to appointed or elected representatives to take ad hoc decisions on land use and air pollution control.

It has also led to the 'unitary'view of the public interest:

> British planning has sought to deal with this

> multiplicity of goals by ignoring it. Its method stems from a characteristic model of political organisation, which Meyerson and Banfield have called unitary. In it decision takers have an organismic view of the public interest; all other interests are subordinated to that of the social 'organism'. This is opposed to a utilitarian view, which would essentially consist of trying to compare and sum up individual pleasures and pains. A unitary concept of politics, Meyerson and Banfield conclude, is natural to upper - and upper middle - class people. It is small wonder, given the natural tendency to elite government in Britain, that the unitary view has prevailed. (5)

The unitary or organismic view of the public interest implies the existence of central decision makers who are considered particularly qualified to adjudge common ends and:

> who can perform the largely technical function of adapting means most efficiently for the attainment of these ends, and who have the power to assert the unitary interest of the 'whole' over any competing lesser interests. (6)

This view helps to explain both the greater acceptance of land use controls and the greater propensity to design environmental protection regulations which leave considerably greater discretion to the individual official in the UK as compared with the US.

Climate

The temperate climate of the United Kingdom is less extreme than that in most parts of the United States. Britain lies north of the most northerly point of the 48 conterminous states; it is thus cooler and evaporation and transpiration are lower. An annual rainfall of less than 100 cms, which is typical of much of Britain, is considerably less than that in much of the eastern United States. This rain falls more gently than in America and, since vegetation thrives, soil erosion is much less serious.[7] Temperature ranges are also much smaller and the seasons are far less clearly demarcated than in the US.

The climate of Britain partly explains the British attitude to air pollution. London, which stands in a shallow basin, became notorious in the age of Dickens for 'pea-souper' fogs caused by smoke being trapped beneath inversion layers. However, by comparison with the United States, Britain is a small windswept land, surrounded by water, where inversions are much less common. Summer temperatures are rarely high enough to cause serious ozone problems and the wind-assisted export of pollutants emitted through high chimneys has for long been an accepted means of control. Recently, however, the complaints of Scandinavia and (of more local political significance) Scotland over acid rain have caused this 'policy' to be questioned, though air pollution control is still not high on the political agenda.

The urban tradition in the UK, which has been rather different from that in the US, provides another reason for differing perceptions. The proximity of industry and housing in densely populated cities has led to an acceptance of industry by the residents. The UK air pollution problem has historically been mainly domestic, rather than industrial, in origin and has been recognised as such by the majority of the population. While industrial pollution problems exist, of course, there is no general belief that industry is the sole cause of pollution. Many people remember how bad smog (smoke plus fog) used to be and remember changing from coal fires to cleaner fuels. They participated in the improvement they witnessed.

These factors lead to a crucial difference in view about air pollution and its control between the USA and the UK. The British appear to accept that the consumption of goods, as well as their production, causes air and other types of pollution : the Americans seem very reluctant to recognise this (see Figure 3.1).

Government system

The United Kingdom of Great Britain and Northern Ireland is a constitutional monarchy consisting of four countries: England, Wales, Scotland and Northern Ireland. While there exist, for executive purposes, the separate ministries of the Department of the Environment (created in 1971 to centralise control over environmental matters in England), the Welsh Office, the Scottish Development Department, and the Department of the Environment for Northern Ireland, each responsible for a wide range of functions relating to the physical environment (including much pollution control and land use planning): the policies these ministries execute are made by the central government in legislation approved by Parliament. Central government retains much greater control than in the US, there being no subsidiary legislative authorities equivalent to the states. A significant consequence of this centralisation is that much air pollution control is undertaken directly by a central government body, the Industrial Air Pollution Inspectorate.

Local government in the United Kingdom is the responsibility of elected local authorities which provide services under specific duties or powers laid down by parliament and subject to a high degree of central government control. In England there were 46 county authorities in 1985, within which there were 364 district authorities each with an average population of over 100,000. Every acre of land thus fell within the administrative areas of both a district and a county. Broadly speaking, the counties are responsible for strategic planning and such matters as refuse disposal whereas the districts are responsible for the vast majority of planning control and some types of air pollution control.

In Wales there are eight county and 37 district authorities and the division of environmental responsiblities is much the same as in England. The mainland of Scotland is divided into nine regions within which there are 53 districts. The regional and district authorities exercise a separate range of functions in much the same way as the counties and districts in England. Orkney, Shetland and the Western Isles each have a single, virtually all-purpose authority. The legal system in Scotland is rather different from that in England and Wales. In Northern Ireland local environmental services are administered by the 26 district councils but planning is undertaken by the Department of the Environment for Northern Ireland.[8]

Local government now receives over half its income as grants from central government. This not only increases the dependence of local government upon the centre but means that much of the benefit it may receive in increased rates (local property taxes) from a new source of industrial air pollution will be lost by an adjustment of its grant from central government. For this reason and because local authorities in Britain are large, the direct revenue benefits of constructing new industrial premises to local communities are not very great. Job creation is a central objective of most local authorities, however.

Contrary to the general view of the integrity of the British civil service, local government is not without taint of corruption, though the scale of such problems has certainly never been remotely comparable to American city graft. Between 1964 and 1974, 16 elected local government representatives and 22 officials were convicted of receiving bribes (of which a few were related to planning matters). Since the notorious Poulson case, however, there has been a reform of practices and fewer convictions have been sought.[9] Generally, however, the suspicion of government so prevalent in the USA has not extended to Britain where local governments are considerably larger and far less parochial.

In both the US and the UK there is an intimate relationship between public and private power or economic and political management. This is perhaps strongest in the UK but in both countries it can act, as Enloe stated, as a counter 'against taking decisive action to limit man-made environmental hazards'.[10]

Environmental regulation

The United Kingdom, in marked distinction to the United States, uses broad enabling legislation and flexible rules based upon various local environmental, economic and technological factors. This system, which is not open to such significant public scrutiny as in America, permits much greater freedom to choose control methods but requires a degree of mutual trust and co-operation between the regulatory officials and regulated firms that may not always be present. As Peacock has stated:

> Legislation is usually couched in language which implies a fairly wide scope for discretion and interpretationon the part of the agents empowered to make and enforce regulations. The words 'as far as is reasonably practicable', which appear with such regularity, are obviously intended to provide a degree of latitude to both the regulators and the regulated. (11)

The main permit a developer needs to acquire is planning permission from the local authority and this is the only process which is open to significant public scrutiny. Negotiations between the developer and pollution control authorities over the very limited number of permits required normally takes place in private. While appeals are reasonably common, there have been very few environmental court cases and transaction costs for developers are usually small.

Environmental regulation has been relatively uncontroversial in Britain. With the exception of some of the reports of the Royal Commission on Environmental Pollution, there has been a notable absence of influential proposals to improve the efficiency of British environmental policy.

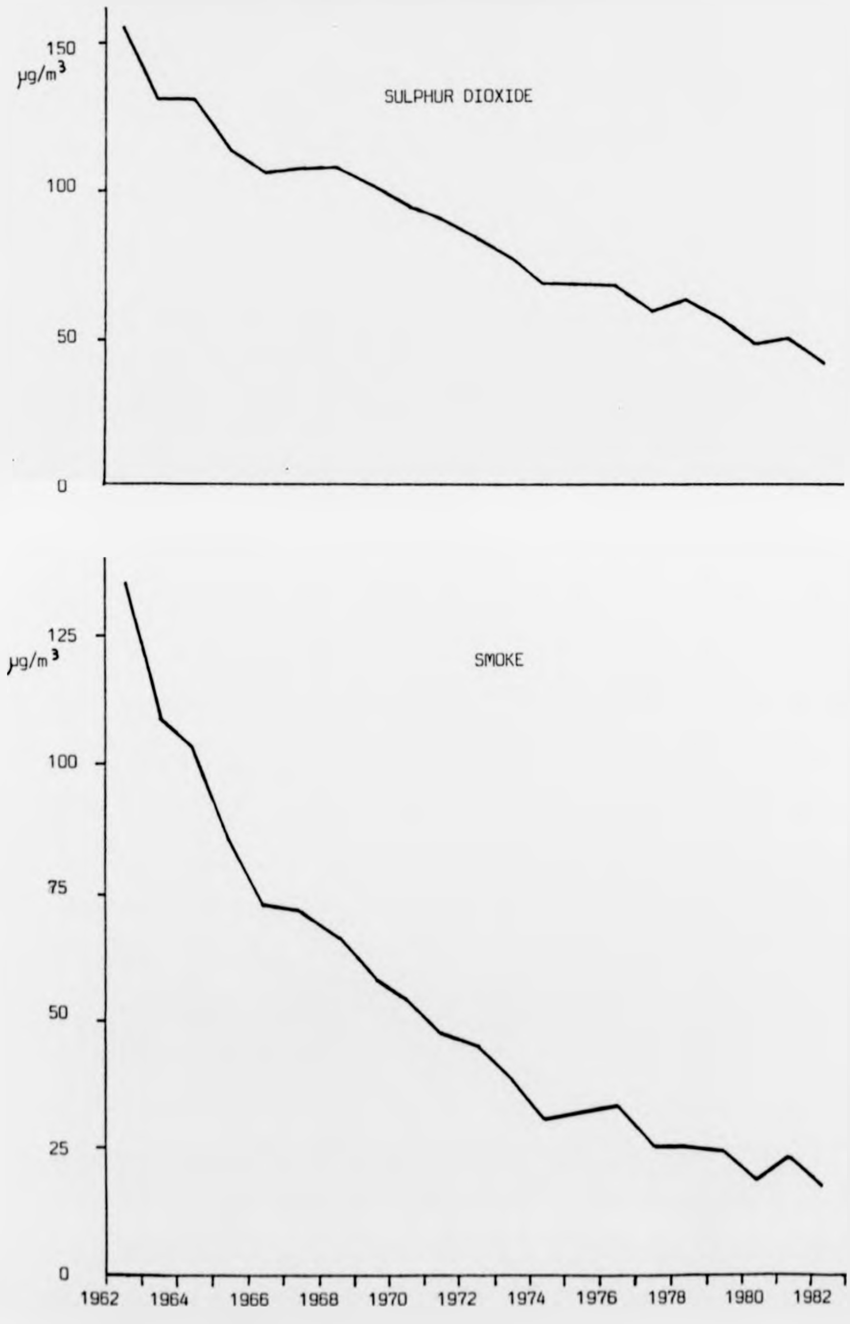
AIR POLLUTION CONTROL

Trends

The United Kingdom, like the United States, has experienced a significant improvement in air quality in recent years: at least so far as smoke (suspended particulates of less than 15 $\mu g/m$ in size) and sulphur dioxide are concerned. Figure 6.1 shows the trends in the emissions and concentrations of these two pollutants. While there has been some dispute as to the precise contribution of the smoke control area provisions of the 1956 and 1968 Clean Air Acts, there is no doubt that changes in domestic heating methods have been instrumental in bringing about the reductions in concentrations observed. There are now about 5,500 smoke control orders covering over 8,000,000 premises.[12] In addition, the replacement of obsolete housing stock in the inner cities by modern residential development with smokeless forms of space heating leads automatically to de facto smokeless zones. Large-scale urban renewal has also afforded an opportunity to remove long-standing 'bad neighbours' such as animal treatment works, dye works, tanneries, etc from residential areas.

Industry has also made its contribution to amelioration. There remain, of course, isolated pockets of high concentrations of smoke and sulphur dioxide, but attention in recent years has begun to focus on the health effects of specific pollutants (notably lead) and on other generally unmonitored pollutants from industrial and vehicular sources. Elevated concentrations of ozone have been detected on hot days in London and other parts of Britain, indicating that photochemical smog can no longer be ignored.[13] However, the levels

FIGURE 6.1 UK AIR QUALITY TRENDS 1963 - 1983



Source: adapted from reference 12

have generally been lower than those recorded in the United States and, as yet, the only controls over mobile sources of air pollution have related to the lead content of gasoline and the opacity of exhaust fumes.

Legal framework

Like the United States, the United Kingdom has suffered from a number of notorious air pollution incidents. Early problems from the burning of coal in London led to several prohibitions and other attempts to control smoke. Further, rather ineffectual, measures were enacted in the 19th century, aimed at preventing the smoke problem arising in numerous industrial cities. The Public Health Act dates from 1875, though more limited powers had been enacted earlier. Emissions of hydrogen chloride from alkali works on Merseyside led to damage to grasslands and cattle in the middle of the 19th century. This could not be controlled under the existing inadequate smoke control legislation and the first Alkali Act was passed in 1863 to cope with the problem.

Nearly a century later, the celebrated London smog (smoke plus fog) of 1952 was estimated to have led to some 4000 excess deaths due to the exacerbation of bronchitis, emphysema and other lung diseases. The Beaver committee on air pollution was set up as a consequence of this catastrophe and the Clean Air Act 1956 was the direct outcome of its deliberations.[14] The Control of Pollution Act 1974 was, at least as far as air pollution control was concerned, largely a codifying measure. As in the United States, anticipatory control over stationary sources is fragmented among various legislative provisions relating to pollution. There is some, partial, control over pollution from motor vehicles and, under pressure from the Commission of the European Communities, air quality limit values and targets for suspended particulates, sulphur dioxide and lead have been adopted.[15]

'Registered' stationary sources

Created by an Act of Parliament in 1863, the body now styled the Industrial Air Pollution Inspectorate (IAPI), previously Her Majesty's Alkali and Clean Air Inspectorate and before that the Alkali Inspectorate, has come under the jurisdiction of various central government departments; but since 1975 it has formed one constituent of the Health and Safety Executive, under the authority of the Health and Safety Commission. The principal function of IAPI is the enforcement of the consolidating Alkali, etc. Works Regulation Act 1906, as amended by successive laws, orders and regulations.[16] The purpose of this recondite body of legislation has been the control of certain noxious atmospheric emissions from a number of specified chemical, metallurgical and other industrial processes. The processes which have been added to the Inspectorate's jurisdiction are those which, by virtue of their complexity in terms of air pollution control, are considered to require a greater degree of technical expertise than can generally be expected to be possessed by local authority environmental health departments (the bodies responsible for the control of non-registered sources). Thus the sources emitting the largest quantities of, and the most active, pollutants are registered with IAPI: power stations, oil refineries, most chemical works, fertilizer plants, most lead works, many smelters, etc.

The Act of 1863 and the Inspectorate's original appellation both derive from the early 'alkali' (Leblanc) process for the manufacture of sodium carbonate, the first stage of which involved treating rocksalt with sulphuric acid. The first Alkali Act required that only 5 per cent of the hydrogen chloride gas generated during this process be allowed to reach the atmosphere. An Act of 1874 imposed another statutory limit on hydrogen chloride emissions from alkali works and introduced what is now the crucial concept of 'best practicable means' (BPM); namely, measures which operators of alkali works must take to prevent or limit the discharge of certain specified noxious gases.

For all but two of the sixty or so processes listed in a much amended schedule to the 1906 Act, no statutory limit on emissions is involved and control is effected solely by requiring the operators of such 'scheduled processes' to use:

> The best practicable means for preventing the escape of noxious or offensive gases by the exit flue of any apparatus used in the work, and for preventing the discharge, whether directly or indirectly, of such gases in to the atmosphere, and for rendering such gases where discharged harmless and inoffensive.(17)

Neither the Alkali Act, nor any subsidiary act or instrument, gives a definition of the term 'best practicable means'. However, the 1956 Clean Air Act does offer an elaboration of the closely allied term 'reasonably practicable': 'reasonably practicable having regard, amongst other things, to local conditions and circumstances, to the financial implications and to the current state of technical knowledge'.[18] It must be assumed that this interpretation is accepted by the Inspectorate for the Chief Inspector has stated that 'it would be unreasonable to interpret the Alkali Act differently'.[19]

Thus 'best practicable means', as enforced by the Industrial Air Pollution Inspectorate, amounts to a pragmatic system of pollution control with account taken of three broad sets of factors: local, economic and technological. The economic and technological factors are brought to bear in setting industry-wide 'best practicable means'. The local factors only come into play in adjusting the industry-wide controls to particular premises. They are of only very minor significance. Thus, in his 1981 report, the Chief Inspector made it clear that the Inspectorate's controls were intended to be uniform:

> BPM for one company are BPM for another operating the same process. Thus, where industry-wide BPM have been stipulated, the same requirements are applied consistently between companies, although local circumstances may require some variation on details. (20)

Best practicable means is interpreted sequentially, 'prevention' requiring the use of technical controls such as electrostatic precipitators, bag filters, absorbers, etc and 'discharge' requiring the use of chimneys of sufficient height to render the resulting ground level concentrations acceptable. However, 'reliance on dispersion alone means that prevention is impracticable'.[21] The legislative control requirement is taken to include not only stack emissions but the abatement of fugitive emissions, the regulation of the industrial process itself and the maintenance and proper use of equipment. As well as involving this comprehensive range of source controls, which include 'housekeeping arrangements', best practicable means also includes emission standards, in the form of presumptive limits. These non-statutory standards are set by the Chief Inspector and 'failure to operate within them may be presumed to be evidence that BPM are not being used'.[22] However, 'if a presumptive limit is exceeded, this does not imply automatically that the best practicable means are not being used'.[23]

In devising industry-wide best practicable means, the Inspectorate has tended to consider the economic consequences of the costs of controlling pollution as paramount:

> The expression best practicable means takes into account economics in all its financial implications, and we interpret this not just in the narrow sense of the works dipping into its own pockets, but including the wider effect on the community. (24)

There has been a shift of emphasis recently, to acknowledge that the benefits of control also have economic consequences.[25]

The technological factors involved in best practicable means result in changes in controls over time. This leads to the much-vaunted advantage of flexibility of control by gradually increasing abatement as knowledge progresses. Best practicable means has been described as '...an elastic band ever tightening as chemical science advanced...'.[26] Full best practicable means is reached when there is 'little or no impact on the community and with no scope for further improvements'[27] but it is often necessary to accept a lower standard. Again, there is now an increasingly overt acceptance that knowledge about the effects of pollution is a relevant consideration.

Once a particular process is, by order of the Secretary of State for the Environment and following a public inquiry, added to the schedule, the Chief Industrial Air Pollution Inspector, after discussions with representatives of the industry concerned (and, recently, consulting the Department of the Environment, the Trades Union Congress and the Institution of Environmental Health Officers) prepares a set of guidelines on the requirements of the best practicable means to be observed in the operation of that process. Subsequently, these guidelines are published as 'Notes of Best Practicable Means'.[28] Almost without exception such published notes have been prefaced by the qualification:

> These notes are not claimed to be comprehensive, but they do provide a basis for negotiation between works' management and the Inspectorate. Flexibility is left to meet special local circumstances by consultation. There are likely to be matters revealed during routine inspections which will need attention to meet...the Alkali Act. (29)

It will be apparent that the determination of best practicable means lies at the discretion of the Chief Inspector. Moreover, it has traditionally been the view of the Inspectorate that the superiority of the best practicable means approach over other systems of pollution control (for example, air quality or emission standards, pollution licences or charges) lies in its discretionary character and its flexibility both in formulation and in implementation. It might be argued that the Inspectorate has gradually assumed a degree of discretion in the exercise of its duties and, in particular, the determination of best practicable means, in excess of that originally intended by Parliament. This assertion, of course, could be tested only in the courts. However, it seems unlikely, in view of the extent of consultation with the relevant industry which precedes the determination of the best practicable means for the process involved, that such a test case will ever arise.[30]

Again, there has been a shift of Inspectorate views regarding air quality standards. In 1977, a district inspector stated that:

> One cannot control industrial air pollution by setting an air quality standard. It has been tried in certain countries, and it has been found to be not possible. It is, in almost every case, associated with a 'best practicable means' requirement. In other words, as well as air quality standards, the industry had to meet certain emission standards,... (31)

As mentioned above, the UK has now accepted air quality targets (not air quality standards - AQS) for suspended particulates, sulphur dioxide and lead, and the Inspectorate has recently commented that:

> AQS and BPM are therefore perfectly compatible, indeed complementary, in nature. ...where the AQS were breached, or in danger of being breached, it would be necessary for consideration to be given not only to the implications for BPM in the particular local circumstances (in terms of more stringent control) but also to the control of sources of pollution outside the Inspectorate's remit, and to the control of possible additional developments. (32)

This statement, which is couched in the form of a hypothetical discussion, is the strongest Inspectorate public utterance on the importance of 'local circumstances' in determining best practicable means or, indeed, of the necessity of using land use controls to prevent pollution (this is discussed below). Such recognition of the posibility of making best practicable means locally variable has not been reflected in other Inspectorate pronouncements or, apparently, in practice. It appears, however, that Parliament, in debating the bill which became the Clean Air Act, attached considerable significance to the term 'local conditions and circumstances'. The inference was that stricter standards would be appropriate where pollution was likely to be particularly serious.[33]

In deciding on <u>specific</u> best practicable means for a particular works, the district inspector,[34] acting on the Chief Inspector's behalf and following discussions with the works' management, specifies exactly what best practicable means for that works shall entail.

> The Chief Inspector, with the help of his deputies, lays down the broad national policies and provided they keep within these broad lines, inspectors in the field have plenty of flexibility to take into account local circumstances and make suitable decisions. (35)

The controls of the Industrial Air Pollution Inspectorate are both retrospective and prospective. It is of particular relevance to the anticipatory control of air pollution, however, that the Inspectorate's powers of 'prior approval' over the industries it controls extend to 'additional or replacement plant and significant modifications to existing plant'.[36] There is no minimum size for pollution sources falling within the Inspectorate's control.

While the phrase 'local conditions and circumstances' could be interpreted to include existing levels of air pollution and the proximity of housing or similarly vulnerable land uses, all the evidence appears to suggest that, if this is the case, it is true to only a very minor extent. If anything, it is interpreted to mean the firm's local circumstances, (ie financial circumstances) though this interpretation may be changing. As a Deputy Chief Inspector put it in 1978:

> We have to take the local circumstances into account; the circumstances could be employment circumstances; they could be planning circumstances; and then of course they could be local pollution circumstances. (37)

The Chief Inspector spelt out the basic philosophy of implementing best practicable means for a new plant in his 1973 report:

> In the case of new plants, where prior approval is required, designers and engineers consult with inspectors at the blue-print stage, when they learn by an interchange of information the basic requirements for emission standards, the type of prevention apparatus which will be acceptable, what instrumentation and control mechanisms will be needed, codes of good practices to be adopted, final height of dispersion, safeguards, and the like. Where corrosion and erosion are to be expected and overcome, should costly impervious materials of construction be used, or should cheaper replaceable units be made? How far should equipment be duplicated in case of breakdowns, eg fans, pumps and electrical precipitators, and what spares should be kept in stock? What extra provisions should be made to prevent or disperse excessive emissions during start-up and shut-down? These and other similar considerations are discussed. Much will depend on the value of the product and the consequences of failure. A breakdown which interferes with the amenities by producing black smoke or releasing inert dust

> is by no means so serious as a breakdown which might result in the massive release of highly toxic materials, such as chlorine, phosgene, hydrogen sulphide or toluene di-isocyanate. The design problems facing the industrialist and the Inspectorate are concerned with how far we can go along the road to perfection in protecting the public without causing financial embarrassment to the industry, or individual works, a small community, or even the nation, for in the long run it is the public which pays, directly or indirectly. Despite all the care taken in planning and designing new plant, we all know that performances do not always come up to expectations, especially when a new step forward is being taken, that excessive teething troubles can be experienced, or that unforeseen weaknesses develop. The consequence is that local amenities suffer. Shutting the plant down rarely provides an answer. Only by continued operation diagnosis and modification can the troubles be overcome. These are difficult decisions to take and the inspectorate comes in for much criticism during these unsettled times. Continual stopping and starting of process plant never gives the arrestment plant or other control units a fair opportunity to work effectively and we have been faced with many such problems as process units have scaled-up and/or become more complicated. (38)

The inference that damage may arise from pollution is very clear. That such damage is not confined to breakdowns is apparent from the 1981 report:

> Whilst the policy of avoiding demonstrable public health hazard has been achieved, BPM cannot guarantee that local environments are fully acceptable in terms of amenity and therefore free from public complaints. (39)

The adjustment of industry-wide best practicable means to specific works, notwithstanding the Chief Inspector's remarks about standards quoted above, genuinely does appear to involve 'variations in details', ie the adjustment of chimney heights:

> In deciding upon BPM the Inspectorate does not permit any emission to result in a demonstrable public health hazard, and the intention is to ensure a margin of safety. ...This practice is simply a means of assessing chimney height requirements which experience has shown will result in acceptable conditions with no demonstrable public health hazard. It must be remembered, of course, that judgements taking into account other factors, such as local conditions, are also important in the final determination of chimney heights. (40)

Again:

> The suggestion that the Alkali Inspectorate is not concerned with external quality is misconceived. We are very much concerned and are statutorily required to implement this. In most cases we have to do this by adjustment of chimney heights. (41)

Non-registered stationary sources

While the scheduled processes pose the more technically intractable problems of control, it must be remembered that the 1,900 registered works in England and Wales are greatly outnumbered by the 30,000 - 50,000 industrial premises not covered by the Alkali Act and from which significant quantities of pollutants are emitted to the atmosphere.[42] There are two such types of operation: those involving combustion processes and those employing non-combustion processes.

Where sources of pollution are not registered but involve combustion (ie industrial boilers and furnaces) the Clean Air Acts grant local authorities some anticipatory powers to forestall pollution from certain non-domestic furnaces. As well as the right to approve the height of any chimney, there is, in some cases, a power of prior approval of equipment to regulate the emission of grit and dust.[43] A local authority must not approve the height of a chimney unless it is satisfied that such height will prevent the smoke, grit, gases or fumes emitted from being prejudicial to health or a nuisance.[44] The personnel responsible for administering these controls are environmental health officers, responsible to a committee and thus to the full elected council of the relevant local government district.

Controls over discharges from combustion processes under the Clean Air Acts are not as comprehensive as those over scheduled processes under the Alkali Act. In particular, a local authority has no power specifically to limit emissions of sulphur dioxide and other gases.[45] Where the functions of the Inspectorate overlap with those of a local authority in respect of any premises then overall control is left to the Inspectorate. In these cases the Inspectorate deals with smoke, grit and dust as well as with noxious and offensive gases.[46]

Where a process giving rise to atmospheric discharges is neither scheduled nor involves combustion then (save for the right to approve the height of any chimney installed under the Clean Air Acts and to approve the establishment of 'offensive trades' designated in the Public Health Act, 1936) there is no power of prior approval available under the pollution control legislation for measures to reduce or render harmless any discharge to the atmosphere. There are numerous such stationary sources of atmospheric pollution which lie outside the scope of both the Alkali Act and the Clean Air Acts. Certain retrospective powers are available to local authorities under the nuisance provisions of the Public Health Acts once a nuisance or a danger to public health has arisen but they are notoriously difficult to enforce. Sometimes, only closure of, for example, animal treatment works, utilizing these acts, can obviate odour nuisance.[47] However, this retrospective power is clearly inferior to the right to intervene at an earlier stage and to require the installation of equipment, the observance of operating procedures and the limitation of emissions which ensure that the risk of such nuisance is reduced to a minimum.[48]

Practice

As in the United States, the public in the United Kingdom has consistently seen air pollution as a major problem and supported efforts to control it. Unlike in the United States, however, the control of air pollution has not been a major political issue in recent years. True, the Industrial Air Pollution Inspectorate has been attacked as being industry's ally, secretive and remote[49] but these accusations have not been supported by the public at large: most people in the United Kingdom have never heard of the Inspectorate. Control by local authorities under the Clean Air Acts and the Public Health Acts is even less controversial.

There have been no environmental regulation and air pollution control debates of the type that have raged in the United States, though recently the government has endeavoured, by advice and by the dismemberment of advisory bodies, to swing the pendulum marginally towards development and away from environmental protection. Industry and the general public are largely satisfied with the current system, though certain interest groups are not and the lacuna in anticipatory powers over non-registered works is regarded as unsatisfactory by many air pollution controllers. While evidence about the costs of environmental regulation in Britain in general and air pollution in particular are very difficult to obtain, they appear to be very small.[50]

One reason for this degree of public satisfaction is that the land use planning legislation frequently provides opportunities both to debate and to control pollution. Another is that the general improvement in air quality has been so marked that complaint may seem churlish. Yet another reason is the widespread lack of knowledge about where complaints should be directed. The split in responsibilities between the Inspectorate, the district council environmental health and planning departments also makes for confusion among the public. Generally, there is a lack of public participation in decisions involving new sources of air pollution, and a marked lack of opportunity for the public to appeal against them.

The Industrial Air Pollution Inspectorate is a very small body with, in 1984, 40 inspectors in England and Wales, each making an average of about six visits per year to each registered works.[51] Inspectors are all graduates in chemistry or chemical engineering with at least five years industrial experience. None have any experience in economics, biology or any of the scientific disciplines concerned with the assessment of air pollution damage. The Inspectorate is politically very remote, being answerable to the Secretary of State for the Environment, via the Health and Safety Executive and its appointed Commission.

Criticisms of the Inspectorate have been persistent, if never politically significant. Rhodes believes that much of this is attributable to the degree of discretion accorded it, which is much greater than its American counterparts enjoy:

> There is an underlying problem of basic philosophies which the Alkali Inspectorate raises... because of its history and traditions, and in particular its marked degree of independence... . An inspectorate which interprets its role as being to judge the balance at any given moment between the technical means of controlling pollution and the cost to industry of doing so, which aims to lead industry along the road of gradual progress rather than to state absolute requirements which industry must somehow meet or face the prospect of prosecution... is extremely vulnerable to misunderstanding and suspicion of its motives.
>
> The logic of its interpretion of what was intended by (best practicable means) has drawn it into considering, and answering - by default as much as anything else- questions which are essentially political in character. Questions like 'How much can this industry - or this plant - afford to spend on anti-pollution measures?' or 'If we insist on this particular measure will it force certain firms out of business and how therefore can we measure the resulting unemployment against the benefits of reducing pollution?' followed naturally from the inspectorate's co-operative approach to industry. In finding answers it has implicitly been deciding not only what degree of pollution is tolerable but at how fastarate pollution should bediminished.(52)

While it is an offence to operate a works in default of the agreed best practicable means, it has become the tradition of the

Inspectorate to prosecute only in the event of the most flagrant and persistent abuses. Usually the Inspectorate considers it sufficient to issue an admonition in the form of an 'infraction letter' indicating the nature of the violation and the measures necessary to secure adherence to the best practicable means. The Inspectorate's policy of reliance on extra-legal methods of persuasion and informed advice, rather than penal sanctions (which are financially derisory), has a lengthy history. Recently, relatively more numerous prosecutions (perhaps 20 per year) have been made but these have been directed, in the main, against small-scale metal recovery operators (eg. cable burning and the smelting of lead batteries in the open air).(53) It has tended to be generous in allowing existing works to continue to operate using controls much inferior to those specified in new best practicable means.

The ultimate sanction, that of refusal of renewal of the certificate of registration has never been employed in England and Wales:

> Annual renewal of the certificate could not be refused because a works did not continue to use the 'best practicable means'. On the contrary, the Inspectorate would be failing in its duty if it allowed such a thing to happen. (54)

(In Scotland, however, where the Industrial Pollution Inspectors exercise almost identical powers, revocation has been used.(55)) Similarly, no instance of refusal to grant a certificate of registration in the first place appears to have been reported. In other words, air pollution permits are always given.

The reluctance to take enforcement action (at least public enforcement action) is one of the characteristics of the Industrial Air Pollution Inspectorate. Another is the lack of information available to the public about both the setting of industry-wide best practicable means and their application to a particular works. While representatives of certain interest groups (above) have been consulted recently on best practicable means and local authority environmental health departments are now informed of the conditions applied to registered works in their areas, the public are unable to obtain either of these types of information.

Criticisms of this secrecy were taken up by the Royal Commission on Environmental Pollution which recommended the release of emissions data, the publication of breaches of requirements and the general availability of registration conditions for particular works.[56] There has since been a marginally greater release of information and the Inspectorate has encouraged the setting up of local liaison committees, at which pollution problems from particular works are discussed. While there has been criticism of these as being mere talking shops, allowing no meaningful public participation,[57] there is evidence that at least some of them have led to real pollution reductions.[58]

There is, all in all, remarkably little evidence on which to review the real achievements of the IAPI. There are, for example, no annual estimates of air pollution control expenditure of the type published in the United States, and it is not possible to advance even rough totals of spending for comparative purposes. There appears to be little doubt that industrialists' anguished prophecies of insolvency if further pollution arrestment is demanded receive a more sympathetic hearing than the protests of those who suffer the effects of emissions from registered works.[59] The alacrity with which industrialists seek registration and the partiality of the advice of the Inspectorate to local planning agencies (below) tend to indicate that IAPI might be in the control of the regulatees. On the other hand, the Royal Commission on Environmental Pollution, while advocating a broadening of the Inspectorate into a unified body to be known as Her Majesty's Pollution Inspectorate, was basically impressed with the way control was achieved.[60] The Inspectorate itself has come to accept that there may be weaknesses in the best practicable means approach:

> The present system may not be perfect, but it has stood the test of time and, at a comparatively low administrative cost, has produced environmental conditions which bear comparison with those in the best of other industrialised countries. (61)

Hill has summed up the Industrial Air Pollution Inspectorate's position as follows:

> (The) key intervention (of the regulatees) comes neither in the law making process norin attempts to negate the impact of the law, but in complex interactions with the regulatory agency from which a consensual front is generally shown to the outside society. Also related is the high discretion allowed to the Chief Inspector and his staff, who are acknowledged by government and by the regulatees as professional experts whose judgement should be trusted in dealing with complex situations. Every pollution control system involves interactions between interested parties, and strenuous efforts by the economic interests to minimise limitations

upon their activities. The British system does at least make this very clear. (62)

As Rhodes points out, it is curious that local authority environmental health officers have largely escaped criticism,[63] despite the fact that they appear to prosecute a smaller percentage of offenders against the Clean Air Acts than does the Inspectorate under the Alkali Act.[64] (The fines they levy are again small, seldom more than £100.) The absence of national information of the type provided in the Inspectorate's annual reports must be a contributing factor to public acquiescence. (There are, for example, no figures available to estimate total national local government manpower devoted to air pollution control.) The officers concerned with air pollution in local environmental health departments are typically members of a very small group, some of whom may not be technically qualified. Others, of course, are qualified and some local authority environmental health departments have proved to be highly competent in controlling pollution, notwithstanding the limitations of the powers available to them.

The officers in environmental health departments have relatively little discretion in interpreting the provisions of the Clean Air Acts. If chimney heights, for example, are considered adequate when calculated according to a standard formula,[65] permission must be granted. The other, very limited, anticipatory powers are similarly rigidly prescribed. Providing a developer meets these requirements, a permit must be granted. Partly because of this lack of discretion, there has been very little political interest in air pollution control within local authorities and officers are normally left to make decisions without being influenced by local politicians. There is no other external input to the officers's decisions, since public participation is virtually non-existent. In practice, there is a good deal of activity by environmental health departments which is not directly sanctioned by the powers conferred by the Clean Air Acts.[66] This partly manifests itself in the use of land use planning powers to prevent pollution.

Almost seven years after the Royal Commission on Environmental Pollution reported on air pollution, the government responded, rejecting many of its recommendations, including the setting up of a unified inspectorate. It did, however, state that details of the best practicable means for particular works are to be made available to 'local interests' and these are now being copied to the local authorities concerned (as mentioned above). It also mentioned the role of air quality target values and stated that a comprehensive review of the existing air pollution control legislation was to be undertaken.[67] That this is necessary is evident from the following quotation from the Commission on Energy and the Environment, which discussed (and slightly exaggerated) the problems of anticipating pollution problems from stationary sources. It emphasised the:

> relative weakness of the existing pollution control system in terms of its capacity to anticipate possible pollution problems compared with its adequacy to deal with existing problems. Local authorities have no power to act in anticipation of a possible pollution problem - except in so far as they may be involved in giving or refusing planning permission for development. (68)

The coming into effect of the European Commission's air quality standards was a very significant event in the control of air pollution in Britain: it implied a change from case by case control to at least some recognition of the effects of air pollution on and from surrounding areas. Notwithstanding the annual limit values of 80 $\mu g/m^3$ for smoke and 120 $\mu g/m^3$ for sulphur dioxide if the smoke concentration is less than 40 $\mu g/m^3$ (80 $\mu g/m^3$ if the smoke concentration exceeds 40 $\mu g/m^3$ - the guide value) the government has not modified the tenor of its advice to local authorities. Local authorities containing areas where limits are currently exceeded are merely urged, in the government's circular, to 'take into account the need to attain the limit within a reasonable time'.(69) There is no question of the prohibition of development in such areas.

LAND USE PLANNING CONTROL

Legal framework

There had been concern over the effects of unplanned urban growth in Great Britain as early as the 1840's. This led to the passing of public health legislation and of byelaws to improve environmental standards in the latter part of the 19th Century. The first year in which the word 'planning' appeared in an act of Parliament was 1909. Between then and the 1930's several acts were passed which permitted the numerous local authorities to implement planning schemes. These schemes, in many ways similar to the US zoning provisions,(70) were largely ineffectual. Partly as a result of the writings of pioneer planners like Geddes, Howard and Unwin, a series of commissions and inquiries was set up during the Second World War. The reports of these led directly to the radical reforms embodied in the Town and Country Planning Act 1947.

This act scrapped the previous permissive planning system and provided that planning control should be administered only by the largest units of local government and that these should be responsible for the preparation of plans and for the control of development. The financial aspect of land development was covered by the nationalisation of development values (a logical consequence of the effective nationalisation of development entitlements), leaving owners only with the right to continue using their property for its existing purpose. A national fund was set up to provide the resources to compensate land owners who would then receive no further profit if the local planning authority granted permission for a change of use of land. This aspect of the planning legislation did not work satisfactorily and, despite several subsequent attempts to recoup for the community the benefits to private owners of increased values resulting from the actions of planning authorities, it no longer (1986) exists. Public acceptance of the principles of plan making and development control has continued largely undiminished.

In 1968 a new system of plans was introduced and, in 1974, local government reorganisation swept away the myriad small local authorities and replaced them with a two-tier system of counties and districts. The metropolitan counties were abolished in 1986 leaving planning powers with the shire counties and their constituent districts in the rural areas and with metropolitan districts in the conurbations. Various amendments to the planning system, including simplified planning zones (which follow the introduction some years ago of enterprise zones) have been made or are under discussion at the time of writing but the land use control system remains essentially as it was conceived in the 1947 act: the preparation of plans and their implementation, at least partially, through control over development.(71)

Development plans

Plans consist of a series of documents, including a written statement and maps or diagrams, containing a local planning authority's main objectives for land use in its area over a period of several years. Structure plans are prepared by the county planning authorities (except, from 1986, in the conurbations) and consist of a written statement, illustrated diagramatically and setting out and justifying policies and general proposals for the development and other use of land in the area. These must include measures for the improvement of the physical environment (which definitely includes pollution control[72]) and the management of traffic.[73] The policies and general proposals must be set in their general context - showing, for example, the implications of investment - and must indicate any 'action areas' where comprehensive development, redevelopment or improvement is expected to start within ten years. There are elaborate provisions for public participation in the preparation of structure plans, including an 'examination in public' (a type of public inquiry) before they can be approved by the Secretary of State for the Environment (in England and Wales).

Local plans, including plans for 'action areas' must conform generally to the structure plan and are normally prepared by district planning authorities, although county planning authorities sometimes prepare certain types of local plan. They consist of a written statement and a map setting out the authority's proposals for the development and other use of land for the area, and define precisely the areas of land affected by the proposals. The plans deal with the detail of development, and so provide the basis for development control and for co-ordinating public and private development. They must include such measures as the planning authority 'think fit' for the the improvement of the physical environment, including the control of pollution.[74] This is a weaker requirement than in the case of structure plans. Besides the plans for action areas, there are 'district plans' for the comprehensive planning of relatively large areas, usually where change will take place in a piecemeal way over a long period, and 'subject plans' for dealing with a particular type of development (such as the reclamation of derelict sites) in advance of the preparation of a comprehensive plan. Again, there are extensive provisions for public participation, including the holding of a public inquiry. The planning authority normally adopts the local plan following an independent report by the inspector adjudicating at the inquiry.(75)

Control of development

With certain limited exceptions all 'development' (which includes most forms of construction, engineering and mining and any material change in the use of land or existing buildings) requires the prior consent ('planning permission') of the local planning authority. Nowadays, the counties deal only with minerals and waste disposal applications and a limited number of other such 'county' (broader area strategic) matters, leaving all other decisions to the districts.

When determining an application for planning permission, the authority must keep in mind the provisions of the development plan for the area concerned and any other relevant considerations - for example, the effect of the development on the ambient air pollution level in the area. If proposals for development do not accord with the plan, the local planning authority can still give its consent if it believes that they do not conflict with or prejudice a fundamental provision of the development plan.

Where 'departures' from the plan do involve conflict with its fundamental provisions, the authority must (if it proposes to permit the development) give public notice of the application, asking for representations, and must send a copy of the application to the Secretary of State for the Environment. The Secretary of State does not normally intervene unless it appears that important planning principles or issues of more than local significance are involved, but he has powers to call in the application to make his own decision, or to direct that planning permission be refused, or to leave it for decision by the local planning authority.

After considering an application for planning permission, the local planning authority can grant unconditional permission, refuse its consent, or grant its consent subject to conditions (these may require, for example, that the site be landscaped, or that a process only be operated during specified hours). No compensation is paid for refusal of consent or for the imposition of conditions on a consent.

There is a right of appeal to the Secretary of State against refusals or against the conditions attached to a grant of permission. This right of appeal by the developer does not extend to third parties (below). While public inquiries to hear appeals are often held, the majority of minor appeals are dealt with by written representations. The decision of the Secretary of State (or his inspector) following an appeal may only be challenged in the High Court on points of law, not on the merits of the case. Public inquiries frequently represent the only opportunity for public involvement in major land use and environmental decisions and they are consequently often broad-ranging.

Pollution control, for example, is frequently discussed at length and in considerable technical detail in inquiries into industrial development proposals.

There are other provisions for public participation in development control decisions. Registers of all planning applications have to be kept and made available for public inspection, and applications for certain types of development (broadly those which might be regarded as anti-social on noise, odour or other nuisance grounds) must be advertised locally giving the general public the chance to object. While these objections may be taken into account by the local planning authority, there is no opportunity for the public to object against its grant of planning permission.

There are special planning requirements in 'conservation areas', in 'national parks' (which are not owned by the nation), and in 'areas of outstanding natural beauty'. There is also legislation relating to the construction and operation of new towns, through no more of these are expected to be designated.

If development is carried out without permission (or conditons are not complied with), the local planning authority may serve an 'enforcement' notice (against which there is a right of appeal to the Secretary of State) specifying the steps which it requires to be taken for the purpose of remedying the breach of planning control. The authority has a right to prosecute developers who fail to comply with an enforcement notice but fines are generally not punitive.

Among the many sections of the Town and Country Planning Act 1971 (as amended) are powers relating to the use of voluntary 'agreements' between the developer and the local authority to achieve planning gains for the community. There are also provisions relating to the discontinuance of existing uses and to the modification of planning conditions to an existing permission, both on payment of compensation to the developer.(76)

'Amenity' is a key concept in town and country planning and, while it is not defined in legal terms, it is apparent that is subsumes pollution, since an order made under the provisions of the act refers to 'detriment to the amenity of that area by reason of noise, vibration, smell, fumes, smoke, soot, ash, dust or grit'.(77) Local planning authorities have very wide scope for deciding whether to grant a planning application and for establishing conditions, often in consultation with the developer, which control the siting and design of a development and the manner in which activities associated with it are to be carried out:

> There are no specific standards of amenity or design against which local authorities have to assess planning applications. It is their responsibility to decide whether the proposed development is acceptable in the context of the locality where it is to take place and the general environmental standards prevailing at the time. (78)

Environmental impact assessment

The Commission of the European Communities became interested in environmental impact assessment (EIA) in the early 1970's. Following a number of EIA research programmes, the Commission decided that an EIA system should meet two sets of objectives:

(1) To ensure that distortion of competition and misallocation of resources within the EEC are avoided by harmonising controls;

(2) To ensure that a common environmental policy is applied throughout the EEC.

Accordingly, the Commission issued its first preliminary draft directive in 1978. After 20 such drafts, not all of which were released, and substantial consultation (this is reliably reported to have been the most discussed European draft directive ever), the Commission finally agreed the directive in June 1985, after significantly weakening its provisions at the behest of the British government.[79]

There has been considerable official interest in EIA in the UK for several years. Several reports have recommended the acceptance of an EIA system but governments of both parties have been very cautious in their attitude to it.[80] The House of Lords select committee set up to examine the draft directive came down firmly in its favour in 1981, after hearing evidence from a wide variety of bodies, including the Royal Town planning Institute:

> The Committee believe that the undertaking of assessments along the lines of the draft directive for major projects could perform a valuable function in ensuring that planning authorities in all Member States take proper account of the implications for the environment of proposed projects. (81)

The government resisted the committee's recommendation, an unusual occurence, while stating that it was in favour of the principle of environmental assessment in appropriate circumstances.

It is difficult to avoid the impression that the government's commitment to environmental assessment was basically that of leaving those planning authorities or developers who wished to carry out an EIA to do so. Any recommendations for formalisation of the system, whether emanating from the European Commission or not, had consistently been opposed. The British position was that the European requirements for environmental impact assessment might duplicate or complicate current planning procedures. It was to ensure minimum disruption to the town and country planning system that the government insisted on major concessions as the price of its eventual acceptance of the draft directive.

The approved directive specified that projects likely to have a significant effect on the environment were to be subject to an EIA Such an assessment was to be obligatory for nearly all projects, other than modifications to existing installations, in certain specified categories which were listed in Annex 1. These were oil refineries, coal gasification and liquefaction plants, large power stations, radioactive waste disposal sites, integrated steel works, asbestos plants, integrated chemical plants, motorways, railways and large airports, ports and canals and toxic waste disposal facilities.

An EIA was also to be obligatory for projects in certain other specified categories (listed in Annex 2 of the Directive) and for substantial modifications to Annex 1 projects, but subject to criteria and thresholds to be established by member states. Annex 2 included agricultural and forestry practices, as well as many industries not encompassed by Annex 1. In addition, an EIA was to be required for any other projects outside the above categories where a significant environmental impact was likely to occur.

The developer was to bear the primary responsibility for supplying all the relevant basic information required in an environmental impact study. At the same time, it was envisaged that the 'competent authority' (the local planning authority in Britain) would often need to assist the developer in the preparation of the study. The authority also had the responsibility of checking the information supplied, which had to include:

> - a description of the project comprising information on the site, design and size of the project,
> - a description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects,
> - the data required to identify and assess the main effects which the project is likely to have on the environment,
> - a non-technical summary of the information mentioned... (82)

Further specification of the desirable content of an assessment was provided in Annex 3 of the directive.

There were provisions for public and agency consultation. The competent authority had to publish the fact that the application had been made, make all the environmental documentation available to members of the public and make arrangements for concerned parties to present their views. The competent authority had then to make its decision and to publish this, the reasons for granting or refusing permission and the conditions, if any, to be attached to the granting of the permission.

The net effect of the deletions of various provisions from earlier drafts has been the emasculation of the draft directive. The impact of the directive on British planning practice will be very dependent on the way in which the Department of the Environment decides to implement it since enormous discretion has been left to the member states in deciding the precise coverage of the EIA system to be adopted. The directive could extend the scope of planning controls by, for example, including agricultural and forestry developments and modifications to Annex 1 projects. It could also affect the operation of the planning system, since it seeks to apply the same provisions to public as to private developments and to provide for more public information prior to any decision whether following a public inquiry or not. This last consequence is likely to prove the most far-reaching for practice as it will vastly increase the amount of information available to third parties outside the inquiry process.

Some 200 'environmental impact assessments' (not necessarily meeting all the European Commission's criteria) have already been carried out in the UK.(83) Most local planning authorities undertaking these have been well pleased with the results and have not experienced untoward delays in determining applications. The costs (while difficult to determine) appear not to have been exorbitant, normally being less than about 0.5% of project costs.(84) It seems likely, therefore, that the mandatory system of EIA could be extended informally to types of projects unspecified in the directive by authorities determined to consider carefully the possible impacts. Certainly, this informal extension seems likely to encompass Annex 2 projects and, further, the type of information set down in Annex 3 of the directive.

Practice

The administration of the United Kingdom land use planning system by local authorities involves a large number of qualified planners. In addition, numerous firms of consultants are engaged on commissions relating to planning applications and appeals. Further, many hundreds of planners are engaged as central government officials and inspectors. Some lawyers also specialise in practice related to the planning system. The Royal Town Planning Institute, the professional association for qualified planners, has some 5,000 members.

There has been a widespread consensus about the utility of the land use planning system in the United Kingdom since its introduction. The one major area of disagreement was not the removal of development rights but the question of whether gains in the value of land caused by the grant of planning permission, or by other planning decisions, should accrue to the landowner or to the community. Another problem has been the length of certain public inquiries into proposals for major and controversial developments like nuclear power stations. While the vast majority of inquiries are short (less than a week) one or two have lasted over a year.

The Conservative government, elected in 1979, swept away taxes on development gains soon after taking office. More than any other administration, it has questioned whether planning controls are sometimes too restrictive. It has held that public sector expenditure (from which planning is largely financed) must be reduced and that much of the planning system may be regarded as dispensable regulation, though it has latterly softened this view. It accordingly instituted six main reforms of the planning system.

First, it simplified the division of planning responsibilities between districts and counties, leaving counties responsible mainly for waste disposal and minerals planning. Second, the government introduced charges for planning applications. The local authority was thus to make the applicant pay for the costs incurred in deciding whether, in the interest of the community as a whole, his project was the right type of development in the right place: a controversial measure. Third, the government extended the range of 'permitted development', thus allowing more minor activities to proceed without requiring planning permission. Fourth, the concept of enterprise zones was introduced. Within these industrial areas (usually located in run-down parts of the conurbations) it is possible to carry out various industrial activities without requiring planning permission. While there was considerable concern that this loss of anticipatory planning powers might lead to pollution problems, in practice the construction of speculative industrial units together with the retention of pollution control agency powers appears not to have caused great difficulties.

The net effect of these changes has been less severe than might have been expected from the political rhetoric. The two other reforms may prove far more radical, however. The fifth reform, the introduction of simplified planning zones,[85] in which local authorities are to be permitted to specify the types of development to be allowed in an area without planning permission (or payment of the related fee), threatened seriously to weaken the planning system as first conceived. However, the government's intention is now that such zones would be confined to areas that are badly in need of regeneration. It is hoped that they will stimulate the redevelopment of derelict or unused land and buildings in such areas and encourage the start-up of new enterprises in low-cost premises.[86] It is intended that there will be far more of these zones than of the more elaborate enterprise zones, to which they are not dissimilar. As in the enterprise zones, pollution control requirements will continue to apply.

Sixth, the government swept away the metropolitan county councils from 1 April 1986, leaving the conurbations with no regional land use planning and environmental management overview. This was, by far, the most controversial measure and it is likely to prove a considerable setback to planning in the conurbations, to co-ordinated pollution control in general and to air pollution control in particular.

Controls over national parks, areas of outstanding natural beauty and conservation areas have been retained but the highly successful new towns programme has been abandoned and the new towns' assets are being sold. Two inner city development corporations have, however, been created. After much discussion, green belts have been retained.

These continue to cause considerable pressures for development close to them.

Structure plans have now been prepared for the whole of England and Wales and many revisions of these have been approved by the Secretaries of State for the Environment and Wales. Numerous local plans have also come into being. Even where no formal local plan exists, many planning authorities have prepared informal plans (plans as yet unapproved by the council of the local government) to help them guide development. All local authorities employ qualified planners, mostly in specialist planning departments or sections.

Despite the existence of the various plans guiding development, there is still no certainty in the British planning system, notwithstanding the fact that development control provides the main means of implementing statutory plans. In practice, however, development control is not such an integral part of policy making and implementation as was originally intended. Thus, if an area is shown to be industrial on the land use plan, a planning application for industrial development could be rejected by the local planning authority if it was, for example, thought likely to generate excessive air pollution. However, the pressures of government policy, rateable values and employment generation have been such that this course of action is becoming increasingly unusual.

Similarly, an industrial development might be accepted in an area designated on the plan for some other use if the local planning authority found convincing arguments for this (and employment generation might be enough). Recent government policy guidance states very clearly that there is a 'presumption in favour of allowing applications for development', that the developer is not 'required to prove the case for the development he proposes to carry out' and that 'development plans are one, but only one, of the material considerations that must be taken into account in dealing with planning conditions'.(87) The government has made it clear that priority should be given to industrial development and that permissions should be granted for small-scale commercial or industrial activities wherever possible, whilst not neglecting:

> ...health and safety standards, noise, smell or other pollution problems... Where there are planning objections it will often be possible to meet them to a sufficient degree by attaching conditions to the permission or by the use of agreements under Section 52 of the Town and Country Planning Act, 1971, rather than refusing the application. Such opportunities should be taken. (88)

This emphasis on the use of planning conditions and agreements rather than refusal is clearly not intended to extended to conditions overlapping the controls of the Industrial Air Pollution Inspectorate. Notwithstanding this advice, it is extremely unlikely that polluting industry would seek to or be permitted to locate in a national park, area of outstanding beauty, green belt or conservation area or indeed in the heart of a homogeneously residential area.

While there may be no certainty of acceptance of industrial development, the probability of acceptance is high. About 85% of all planning applications are approved (nearly 90% for industrial developments) and, of those applications which are determined by the

Secretary of State after appeal against the planning authority's decision, nearly 30% are approved (more for industrial developments).[89] There is, of course, much informal consultation about applications for major developments before they are submitted. The relationships established tend to discourage applications which are very unlikely to succeed. There is more consensus between the land use planning authority and the developer about the nature and order of the physical environment than in the USA. Despite the uncertainties, therefore, a developer has a good chance of obtaining planning permission to construct a new source of air pollution in the United Kingdom, depending to some extent on the type of pollution involved.

Relationship with air pollution controls

In the absence of realistic formal anticipatory pollution control powers over non-registered sources UK local authorities are bound to try to employ land use planning controls over potential pollution problems. The planning departments of local authorities have shown a readiness to use statutory powers, both in the preparation of development plans and in the control of development, to prevent atmospheric pollution or to mitigate its effects upon the population.

There is positive encouragement from central government to include air pollution policies in development plans:

> Both structure and local plans are required to include land use policies and proposals for the improvement of the physical environment. this includes...policies designed to control pollution and to limit and reduce nuisances such as noise, smell and dirt. In formulating all their policies and proposals, local planning authorities should have regard to the impact the policies and proposals will have on the environment and how

> they relate to pollution control; this should be made clear in the explanatory memorandum or reasoned justification. In particular the introduction of European air quality standards may impose a constraint on the extent to which plans should provide for intensification of development in some urban areas. (90)

While encouraged, it is not proposed to make the inclusion of such air pollution policies mandatory.[91]

Many structure plans demonstrate a real grasp of air pollution problems, a recognition of the use of planning powers in the control of pollution, an appreciation of the roles of land use planning in pollution control and an awareness of the various planning techniques for controlling pollution.[92] The main reasons for this are probably the duty imposed upon planning authorities to include 'measures for the improvement of the physical environment', the pressure of the public for environmental improvement and the quality and interests of the staff of county planning departments.

For example, in the late 1970's Cheshire County Council not only included policies on air pollution in its structure plan but included a radical policy relating to ambient air quality. It proposed that, in those areas where the World Health Organisation target concentrations for smoke and sulphur dioxide were not exceeded, any new development (industrial or otherwise) the emissions from which might cause those levels to be exceeded, would not normally be permitted. Obviously, the industries concerned were hostile to Cheshire's proposals and they convinced the Secretary of State to modify the plan to remove the quantitative targets following the examination in public.[93]

The Department of the Environment, in discussing the air pollution control policies in the Cheshire structure plan stated that it was afraid that:

> An over rigorous adherence to a particular quantified level of air quality universally applied in reaching planning decisions may be unsupported on scientific evidence, unworkable in practiceand may...unjustifiably obstruct the achievement of other policy objectives. (94)

The Department of the Environment has obviously been concerned to maintain flexibility by permitting ad hoc development control decisions unconstrained by local ambient air quality standards. Central government opinion towards standards has now been modified somewhat by the imposition of European target concentrations, as the quotation on plan preparation (above) indicates; but its opposition to local, as opposed to national standards remains. Other structure plans, such as that for Teesside have also been modified by the Secretary of State to reduce the effectiveness of policies relating to air pollution control. (In Teesside this included a proposal to demolish housing in grossly polluted areas.[(95)])

There is considerable variety in the treatment of air pollution in local plans. This ranges from the detailed to the non-existent. There is, of course, no statutory requirement to include 'measures for the improvement of the physical environment' in local plans unless the planning authority 'thinks fit'. Recognition of the state of London's atmosphere caused the planning authority in Islington to include within a draft local plan a policy reserving the least polluted areas for housing. Other district councils with a worse legacy of air pollution, such as Barnsley and Rossendale, have made reference to air quality standards in their local plans.[96] There appear to have been no subject plans relating to air pollution.

Development control powers have been found, of course, to be most effective when applied to new (as distinct from established) development-where they can be used to prevent the juxtaposition of the polluter and land uses particularly susceptible to pollution damage. Few British planners possess any detailed knowledge of pollution control technology and it is generally accepted that planning powers should be used to ameliorate air pollution problems only after consultation with the pollution control authorities: the Industrial Air Pollution Inspectorate and the environmental health departments. In the latter case, consultation usually consists of discussions between officers of a single district council. In the case of liaison between planning departments and the Inspectorate, relations have occasionally been strained by antagonisms and conflicts of interest which stem from fundamental differences, in both attitudes and responsibilities, between the local and the central bodies.

The Inspectorate is now asked for its advice on planning applications for registrable works by most local planning authorities as a matter of course. In some cases, the advice received would appear to be perfunctory, consisting of a simple reiteration of the operator's obligation to comply with the best practicable means without specifying what they will consist of, or more pertinently, what the consequences of the permitted discharges might subsequently be. The consultative role of the Inspectorate is not confined to offering advice on the location of what might be termed 'sources' of atmospheric pollution. It is willing, indeed often eager, to comment on the wisdom of permitting sensitive development, notably housing, in the vicinity of existing registered works:

> The Royal Commission on Environmental Pollution recommends there should be a mandatory obligation on planning authorities to consult the Inspectorate on all applications to build or alter registrable works. The Health and Safety Commission support this recommendation and consider that the obligations should extend to consulting about other developments near to existing registered works. (97)

While agreeing with the concept of consultation, however, the government chose not to make this compulsory.[98]

It is apparent that the 'planning circumstances' mentioned by the Deputy Chief Inspector (in the sub-section on 'registered' stationary sources, above) extend to controls over development around a works but seldom, if ever, to a recommendation not to construct a works:

> We get very good consultation with planning officers, district planning authorities and county planning authorities all over the country. Quite a lot of Inspectors' time is taken up with this. They are often asked a question which they can't really answer: 'what effect is this plant going to have upon the environment?' Quite often you can't answer that in absolute, numerical detail. The process may be a new process; it may be an adaption or an enlargement of an earlier process with new equipment which is yet to be proven. All we can say is that, in our honest opinion, there may be this or that type of effect; in our honest opinion, you should or should not permit the neighbouring development to come nearer than so many metres or kilometres to the works. (99)

> With the passing years, there has developed a greater awareness of the part which can be played by planning authorities in setting the scene for good or bad environment. The Inspectorate is being increasingly consulted on planning applications, both for industrial and residential developments,

> and one district Inspector had to deal with thirty-five such requests during 1974. We welcome this co-operation, more so when our advice is followed, which is not always the case. There are many facets for planning authorities to take into consideration and sometimes we are left with a pollution legacy where we know there will be complaints and we will not be able to guarantee immunity... A district Alkali Inspector gave evidence at a Planning Inquiry where a company appealed against refusal by a local planning authority, quite rightly in our view, to grant permission for housing development alongside a mineral works. (100)
>
> Another inspector gave evidence to a Public Inquiry on appeal against the local planning authority's refusal to allow dwelling houses to be built close to an industrial complex. He supported the planning authority's view and the appeal was rejected. (101)

Other examples of this attitude can be quoted.[102]

Notwithstanding this seeming partiality, the necessity to prevent new industrial development where pollution may damage the environment is recognised by the Inspectorate, at least in principle:

> It is encouraging to see that an increasing number of planners are seeking the Health and Safety Executive's advice on the air pollution aspects of new applications concerning both registered and non-registrable works. (One district inspector dealt with twenty-seven such requests.) But many are still failing to do so with the result that industrial developments which cause pollution are allowed too near houses, shops, schools or hospitals and vice versa. (103)

However, in response to a questionnaire survey, one county planning authority, responsible for an area with a preponderance of heavy industry, expressed a view which was echoed by other respondents:

> The reply from the Alkali Inspector is seldom satisfactory in as much as the planning authority is given no information ie the degree of pollution likely to arise or the conditions which the Alkali Inspector might be imposing. The planning authority is only told in most cases that

the developer is using 'best practicable means' and this always seems to be acceptable notwithstanding the results. The local authority should be given more information on proposals of this nature. (104)

It is apparent, therefore, that not only is best practicable means adjusted only marginally to take account of local circumstances, by altering chimney heights in certain cases, but that it is extremely unusual for the Industrial Air Pollution Inspectorate to advise against the location of a new source of air pollution, whatever its neighbours. Though negotiations between the Inspectorate and the developer may be privately protracted, the requisite authorisation has always been forthcoming. It remains to the local planning authority to determine whether or not best practicable means is enough in the local conditions and circumstances, and hence to decide whether or not to permit the development of the new source. It is clear that it seldom has sufficient information to do this.

The Inspectorate has uniformly resisted the use of planning conditions which might duplicate its own powers. It has been supported in this view by the Royal Commission on Environmental Pollution[105] and by the government. However, the practice of imposing planning conditions on new industrial premises not controlled by the Industrial Air Pollution Inspectorate, in lieu of other anticipatory powers, is acceptable to the government:

it is the view of the Department of the Environment, supported generally by the Courts, that planning conditions should not be used to duplicate specific controls which already exist under pollution or other legislation. But where there are no such specific controls, it will continue to be appropriate to consider the use of

> planning controls to ensure that, where necessary, new development incorporates features which will make it acceptable from a pollution point of view in the proposed location. (106)

Despite the existence of powers under the Clean Air Acts over smoke, chimney heights and dust and grit emissions, it would appear that it is quite common for local planning authorities to control such pollution sources, at the request of environmental health departments.[107] Similarly, and again usually at the behest of the environmental health departments, many local planning authorities have used planning conditions and planning agreements to secure some form of anticipatory control over premises which fall outside the scope of both the Clean Air Acts and the Alkali Act and have sometimes achieved this where premises fell within the scope of the latter legislation.[108]

Notwithstanding the advice by central government on the importance of not promulgating plans which might lead to the exceeding of European air pollution target concentrations, it has stated that the Commission's air quality directive should 'not be interpreted as prohibiting the siting in such areas of new plants that may be sources of smoke or sulphur dioxide'.[109] The sanction of planning refusal should be used only when the development 'would result in a significant deterioration of local air quality even after the use of specific powers to control pollution'.[110] It is perhaps a telling reflection on the effectiveness of those 'specific powers' that despite their application, a 'significant deterioration' remains a possibility. In these circumstances it seems likely that planning authorities will continue to use their own statutory planning powers to prevent additional pollution of the local atmosphere.

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17. Alkali, etc, Works Regulation Act, 1906 s 7(1).

18. Clean Air Act, 1956 s 34(1).

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20. Health and Safety Executive (1982) Industrial Air Pollution 1981 HMSO, London, p 15.

21. Health and Safety Executive (1984) Industrial Air Pollution 1982 HMSO, London, p 21.

22. Ibid, p 14.

23. Ibid, p 15. The presumptive limits are published in the Inspectorate's annual reports.

24. Ministry of Housing and Local Government (1967) 103rd Annual Report on Alkali, etc Works 1966 HMSO, London, p 3. Financial implications are also discussed in Health and Safety Executive (1982) op cit, p 15.

25. See, in particular, Health and Safety Executive (1982) op cit.

26. Ibid, p 16.

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28. These notes are now listed in appendices to the Inspectorate's annual reports. (Before the 1975 change in annual report format, they were published in the reports.) Several are reproduced as an appendix in McLoughlin, J (1976) Law and Practice of Pollution Control in the United Kingdom Graham & Trotman, London.

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34. For operational purposes England and Wales are divided into twelve districts, in each of which the duties are exercised, in the name of the Chief Inspector, by a district industrial air pollution inspector assisted by one, or in some cases, two Inspectors. The Chief Inspector, his three deputies and four technical assistants are based at the London headquarters (Health and Safety Executive (1985) Industrial Air Pollution 1983 HMSO, London).

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50. Peacock, op cit.

51. Health and Safety Executive (1985) Industrial Air Pollution 1984 HMSO, London.

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64. Royal Commission on Environmental Pollution, op cit.

65. Ministry of Housing and Local Government (1967) 'Clean Air Act 1956 : Memorandum on Chimney Heights' HMSO, London.

66. The setting up of local pollution panels involving industrialists is one example of this. See, for example, Environmental Data Services (1982) Coventry's Pollution Prevention Panel : pioneering social accountability in industry ENDS Report 84 12 - 15.

67. Central Directorate on Environmental Pollution, op cit.

68. Commission on Energy and the Environment (1981) Coal and the Environment Department of the Environment, HMSO, London, p 189.

69. Department of the Environment (1981) 'Clean Air' Circular 11/81, HMSO, London.

70. Clawson and Hall, op cit, p 160.

71. See, for a good exposition, Cullingworth, J B (1985) Town and Country Planning in Britain Allen and Unwin, London, 9th Edition.

72. Wood, C (1979) Land use planning and pollution control, in O'Riordan, T and D'Arge, R C (eds) Progress in Resource Management and Environmental Planning 1 Wiley, Chichester.

73. Local Government, Planning and Land Act 1980 Para 2(a) Schedule 14.

74. Local Government, Planning and Land Act 1980 Para 7(a) Schedule 14.

75. Cullingworth, op cit.

76. Ibid.

77. Town and Country Planning (Use Classes) Order 1972 SI 1972 No 1385 as amended.

78. Commission on Energy and the Environment, op cit, p 22.

79. Commission of the European Communities (1985) Council directive of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment Official Journal of the European Communities L175 40-49, 5 July 1985.

80. For example, Catlow, J and Thirlwall, C G (1976) Environmental Impact Analysis Research Report 11, Department of the Environment, London; Clark, B D, Chapman, K, Bisset, R, Wathern, P and Barrett, M (1981) A Manual for the Assessment of Major Development Proposals HMSO, London. For an account of the gestation of EIA in the UK, see Wood, C (1982) The impact of the European Commission directive on environmental planning in the United Kingdom Planning Outlook 24 92-98.

81. House of Lords (1981) Environmental Assessment of Projects Select Committee on the European Communities, 11th Report, Session 1980-81, HMSO, London, pp xxv-xxvi.

82. Commission of the European Communities, op cit.

83. Petts, J and Hills, P (1982) Environmental Assessment in the UK Institute of Planning Studies, University of Nottingham.

84. House of Lords, op cit.

85. Her Majesty's Government (1985) 'Lifting the Burden' Cmnd 9571, HMSO, London.

86. Ibid.

70. Clawson and Hall, op cit, p 160.

71. See, for a good exposition, Cullingworth, J B (1985) Town and Country Planning in Britain Allen and Unwin, London, 9th Edition.

72. Wood, C (1979) Land use planning and pollution control, in O'Riordan, T and D'Arge, R C (eds) Progress in Resource Management and Environmental Planning 1 Wiley, Chichester.

73. Local Government, Planning and Land Act 1980 Para 2(a) Schedule 14.

74. Local Government, Planning and Land Act 1980 Para 7(a) Schedule 14.

75. Cullingworth, op cit.

76. Ibid.

77. Town and Country Planning (Use Classes) Order 1972 SI 1972 No 1385 as amended.

78. Commission on Energy and the Environment, op cit, p 22.

79. Commission of the European Communities (1985) Council directive of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment Official Journal of the European Communities L175 40-49, 5 July 1985.

80. For example, Catlow, J and Thirlwall, C G (1976) Environmental Impact Analysis Research Report 11, Department of the Environment, London; Clark, B D, Chapman, K, Bisset, R, Wathem, P and Barrett, M (1981) A Manual for the Assessment of Major Development Proposals HMSO, London. For an account of the gestation of EIA in the UK, see Wood, C (1982) The impact of the European Commission directive on environmental planning in the United Kingdom Planning Outlook 24 92-98.

81. House of Lords (1981) Environmental Assessment of Projects Select Committee on the European Communities, 11th Report, Session 1980-81, HMSO, London, pp xxv-xxvi.

82. Commission of the European Communities, op cit.

83. Petts, J and Hills, P (1982) Environmental Assessment in the UK Institute of Planning Studies, University of Nottingham.

84. House of Lords, op cit.

85. Her Majesty's Government (1985) 'Lifting the Burden' Cmnd 9571, HMSO, London.

86. Ibid.

70. Clawson and Hall, op cit, p 160.

71. See, for a good exposition, Cullingworth, J B (1985) Town and Country Planning in Britain Allen and Unwin, London, 9th Edition.

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73. Local Government, Planning and Land Act 1980 Para 2(a) Schedule 14.

74. Local Government, Planning and Land Act 1980 Para 7(a) Schedule 14.

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79. Commission of the European Communities (1985) Council directive of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment Official Journal of the European Communities L175 40-49, 5 July 1985.

80. For example, Catlow, J and Thirlwall, CG (1976) Environmental Impact Analysis Research Report 11, Department of the Environment, London; Clark, B D, Chapman, K, Bisset, R, Wathern, P and Barrett, M (1981) A Manual for the Assessment of Major Development Proposals HMSO, London. For an account of the gestation of EIA in the UK, see Wood, C (1982) The impact of the European Commission directive on environmental planning in the United Kingdom Planning Outlook 24 92-98.

81. House of Lords (1981) Environmental Assessment of Projects Select Committee on the European Communities, 11th Report, Session 1980-81, HMSO, London, pp xxv-xxvi.

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86. Ibid.

87. Department of the Environment (1985) 'Development and Employment' Circular 14/85, HMSO, London.

88. Department of the Environment (1980) 'Development Control - Policy and Practice' Circular 22/80, HMSO, London.

89. Department of the Environment (1980 and 1985) Development Control Statistics 1978-79 and 1979/80 -1982/83 DOE, London.

90. Department of the Environment (1984) 'Memorandum on Structure and Local Plans' Circular 22/84 HMSO, London.

91. Central Directorate on Environmental Pollution, op cit, p 16.

92. Wood (1979) op cit.

93. The Cheshire structure plan saga is recounted in Wood, C (1978) DOE bars Cheshire air standards New Scientist 78, No 1107 738-739 and in Miller and Wood, op cit.

94. Department of the Environment (1977) 'Statement of Policy on Air Pollution Objectives and Planning : Cheshire Structure Plan EIP' Noise, Clean Air and Coast Protection Division, DOE, London.

95. A description of the changes made to the Teesside Structure Plan may be found in Wood, C (1979) op cit.

96. Questionnaire returns, quoted in Miller et al, op cit, Volume I.

97. Health and Safety Executive (1978) Industrial Air Pollution 1976 HMSO, London, p 3.

98. Central Directorate on Environmental Pollution, op cit.

99. Miller et al, op cit, Volume IV, pp 63, 64.

100. Department of the Environment (1975) op cit, pp 9,10.

101. Health and Safety Executive (1977) Industrial Air Pollution 1975 HMSO, London, p 7.

102. Miller and Wood, op cit.

103. Health and Safety Executive (1978) op cit, p 3.

104. Miller et al, op cit, Volume I, p 44.

105. Royal Commission on Environmental Pollution, op cit and Miller and Wood, op cit.

106. Central Directorate on Environmental Pollution, op cit, p 16. The government has, in the past, conceded that 'in exceptional cases' planning conditions restricting, for example, the sulphur content of fuel oils consumed in registered works and the hours of operation of scheduled processes might be justified (Department

of the Environment (1972) 'Planning and Clean Air' Draft Circular, DOE, London).

107. Miller et al, op cit, Volume L.

108. Ibid.

109. Department of the Environment (1981) 'Clean Air' Circular 11/81, HMSO, London.

110. Ibid.

7 IMPLEMENTATION OF ANTICIPATORY CONTROLS IN THE UNITED KINGDOM

This chapter parallels Chapter 6. It presents eight case studies involving both land use planning and air pollution controls over new stationary sources of air pollution in the United Kingdom. Other British cases illustrating the use of both sets of powers have been written up in considerable detail: in particular Gregory's study of the abortive Holme Pierrepont power station proposal;[1] West and Foot's study of the Anglesey aluminium smelter;[2] Wood and Pendleton's study of the Manchester steel mill;[3] and Blowers' study of the Bedfordshire brick works.[4] Table 7.1 presents some of the characteristics of the case studies in summary form.

The new town glass fibre works

A company wishing to manufacture glass fibre approached a new town development corporation in 1977 with a view to constructing a large factory in an area zoned for industrial use.[5] This zoning, which must be approved by the Department of the Environment under the provisions of the New Towns Act 1965, is made without any knowledge of the type of industry likely to be attracted and without any necessity to carry out consultations. Once designated, incoming industries do not need to apply for planing permission but a lease is drawn up between the development corporation and the company, to which covenants may be added. Development corporations do not usually employ staff with pollution control expertise and are under no duty to consult other bodies in drawing up the lease. The nominated members of the corporations are not normally involved in such discussions.

The company concerned was extremely reticent in providing information about its proposed process, which it felt to be

TABLE 7.1 SOME CHARACTERISTICS OF THE UK CASE STUDY AUTHORISATION PROCESSES

	AIR POLLUTION CONTROL AGENCY				LAND USE PLANNING AGENCY					OTHER PROCEDURES		IMPLEMENTATION				USE OF THE COURTS
	No. OF AGENCIES	PRIOR OBJECTIONS	ACCEPT/ REFUSE	APPEAL (ACC/REF)	No. OF AGENCIES	PRIOR OBJECTIONS	ACCEPT/ REFUSE	APPEAL (ACC/REF)	AIR POLL CONT CONDS	PRIOR OBJECTIONS	ACCEPT/ REFUSE	CONSTRUCTION	SUBSEQUENT OBJECTIONS	APCA ENFORCEMENT	LUPA ENFORCEMENT	
NEW TOWN	1		✓		1		✓		✓			✓	✓	✓		
TAMESIDE	1	✓	✓		1	✓	✓		✓							
BOLTON: INCINERATOR	1	✓	✓		1	✓	x	x								
YORKSHIRE	2		✓		1		✓ ; x	✓	✓			✓	✓	✓	✓	
BOLTON: CHLORIDE	2	✓	✓		1	✓	✓		✓			✓		✓		
CHESHIRE	1	✓	✓		2	✓	(✓)	✓	✓ ; x			✓	✓	✓	✓	
ST. HELENS	1		✓		1		✓	(✓)	✓			✓	✓	✓	✓	✓
GLOSSOP	1	✓	✓		1	✓	✓		✓			✓	✓	✓	✓	(✓)

commercially sensitive. The development corporation nevertheless requested more details and it was apparent from these that potential air pollution problems would arise. The only site suitable for the development lay in an industrial zone close to the boundary of the new town and also close to housing, a hospital, and food and drink manufacturing plants. The new town corporation was anxious to attract the development but was now conscious that an independent assessment of the environmental consequences was necessary. Accordingly, it gave its agreement in principle and commissioned consultants to investigate and to recommend conditions which could be incorporated into the lease as covenants.

A few weeks later, the environmental health department of the district council in which the new town was situated was belatedly consulted on noise aspects. It immediately took a wider interest in the proposal. The consultants recommended a chimney to reduce air pollution, but the environmental health department expressed its concern that the proposed chimney was of inadequate height to render ground level concentrations acceptable and requested further details of stack emissions. The Industrial Air Pollution Inspectorate (IAPI) was consulted, though glass fibre manufacture is not a registered process, and voiced its concern about likely air pollution and detrimental effects on the adjoining food and drink processing plants. In 1978, the consultants suggested a higher chimney height of 24m, but the environmental health department, in consultation with IAPI, felt that 46m would be more appropriate though they still believed they had inadequate information.

The development was now discussed by the district council environmental health committee, meeting in private. It recommended the incorporation of a set of stringent pollution control conditions in the company's lease and the use of independent consultants to make an assessment of air pollution problems. It hoped this would break the deadlock which had developed between the environmental health department on the one hand and the company, the development corporation and their consultants on the other.

The development corporation felt that some of the suggested conditions were too specific but the district council continued to press for the incorporation of air pollution controls. The council duly appointed consultants, who suggested a chimney height of 55m and permission for this was granted, under the provisions of the Clean Air Acts 1956 and 1968. Several stringent conditions relating to the emission limitations and the process were appended, some of which appeared to be not strictly within the scope of the acts. The lease, with many air pollution control conditions, was eventually signed in 1980, and construction was completed in 1981.[6]

A number of complaints about phenolic odours,eye irritation and particulate emissions from local residents, who had not been used to industrial neighbours, ensued. Measurements taken by the environmental health department demonstrated that the plant was meeting the various emission limitations imposed upon it and none of the pollutants could be detected in the atmosphere using monitoring equipment. Alterations to the process were made by the company at the request of the environmental health department but these led to increased emissions of glass fibre resin and renewed complaints. Further changes were made which led to an improvement and, in 1986, the situation had been resolved to the point where few complaints were being received.

The district council's involvement in the siting decision was incidental although it (and not the development corporation) was statutorily responsible for pollution control. This illustrates the importance of meaningful consultations in the siting of a new source. A recent circular has urged development corporations to consult other bodies in cases like this. Because the development had already been agreed in principle, only controls by means of conditions could be imposed. The district council was able to demand a high chimney and to impose numerical conditions on the chimney height approval, its only statutory power. The new town development corporation also incoporated pollution control covenants in the lease which were more enforceable than normal planning conditions. When problems arose, however, the new town development corporation left it to the district environmental health department to implement better controls. Despite the fact that the various conditions were not exceeded and despite the construction of the high chimney, the vigorous complaints of the public ensured that action by the air pollution control agency and the developer was taken to negotiate a solution.

The Tameside resin manufacturing mill

Sterling Mouldings Ltd applied for outline planning permission to extend its existing premises (an old cotton mill) to enable a resin manufacturing process to be carried out on site in 1976. The mill is situated in Tameside, Greater Manchester and is virtually surrounded by modern housing, much of which results from redevelopment of the area. The existing resin moulding powder processes carried on at the mill had given rise to a history of complaints, and the area around another of the company's nearby works had had to be evacuated on several occasions because of releases of toxic chemicals. The application contained very limited information but it was stated that a number of hazardous chemicals would be stored in quantity, including formalin and phenol (both to a maximum of 120 tonnes). The residents of the new housing vociferously attacked the proposal because of the potential pollution and because of the reversal of the trend towards residential use in the area. They enlisted the support of their three local councillors.

Numerous consultations were carried out by the local planning authority on the basis of the information supplied. The environmental health department gave assurances that 'no unacceptable pollution should result from the process' and that safeguards relating to fume and dust emissions could be attached to the detailed permission. Two public meetings were held at which the proposals were explained. Heated exchanges between the public and officers took place but the previous record of the company was ruled to be irrelevant to the present decision. While the officers' report to the planning committee mentioned existing pollution, the environmental health officer gave many assurances regarding the safety of the plant and dismissed residents' fears. The committee (not the full council) granted the permission, after lengthy discussion, in 1976, subject to a number of conditions, including one intended to prevent any possible pollution.

After pressure from the three local councillors, and the mention of new evidence, the full council asked the planning committee to reconsider its decision, knowing that the withholding of permission would now involve a revocation order and the payment of compensation. When the planning committee met again, it heard evidence from the local residents, the council's officers and the company and decided not to revoke the permission, but only on the chairman's casting vote.

Before the full council next met, at the end of 1976, the residents obtained scientific evidence in support of their objections from the regional branch of the British Society for Social Responsibility in Science. This referred to the potential of phenol and other chemicals for causing damage by fire or explosion when stored in bulk. At the council meeting, one leading councillor dismissed this evidence as 'a load of emotional clap-trap provided by students' and another claimed to have gargled with phenol. After hearing further representations, the council endorsed the planning permission, but again only on the casting vote of the chairman. The Local Government Ombudsman, who investigated the case, found no maladministration, but felt the initial decision should have been taken by the full council, and not the committee, because of its controversial nature.

The application for reserved matters was made at the end of 1977, and a new officer in the environmental health department requested further information on various pollution aspects and subsequently recommended pollution control conditions. Permission was granted in 1978, with conditions. Later that year another of the company's mills was evacuated when a fire occurred and the company was prosecuted by the water authority for releasing 500 gallons of styrene to a water course. These incidents were given wide publicity and, at the end of the year, following futher pressure from the local councillors, the council voted to revoke planning permission, only to reverse this decision in 1979 after press speculation that a compensation claim of £3 million might be involved. In the event, the company decided to concentrate the manufacturing of resins at another site, and continue to make only powders at this mill, largely as a result of the widespread public opposition.(7)

This case demonstrates the importance of the political context in land use planning agency actions, the attitude of air pollution control agency officials and the reputation of the developer most clearly. The campaign by the three ward councillors, which was so nearly successful in convincing the council to revoke planning permission, was matched by the ignorance of other elected representatives. The initial report by the environmental health officer that there would be no problems was unlikely to be convincing in the light of experience from the developer's previous activities on the site and at other works in the locality. The strength of public opposition was reflected in the unusual permission to allow members of the public to address the planning committee and in the developer's eventual change of mind about implementing the project. However, objectors had insufficient information and time to mount an effective argument before the crucial initial permission was given.

The Bolton sewage sludge incinerator

The North West Water Authority applied in 1976 to Bolton Metropolitan Borough Council for outline planning permission to build a sewage sludge incinerator on the site of an existing sewage works located in the Irwell Valley. The site was designated as a 'green area' in an informal plan prepared some years earlier. Substantial derelict land reclamation and planting schemes had taken place in the area. The water authority intended to bring sludge from a variety of locations for incineration as an alternative to the method of disposal then currently employed - dumping at sea, via the Manchester Ship Canal.

It was agreed between Bolton and the Greater Manchester Council that the planning decision was a 'county matter', since strategic issues were involved. It would therefore be determined by Greater Manchester Council whose officers felt that the potential pollution problems arising from the development (which were apparent from the documents accompanying the application) were outweighed by the strategic sludge disposal requirements of the water authority. Bolton would, however, make a recommendation.

Bolton's planning department officers assumed a co-ordinating role and relied upon the environmental health department to supply the necessary expertise on air and noise pollution, while dealing with other planning considerations themselves. They consulted widely about the application in order to prepare their recommendations. Through the planning department, environmental health officers asked the water authority to prepare an environmental impact assessment but the North West Water Authority declined, stating that it was pointless until planning permission had been secured! The only disagreement between the two district departments concerned the preferred height of the stack, the planners wanting the height limited to 50m for visual amenity reasons and the environmental health officers requiring a higher chimney to dispose of airborne effluents effectively and prevent the build-up of ground level concentrations in the Irwell Valley.

An existing residents' association was activated and operated with great professionalism, calling on the skills of a socially mixed population, marshalling arguments, obtaining expert advice, lobbying support in opposing the proposal from councillors and from their Member of Parliament, and gaining publicity in the local press.

As a consequence, despite a balance of opinion in favour of the scheme among the Bolton officers (provided stringent conditions were attached to the planning approval to minimise pollution) the elected members of the whole council did not just recommend refusal of permission to the county but exercised their right under the Local Government Act 1972 and refused permission on pollution, and various other, grounds.[8] The councillors were following the precedent set by many previous planning decisions for the area which had been made to preserve and enhance its open character in accordance with the informal plan.

The water authority appealed to the Secretary of State for the Environment against the refusal and a public inquiry was held in 1977, at which air pollution was a major issue, being discussed at length by various expert witnesses, with the North West Water Authority making significant amendments to reduce the environmental effects of its original proposals. Bolton's officers and the residents' association were satisfied that their efforts had been justified by these modifications and they anticipated that the appeal would be allowed, subject to the measures discussed at the inquiry to ameliorate pollution and other environmental impacts. However, notwithstanding these mitigation measures and the water authority's sludge disposal needs, the Secretary of State upheld his inspector's recommendation that the appeal be dismissed on the grounds that the choice of site was 'environmentally unacceptable'. The inspector considered that the visual improvements achieved in the area in line with the informal plan would have been nullified by so industrial a development. Air pollution, despite the discussion devoted to it at the inquiry, hardly figured in the reasons stated for the decision.[9]

The case demonstrates the dependence of the air pollution agency on the land use planning agency for anticipatory controls in Britain. The environmental health department would have had to accept emissions from the incinerator, had permission been granted. Notwithstanding the existence of the informal plan, the first instinct of the professional planners had been to approve the development. They were able to utilise a close and effective collaboration with environmental health officers though the unresolved chimney height issue was virtually a textbook example of the differing interests of the two agencies. The role of the objectors was very important, as they organised rapidly and effectively and persuaded the elected representatives to overturn their officers' recommendations and refuse the development. The concessions made by the developer at the subsequent public inquiry illustrated the value of meaningful prior examination of proposals to construct new air pollution sources. Finally, the importance of the policy context in land use planning decisions was demonstrated by the inspector's decision adhering to the provisions of the informal local plan.

The Yorkshire chemical formulation plant

In 1976 a small rapidly growing chemical firm, Crewe Chemicals Ltd, bought an old rug mill in a valley site in Kirklees, West Yorkshire, some distance from the nearest housing. It applied for planning permission for a change of use from rug manufacture to the manufacture, processing and packaging of chemicals including herbicides and pesticides, but provided little information. Kirklees Borough Council Planning Department, working closely with the environmental health department, undertook a number of consultations, and asked for advice about likely pollution from the Alkali Inspectorate (although the works was unregistered). None of the consultees advanced compelling objections and planning permission was granted subject to a number of conditions, many of which related to pollution control. There was little public involvement in the decision.(10)

Shortly afterwards, the company applied for permission to use land surrounding the works for parking and the storage of chemicals. Again, consultations were carried out and, again, numerous conditions were applied to the consent. However, neither of the sets of conditions was operative, because the company had not yet started to operate processes which took the works outside the category of a 'general industrial building'. Hence no statutory change of use had taken place and planning permission was not needed for the new manufacturing activity.

When eventually in operation, however, the chemical formulation processes attracted considerable opposition and complaint because of defoliation of vegetation. (The local recreation ground lost its grass.) Monitoring by Kirklees failed to link this defoliation with the company and it proved impossible to detect the chemicals manufactured or used at the works in the environment. Both a local action group and a pharmaceutical company downwind of the works were by no means convinced by these measurements.

A further application, for the construction of a new building, was submitted in 1977 and aroused a welter of protest, including demands by the action group for an environmental impact assessment. This time, the local authority decided to refuse the application

The inspector at the public inquiry in 1980 found that planning permission was not required for the tanks. The plant was registered under the Alkali etc. Works Act 1906 later in 1980 (to the pleasure of the works manager) and, as a consequence, a change of use from general industry was involved and the original planning conditions now became operative. Crewe Chemicals became bankrupt but a new company, Pennine Chemical Services Ltd, operated with the same general manager. Kirklees actively sought observance of the conditions on the various planning permissions and took enforcement action, though this was complicated by the change of company ownership.

In the event, the formulation plant has proved a regrettable neighbour. The original permission is now regarded by the local planning authority as unfortunate, despite its inclusion of various pollution control conditions attached after comprehensive consultations. Since the change of ownership there have been fewer pollution incidents and none involving atrazine, the throughput of which has diminished markedly. Indeed, complaints generally have almost ceased to be received and it appears that environmental control is given higher priority by Pennine than by Crewe Chemicals.

This case perhaps illustrates the importance of the inadequacy of anticipatory planning powers most clearly, since no planning permission was necessary for the change of use from rug manufacture to chemical formulation (and hence no conditions applied). The difficulties of proving what was quite obvious to local objectors, namely that the herbicide formulated by the company was causing the defoliation, were also apparent. Both the planning department and the environmental health department of the local authority attempted to implement controls, but their enforcement activities proved ineffective. The central government decision in favour of the developer following the inquiry particularly surprised the planning officers, who felt they had a strong case for enforcement. The welcome given by the works manager to the change of pollution control agency was notable: he felt that there would be less interference with his activities from IAPI than from the district. It was not until the management objectives governing the operation of the works changed with the change of its ownership that improvements in pollution levels started to take place.

The Bolton lead battery plant

Chloride, a company manufacturing lead batteries, sought to expand production in 1973 by constructing a new factory on poor quality farmland adjacent to derelict colliery and open cast coal sites at Over Hulton, Bolton. More than 400 new jobs were involved and Chloride was anxious to locate close to its existing works in Salford. The only dwellings within 400m of the proposed building were a dozen cottages along a major road. The planning department of Bolton County Borough Council embarked upon an extensive series of consultations involving advice on air pollution and other matters. The environmental health department and the Alkali Inspectorate were both involved at this stage.(12)

The medical officer of health of the local authority and the Department of Health and Social Security in London stated that they could see no health grounds for refusing permission but the adjoining authority, Worsley Urban District Council (the proposed development being close to its boundary), and local residents expressed fierce opposition to the development. However, in 1974, Bolton's planning committee granted outline planning permission subject to several stringent planning conditions which overcame many of the environmental objections to the development, including Worsley's. One of the conditions related to the reserved approval of 'processes to be carried out; together with the precautions to be taken to avoid any form of pollution or risk of explosion'.(13) The factory was to be located behind a mounded, planted buffer strip of open land.

Public antagonism to the development persisted, partly as a consequence of the debate then raging about the environmental effects of lead. This concern may partly have motivated the officers of the environmental health department to impose the most onerous possible controls on lead emissions, some of which would be the local authority's responsibility and some the Industrial Air Pollution Inspectorate's. Negotiations progressed; local government reorganisation intervened (with the newly created Greater Manchester Council suggesting alternative locations for the works - all of which Bolton resisted), and the company was asked to reduce the number of stacks and to filter emissions from every chimney to reduce the quantities of lead released to the environment.

When the application for detailed planning permission was made in 1975 another round of consultations was embarked upon, on the basis of a set of provisional planning conditions. The quantitative condition relating to the maximum rate of lead emissions was much tighter than the IAPI's presumptive limit and the district inspector protested vigorously both about this and about the duplication of his powers. The idea of retaining consultants to advise on environmental pollution was floated within Bolton Metropolitan Borough Council but categorically rejected by the environmental health department.

To circumvent IAPI's objections, Bolton accordingly decided to try to achieve the desired controls by using a planning agreement, rather than by means of planning conditions. Chloride concurred as it was anxious both to obtain planning permission quickly and to be seen to be doing all it could to protect the environment. Permission was granted in 1975 and an agreement was drawn up with stringent air pollution conditions. This was signed in 1977. The company itself suggested a maximum lead emission of just under 4kg per week, at least an order of magnitude below that normally required by IAPI. However, the Inspectorate stiffened its requirement in this case to a level compatible with the local authority's. The factory, now in operation, is considered a show-piece of pollution control and for some time emitted far less than 4kg of lead per week as monitored at the stack.

However, a complete change of senior management shortly after manufacturing commenced resulted in lack of attention to maintenance schedules. Although no increase in ambient levels was detected, the readings from the stack emission monitor showed Bolton environmental health department that a significant rise had occurred. The local authority encouraged Chloride to reinstitute regular maintenace and performance is now once again below the limit set. The standard was weakened to an annual average level of under 4 kg a week when Chloride introduced a reaction pot to make lead oxide alongside the existing mill. Very few complaints about air pollution have been received since the company built on the site and the works is used by IAPI as an example of what can be achieved. Chloride has subsequently earned fees by advising other companies about pollution control techniques.

Needless to say, this desirable result could not have been attained without the willing co-operation of the company, whose leading negotiator was serving as the President of the Institute of Occupational Hygiene while the environmental controls were being decided. The importance of consultations was also apparent. Because of the benefits to the local community, there was never any question of a refusal of planning permission in this case. The company still willingly made a large number of environmental concessions and substantially modified its design. The conflict between the local land use planning agency and the central government air pollution control agency over the use of anticipatory powers was marked and resolved in the local authority's favour by the use of a legal agreement over which central government could exert no influence. The use of a planted buffer zone as a planning technique for air pollution control was notable, as was the location away from existing homes. Despite the political nature of the pollutant involved, lead, the opposition from local residents and neighbouring authorities was not vociferous enough to bring sufficient pressure to bear on the elected representatives to resist the application. This may partly have been due to the company's good local reputation. The opposition may, however, have encouraged the council to obtain the maximum concessions from Chloride and to sidestep IAPI's objections. The attitude of the developer is very clearly marked in this case, both in the initial negotiations and in the subsequent performance of the plant. The case also illustrates the reluctance of IAPI to adapt its best practicable means to allow clearly attainable emission limits to be imposed in particular local circumstances.

The Cheshire fertiliser plant extension

A fertiliser plant was constructed by Shellstar Ltd on the marshes to the south of the Mersey estuary, close to other works and some distance from housing, in 1967. This plant occasioned numerous complaints from the residents of the two attractive nearby towns of Helsby and Frodsham about odours and particulates over several years. The pollution arising from the Shellstar works thus became notorious. In 1973 the company sold its interest to UKF Ltd. The new owners applied for planning permission to extend the works in 1974 and the Secretary of State for the Environment decided to 'call in' the application because of its controversial nature.

The works is located in the area administered by Ellesmere Port and Neston Borough Council, which was uncertain how to react to the application. Two adjoining district council s, Chester and Vale Royal, opposed the development. Cheshire County Council carried out consultations and engaged the services of a firm of consultants, Cremer and Warner, to provide advice to enable it to determine its stance at the forthcoming public inquiry on what would have been a 'county matter' had not the minister intervened. Cremer and Warner saw no reason to prohibit the development but recommended a number of planning conditions, should the Secretary of State ultimately decide to approve the application. Local residents, however, were extremely active in lobbying their elected representatives to seek refusal of the extension.

The council of Ellesmere Port and Neston, as a result of this pressure, overrode its officers' advice that permission be granted but that a planning agreement be made to control pollution problems, and recommended refusal. More crucially, the elected representatives of Cheshire County Council's Planning Committee also ignored their officers' advice to grant permission and expressed their opposition despite their stated desire to attract industrial development.

The Industrial Air Pollution Inspectorate was involved in negotiations both with the company and between the company and the county's planning officers from an early stage. It warned against Cheshire seeking to duplicate IAPI's statutory powers over air pollution by the use of planning conditions. The attitudes of the elected representatives of both the county and the district softened somewhat as the new company began to demonstrate its competence in running the existing plant, substantially reducing pollution. During negotiations, UKF also promised improvements in environmental conditions were its extension to be granted. On the basis of Cremer and Warner's suggestions, the county planners were able to negotiate planning conditions with the company, which would be applied if planning permission was granted. Many of these related to air pollution control. No agreement could be reached, however, on a condition originally suggested by the consultants requiring the monitoring of gaseous and particulate emissions: the company argued that the monitoring condition would be too expensive to implement. The elected representatives of both Ellesmere Port and Cheshire eventually agreed to support the company's proposals but only subject to the most stringent safeguards in the form of the proposed conditions.

The public inquiry held in 1976 was notable for the articulate and reasoned contribution of members of the public, in the form of local amenity societies and parish councils and for the insistence by the planning authorities on adequate environmental controls, should permission be forthcoming. The district inspector appeared on behalf of the company. Cheshire argued that its monitoring condition and other proposals did not duplicate IAPI's powers. The company emphasised its contribution to the balance of payments and to local employment and used the tacit threat of withdrawal. It was supported by the Transport and General Workers' Union. The inquiry inspector recommended that the application be granted, subject to the conditions agreed between the planning authorities and UKF to control noise and air pollution and to a condition 'requiring the monitoring of chemical emissions from the plant'. He therefore took the county's part against the company on the one area of disagreement between them.

The Secretary of State's decision to grant conditional planning permission was announced in 1977 but he overrode his inspector and refused to allow the planning authorities more than token powers to control pollution, striking out the conditions relating to air pollution abatement and monitoring as duplicating the powers of IAPI, and weakened others. Nevertheless, there have subsequently been few environmental problems from the works comparable with the pollution experienced in the 1960's and early 1970's which had so incensed local residents.(14) The level of complaint, both direct to the air pollution control authorities and expressed at the meetings of a local liaison committee set up after the early difficulties, has been very low in recent years.

The planning officers recommended approval in this case, subject to air pollution control conditions that were largely acceptable to the developer. UKF may well have exaggerated the difficulties and expense of monitoring because it was reluctant to reveal the relevant information to the public. Corporate interests proved triumphant, as did IAPI in having planning conditions relating to air pollution control deleted from the permission by central government. That the officers were initially overruled by the elected representatives (who were conscious of the project benefits and of union support for it) was largely the result of the influence of local objectors. These objectors, for whom this expansion was the first meaningful opportunity to protest about the fertilizer plant, were instrumental in having the application called in and in making the land use planning agency initially oppose the development. It is ironic that planning controls over pollution would probably have been stronger had the county been able to grant permission subject to the conditions negotiated with the company.

The St Helens sulphuric acid works

Leathers Chemical Company Ltd sought planning permission to construct a major sulphuric acid manufacturing plant in St Helens, Lancashire in 1968. One of the reasons for proposing to locate the works in a mixed residential/industrial neighbourhood was the desirability of using the sulphides in the effluents of an existing works as a source of sulphur, thus both reducing odours from a notorious water course which were due to the effluent and bringing about a net decrease in emissions of sulphur dioxide to the atmosphere. The application contained little information about likely pollution arising from the sulphuric acid plant itself, or about the effects of such pollution on the environment of the works.

Nevertheless, the local planning authority was conscious of potential problems and sought the advice of local private consultants, but not of its environmental health department or the Industrial Air Pollution Inspectorate. The consultants were favourably disposed towards the development but raised the problems of pollution caused by non-routine incidents such as the bursting of a pipe or the leaking of a valve. They proposed that arrangements for monitoring sulphur dioxide be made, that quantitative limits should be placed on discharges of sulphur oxides to the atmosphere and that the plant should close down if such limits were exceeded for more than 30 minutes. The planning committee, which did not have the benefit of many public representations, decided to grant permission for the development largely as a result of the net reductions in pollution anticipated. They incorporated the consultants' recommendations in the conditions attached to the planning permission. The use of the sulphides as feedstock proved, in the event, not to be feasible. IAPI accepted a chimney height of 43m, provided the foundations were such as to support a stack of 61m.

The works, once in operation, frequently emitted substantial quantities of sulphur oxides, especially during start-ups and during break-downs. These led to elevated ground level concentrations of pollutants, which damaged fabrics (including ladies' stockings) and motor vehicle paintwork, caused severe coughing and led to a number of people being taken to hospital. Not surprisingly, pollution from the works became a major public issue, despite the absence of representations at the outset.

The local authority logged numerous serious pollution incidents and served an enforcement notice on the company for exceeding the emission level stated in the planning condition. A well-attended public inquiry was held into the appeal by the company against enforcement in 1973. IAPI appeared on behalf of the company and eminent counsel and witnesses were retained by both parties. The appeal was successful because the planning conditions were held not to be adequately rigorously worded. The inspector recommended raising the chimney height. A prosecution of the company by IAPI was, however, successful but the fine eventually imposed was only £25.

Further incidents took place and, partly as a result of very significant public pressure by a local action group, St Helens council voted in 1975, after considerable debate, to serve a discontinuance order on the company. This action group had won extensive publicity in the local press and even managed to elect a member to the council of the local authority on a 'Leathers Out' ticket. At the instigation of IAPI, meanwhile, the company applied for planning permission to extend its chimney height to 61m. This was eventually granted and the chimney was erected in 1975, when a general overhaul of pollution equipment was undertaken. A second public inquiry was held in 1976, into the company's appeal against discontinuance, at which IAPI again supported the company. The inquiry inspector recommended that the appeal be upheld because the works could now be expected to operate more satisfactorily as a result of recent modifications (especially the chimney extension). He roundly criticised IAPI for its slowness to recognise the desirability of this overhaul and extension. The Secretary of State concurred with the decision on the discontinuance order.

Pollution incidents have occurred since this ruling. Though environmental conditions improved in the vicinity of the works, pollution levels remained generally unsatisfactory in a mixed residential area and the initial decision to locate the works in such an environment (despite the ostensible initial pollution abatement reasons) has been widely regarded as misguided.[15] In the early 1980's the ownership of Leathers Chemicals switched to the Hayes Group, which has given much greater priority to pollution control. The company has invited councillors to inspect the works, has replaced much of the offending process plant and has seen its efforts rewarded by a reduction in the number of complaints to negligible proportions.

This case illustrates the necessity to undertake full and meaningful consultations before granting a land use permit for a major air pollution source. It also illustrates the difficulties of securing effective enforcement once a source has begun to generate pollution problems. The nature of central government control over this enforcement process is shown by its reluctance to sanction discontinuance (and by the air pollution control agency's support for the company). The air pollution control agency was, as the planning inspector pointed out, dilatory in pressing for the extensive modifications required and appears to have taken the company's part during the whole dispute, notwithstanding the prosecution it eventually felt impelled to bring. The power of objectors to influence the land use planning agency is clearly demonstrated, since the election of a councillor and the agreement to pay very high compensation were both unusual. Finally, the attitude of the company's management to pollution control, which appears to have changed markedly with the change of ownership, has had a notable effect on environmental problems and led to belated improvements.

The Glossop molybdenum smelter

A molybdenum smelter has operated since the 1930's in Glossop, on the outskirts of the Peak District National Park; a town in a basin almost completely surrounded by hills. Ferro-Alloys and Metals Ltd had gradually expanded its operations in a mixed residential/industrial area since commencing manufacture. In 1970 planning permission for the construction of a new smelting furnace was granted by the local planning authority, after some consideration of the consequential environmental pollution. An air pollution control condition was incorporated. This decision, subsequently described by the Local Government Ombudsman as a 'serious error of judgement' involved the continued use of the company's 52m chimney stack to disperse sulphur dioxide laden gases after passage through an electrostatic precipitator.

By 1974 it had become apparent that the plume from the chimney was causing intermittent smell, taste and throat irritation and local residents, who boasted many amenity societies, were complaining bitterly about pollution from the smelter. Although molybdenum emissions were being satisfactorily controlled by the electrostatic precipitator, so far as could be ascertained, complaints about the effects of this heavy metal, as well as about sulphur dioxide, were prolific. The Industrial Air Pollution Inspectorate, to whom many complaints were addressed, suggested that a much taller chimney (90-120m) was the only answer and the firm duly applied for planning permission for a 120m stack.

Despite contrary advice from IAPI, the new post-local government reorganisation planning authority (High Peak Borough Council) did not feel that sulphur dioxide concentrations were sufficiently prejudicial to health to justify the visual intrusion of such a large chimney in an attractive town and refused permission in 1975. The environmental health department concurred with this decision. (There had been only a limited number of monitoring readings at the time.) However, the number of complaints continued unabated, IAPI persisted in pressing for a taller chimney and the environmental health department began to gather detailed evidence of elevated sulphur dioxide levels.

A residents' petition was received by the council and a number of heated public meetings took place at which the public expressed opposition to the continued operation of the company because of the pollution it was causing. The dangers of heavy metal pollution were stressed again and again. Accordingly, after an unpublished investigation of alternative means of control of sulphur dioxide by the environmental health department had found no practicable means of removal of sulphurous gases, the chief planning officer invited the company to resubmit its planning application for the tall chimney in 1976.

The company promptly submitted an application for a 90m chimney (with scope for extension to 120m if necessary) which met with concerted opposition from the local residents who believed that alternative means of sulphur dioxide removal existed, that sulphur dioxide concentrations would continue to be a problem despite the gas being dispersed from a greater height and that the visual impact of the chimney was unwarranted. Another petition was presented but, in 1977, the planning committee granted a temporary 10 year planning permission after considerable discussion. In view of the continuing disquiet expressed by the unprecedentedly active residents (who managed to obtain national publicity for their campaign against the company) meetings with pollution control equipment manufacturers, and with the Secretary of State for the Environment, were held without altering the decision.

The residents served a High Court writ on the company to reduce pollution but this was later dropped because of the costs involved. As mentioned above, the Local Government Ombudsman investigated the whole affair but found no maladministration by the planning authority though he questioned the merit of the decisions taken. The chimney was built and has substantially improved the situation, although residents further afield are now subject to occasional groundings of the plume on the hill slopes. The possibility of raising the chimney height further has been discussed but not implemented.(15) The number of complaints has dropped but, with the 10 year temporary permission period drawing to a close, is expected to increase again. An intensive sulphur dioxide monitoring programme is being undertaken by the local environmental health department in preparation for the reapplication. Daily readings no longer exceed the European Commission guide values (Chapter 6).

This case illustrates the difficulties faced by a land use planning agency once permission to locate a source of air pollution has been granted. This was a classic British 'high chimney' case in which a higher chimney was deemed to be the only method of reducing pollution which was technically feasible. Removal of sulphur dioxide by scrubbing was ruled to be impracticable by IAPI, despite evidence to the contrary presented by objectors. The objectors may well have been trying to raise the developer's control costs, to force him to relocate. The conflict between visual amenity and air pollution control was nicely exemplified by the land use planning agency's initial refusal to permit a higher chimney, despite IAPI's advocacy of it. The developer was able to exploit divisions between these two agencies, to postpone taking action. It was the emotive campaign of the objectors which eventually forced the land use planning agency to accept a higher chimney reluctantly and temporarily. This has certainly led to a reduction of ambient concentrations, though the controversy can be expected to erupt again when the company reapplies for planning permission for the stack.

Notes and references

1. Gregory, R (1971) The Price of Amenity Macmillan, London.

2. West, R and Foot, P (1975) Anglesey: aluminium and oil, in Smith, P J (ed) The Politics of Physical Resources Penguin, Hrmondsworth.

3. Wood, C M and Pendleton, N (1979) 'Land Use Planning and Pollution Control in Practice' Occasional Paper 4, Department of Town and Country Planning, University of Manchester, Manchester.

4. Blowers, A (1984) Something in the Air : Corporate Power and the Environment Harper and Row, London.

5. Anonymity was promised to the company and the new town development corporation in undertaking the case history and is preserved in this summary.

6. This account is derived from Ledger, M J (1982) 'An Assessment of the Effectiveness of Land Use Planning Powers to Control Pollution' Unpublished PhD Thesis, University of Manchester, Manchester.

7. This account is derived from Ledger, op cit.

8. Under this act districts could refuse, but not approve, a 'county matter'.

9. This account is derived from Ledger, op cit.

10. This account is derived from Miller, C and Wood, C (1983) Planning and Pollution Oxford University Press, Oxford.

11. Ibid, p 121.

12. This account is derived from Miller and Wood, op cit.

13. Miller and Wood, op cit, p 194.

14. This account is derived from Miller and Wood, op cit.

15. This account is derived from Miller and Wood, op cit.

16. this account is derived from Ledger, op cit.

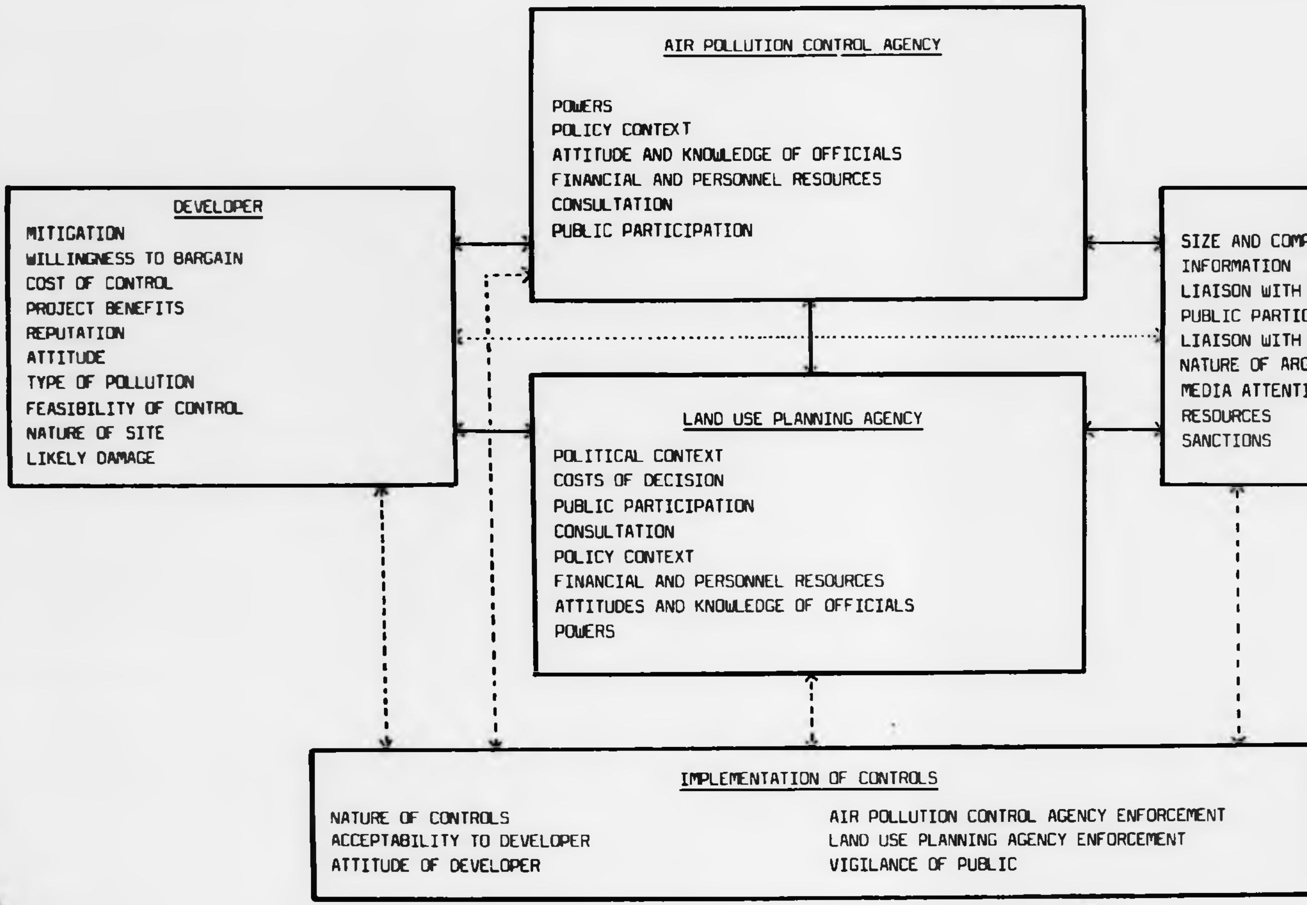
8 OUTCOME OF THE SITING PROCESS FOR AN AIR POLLUTION SOURCE

This chapter contains an analysis of the role of the various actors in the siting process for a new stationary source of air pollution. As Gladwin has pointed out, there is no readily available set of determinants to predict the outcome of any case history (Chapter 2).(1) Rather, it seems that the outcome in any particular case is going to be contingent on the interplay of a very large number of factors which will rarely reoccur in an identical manner.

The permitting process can be categorised as a series of negotiations. One set of negotiations will be between the developer and the air pollution control agency. Another set will be between the developer and the land use planning agency. A third set may be between the developer and objectors (usually local groups) conducted through the air pollution control agency, or (especially) through the land use planning agency, or sometimes directly.

These actors in the permitting process provide the structure for the discussion of the various factors determining the outcome of the siting process in this chapter. Figure 8.1 shows many of these factors. The role of each actor in the authorisation process is analysed in turn, utilising both literature sources and the case study material presented in Chapters 5 and 7. On the basis of this analysis a hypothesis about the influence of the actor on the outcome of the process is advanced. Following examinations of the roles of the developer, of the air pollution control agency, of the land use planning agency and of the objectors, a hypothesis about the nature and outcome of the siting process as a whole is put forward. Finally,

FIGURE 8.1 THE MAIN FACTORS INVOLVED IN DETERMINING THE OUTCOME OF THE NEW SOURCE AUTHORIZATION PROCESS



the implementation of controls imposed during authorisation is discussed.

The discussion in this chapter deliberately focusses on the common elements of the approval processes in America and Britain during which anticipatory air pollution controls are utilised. There are, of course, very substantial differences between the United States and the United Kingdom which are explored in detail in Chapter 9.

The developer

The degree of conflict arising between a developer and the control agencies or sections of the public will depend, among other parameters, on the developer's attitude and responsiveness and on the general local climate of opinion. Few developers will seek conflict. As Gregory puts it: 'few leading businessmen or members of public boards are totally unmindful of society's informal sanctions and constraints'.(2) Royston makes much the same point about the benefits of industrial concern for the environment:

> Environmental conflict... is sparked off primarily by fears, justified or otherwise, about the pollution which will be caused by a given development. Conflict can be expensive, and it can and does destroy projects and companies. If survival is one of the prime objectives of the enterprise (and increasingly survival of the enterprise is considered to be the central objective) then it must avoid conflict of all kinds, with local communities, with organised groups, and with government - at local, regional or national level. (3)

The case studies afford numerous examples of environmental conflict. Thus, the Oregon energy recovery facility furnishes an instance of a project being abandoned following conflict sparked, at least partially, by fears about the effects of dioxin on the local population. Similarly, conflicts of interest with local residents, and subsequently with the local authority, lost the North West Water Authority its sludge incineration project in Bolton.

The main factors determining the success or otherwise of the developer's application to construct a new air pollution source, which will often involve conflict, can be analysed according to the mitigation measures utilised and their cost; the advantages of the project; the characteristics of the developer; and the characteristics of the project and its proposed location.

Mitigation

The developer will obviously wish to build the new facility as inexpensively as possible. Having said this, he will be aware that the development will give rise to various environmental impacts and that he will be expected to spend money to mitigate these. Thus, most developers will expect to meet all the legally specified environmental control requirements relating to a proposed project, including those of the air pollution control agency, to gain their permits. Generally, pollution control is becoming an increasingly important factor in business decision making at the local level (but not in site selection - see Chapter 4). Thus, for example, Dow negotiated with the air management district in California for some months before applying for permits for its chemical plant project. In Britain, UKF discussed air pollution controls with the Industrial Air Pollution Inspectorate (IAPI) at an early stage in its application to extend its fertilizer plant in Cheshire.

A developer may decide that it is in his interest to mitigate the effects of a new plant to the point where conflict is avoided. This will frequently mean both designing environmental controls in the first instance and making further concessions on environmental and other mitigation measures later on. This was the strategy successfully employed by, for example, BECO in its oil refinery application in North Carolina and by UKF in its fertilizer plant extension in Cheshire. Such anticipatory mitigation obviously involves the incorporation of environmental controls into the new plant from the outset, when they are relatively inexpensive (Chapter 1).[4]

Thus, the developer may incur 'voluntary' expenditure to make the new facility more acceptable. This may be achieved, for example, by visual amelioration or by paying for certain off-site improvements not required by law. An example of this would be Chevron's payment of $750,000 towards traffic management measures and road improvement design studies in the process of obtaining its oil refinery modification conditional use permit from the City of Richmond, California. Acceptability may also be gained by reducing air pollution emissions below the statutory levels. Chloride's voluntary proposal of lead emissions well below IAPI's presumptive limit in constructing a new battery works in Bolton exemplifies this.

Some mitigation (both statutory pollution control-related and additional amelioration) may actually save the developer money (by, for example, reducing wastage of raw materials). Thus, for example, Chloride would claim that its expenditure on air pollution control has been partially offset by the value of the lead recovered at its Bolton works. The developer usually has ample scope for negotiation in mitigating the effects of a new project at the design stage, within the limits imposed by legal requirements and financial viability.

While it will be perfectly obvious that the developer has to bargain with the air pollution control, land use planning and other agencies, it may be much less clear that he may also have to negotiate with various local groups. New voices of opposition may be heard when the developer feels the situation is under control.[5] Examples of this phenomenon are the springing up of groups opposed to the proposed Spectron solvent recycling plant at Childs, Maryland, and of the election of a councillor in St Helens solely on the strength of opposition to the existing Leathers sulphuric acid plant.

The developer will thus often try to identify opposition leaders and, where possible, seek to negotiate with them. Negotiations can be undertaken directly or, more usually, through intermediaries such as the land use planning agency. For example, the North Carolina Department of Natural Resources and Community Development attempted to set up a committee, involving the expected opponents of the BECO oil refinery, to facilitate direct discussion of mitigation measures. Midland City Council planning department adopted a mediating role in the acrimony resulting from Petroplex's construction of an asphalt plant. Similarly, Kirklees Metropolitan Borough Council planning department acted as a link conveying the demands of local residents to the management of the Crewe Chemicals formulation plant in Yorkshire.

There are, however, financial limits to mitigation. The cost of control may become too large. To eliminate all pollution would in most cases render the plant uneconomic. Generally, both statutory and additional amelioration costs follow the same pattern. Relatively large amelioration for relatively low expenditure is usually followed by rapidly increasing costs for relatively small degrees of further amelioration. Thus even BECO, which set out to be as co-operative as possible in gaining permission to build its oil refinery in North Carolina, drew the line at the expense of the state's condition relating to epidemiological studies. Similarly, UKF refused to accept an air pollution monitoring condition relating to its fertilizer plant extension in Cheshire on the grounds of expense.

There comes a point when the total cost of mitigation becomes too great and threatens a project's viability. Thus, while the precise figures may not be known publicly, the developer is normally only too aware of the financial constraints on the mitigation measures he can offer. As Morell and Magorian stated: 'the developer can simply abandon his siting proposal if, for example, local demands for compensation are too high or state regulatory requirements are too onerous'.(6) The Dow withdrawal of its applications to construct a chemical plant in Solano County, California furnishes a rare example of such an abandonment because of onerous regulatory requirements.

A further financial cost to the developer to be taken into account is that involved in the permitting process itself (the transaction costs). If the process proceeds smoothly in the minimum feasible amount of time it will cost a certain sum. However, if delays occur these will result in effects on corporate strategy, in increased uncertainty in financing, in increased construction costs and in changing market conditions.[7] Thus, Metro spent over $2M on the protracted permit application process in Portland, Oregon, before it abandoned its proposed energy recovery facility and BECO spent over $3M on the oil refinery siting process before it withdrew from North Carolina. The longer the delay, the more expensive it is likely to become, though delays may sometimes reveal that a project was misconceived. One example of delays being sufficient to produce a changed market climate for a project is provided by Palmer Barge Line which, after its delays in Louisiana, gained the relevant permit to store creosote in Mississippi but never constructed the plant there because of the downturn in the economy.

Project benefits

The developer will usually have to convince both the control agencies and local residents of the need for the project as well as its environmental acceptability. A major new source of air pollution normally brings benefits as well as environmental and social costs to the locality chosen. The developer will frequently be able to offer a substantial amount of additional employment in both the construction and operating phases of the project's life and will certainly make a contribution to the tax base of the area concerned. He can therefore often expect encouragement from the local authority. The attractions of the BECO oil refinery, North Carolina, of the Oregon energy recovery facility and of the Dow chemical plant in California to the small local authorities concerned was not unconnected with the anticipated disproportionate increases in local tax yields. Labour leaders, local businessmen, and other such economic 'gainers' may also lend support. This was evident, for example, for the energy recovery facility from the Citizens for Common Sense group in Portland, Oregon and for the fertilizer plant extension in Cheshire from the Transport and General Workers' Union.

It is noticeable that, in those cases where serious disputes arose between the land use planning agencies and the developer, the benefits of the project for the local community were relatively small. Thus, the Palmer Barge Line creosote storage plant in Louisiana, the Petroplex asphalt plant in Texas, the Yorkshire chemical formulation plant, the Bolton incinerator and even the Spectron solvent recycling plant in Maryland and the St Helens sulphuric acid plant offered only relatively small advantages. Conversely, the California oil refinery, notwithstanding its poor environmental record, was too important to the City of Richmond to merit any challenge.

Developer characteristics

Further influences in the reception a prospective developer will receive from the local community will be his reputation and his attitude. If the developer's enterprise is a local company or organisation, with a reasonable environmental record, or perhaps a company with a good environmental reputation nationally, he would be expected to be received more favourably than an unknown organisation from another part of the country or a company with a poor record. Chloride's local reputation in Bolton was undoubtedly one reason why opposition to its new lead battery plant was muted. On the other hand, the suspicion with which Palmer Barge Line from Texas was regarded in neighbouring Louisiana when it sought to build a creosote storage plant represents a good example of parochial antagonistic attitudes.

The developer's reputation will be particularly important if he is contemplating the expansion of an existing source which has given rise to pollution problems. Thus, proposals to expand Spectron's Providence solvent recycling plant in Maryland were poorly received as a result of the pollution previously caused by the company. Similarly, the poor environmental reputation of Sterling Mouldings in Tameside was undoubtedly the reason for strong local opposition to its proposed resin manufacturing plant.

The attitude of the developer, particularly in the early stages of the permitting process, will be crucial. If he can show himself to be accommodating in seeking to meet objectors' fears or valid criticisms by modifying his proposal, if he can provide sufficient information and appear open to all criticisms and suggestions, he is likely to be more successful than if he appears intransigent and to regard his project as an unqualified blessing for the chosen community.(8) The Petroplex asphalt plant in Texas furnishes an example of a company refusing to concede an inch to potential opposition and paying for its intransigence with prolonged conflict. The Chloride lead battery works in Bolton, on the other hand, demonstrates what can be achieved by a more co-operative and open approach to comment and suggestion.

As Blowers has stated, corporate interests have a large measure of effective power, or influence, which they can wield 'by the presentation of evidence, by exploiting divisions and making concessions, by building alliances with other interests and by threatening investment withdrawal'.[9] Examples of all these tactics can be quoted from the case studies. Chevron's ability to present credible evidence was apparent throughout the California oil refinery application. Ferro-Alloy's exploitation of divisions between the Glossop Borough Council and IAPI was notable in the molybdenum smelter case. The new town glass fibre works case study provides an example of a developer making several concessions during the approval process. Dow Chemical's forging of common cause with Solano County in California over the building of the chemical plant is a typical example of alliance building. Finally, UKF used the tacit threat of withdrawal from its Cheshire fertilizer plant in its negotiations with the planning authorities.

Project characteristics

There are several specific local factors which can militate for or against the success of a development proposal: the nature of the pollutant; the technical feasibility of control; the nature of the site; the likely damage. If the type of pollution is particularly emotive then it will reinforce local residents' fears and mobilise opposition. There are certain political pollutants : polychlorinated biphenyls, dioxin, asbestos and so forth which 'will automatically raise the visibility of the debate due to widespread public recognition of their harm'.[10] Industry's assurances tend to be discounted where these pollutants are involved, due to well publicised previous incidents. There will probably be little 'hard' scientific evidence firmly to prove a case, and any decision in these circumstances may carry an element of risk. Examples of this type of 'political' pollutant are dioxin in the Oregon energy recovery facility case and creosote in the Lousiana storage plant case (where creosote was locally controversial).

The technical feasibility of control of pollutants varies. If the proposed level of control will still result in what are perceived to be very high emissions, resistance to the proposal will remain severe. This was certainly true in the molybdenum smelter case in Glossop where Ferro-Alloys had claimed that no reduction in sulphur dioxide emissions was technically feasible. However, only a few years later in Portland, Oregon, Metro was able to offer 80% removal of sulphur dioxide from the energy recovery facility emissions by the use of a scrubber.

The nature of the site will determine the responses to the developer's proposal. If this is in an existing industrial area, or an extension or modification is proposed on an existing firm's land, opposition will usually be muted (unless the area or firm have poor reputations). Applications for modifications or extensions to existing plants are thus usually approved (Chevron's oil refinery modification in California, Crewe Chemicals' formulation works in Yorkshire, Sterling Mouldings' resin manufacturing plan in Tameside, UKF's fertilizer plant extention in Cheshire and Ferro-Alloys' molybdenum smelter in Glossop were all granted permits altering existing plants -

despite having unconvincing reputations in some instances). Only Spectron, in Maryland, was refused permission to expand its solvent recycling plant, largely as a result of its previous record. Development on green field, or previously non-industrial, sites is likely to be more contentious. It is notable that the Texas asphalt plant, the Bolton incinerator, the Louisiana creosote storage plant, the Oregon energy recovery plant and the California chemical plant, all on green field sites, were refused the necessary permits.

The level of likely pollution damage will depend partly on the nature of the local terrain and the proximity of homes, schools, hospitals, etc. While it is very difficult to calculate this level of damage, judgements can be made. Local opinion may exaggerate it, just as the developer may under-emphasise it. Thus the pollution from the Dade County resource recovery plant in Florida was not expected to cause great damage because of its distance from sensitive receptors and consequently it attracted no initial opposition. On the other hand, the problems caused by Ferro-Alloys' molybdenum smelter in Glossop have been exacerbated by the location of the town in a bowl surrounded by hills and led to marked antagonism when a planning permission was sought.

All these factors influencing the likely outcome of a developer's application to build a new stationary source of air pollution can be summarised in a hypothesis which appears to be true in the case studies analysed:

The more open the attitude of the developer, the greater the developer's local influence, the greater the benefits offered by the project, the more the developer is prepared to negotiate with, and make meaningful concessions to, the control agencies and local residents, the more industrial the previous use of the site and the surronding area, the further the site from existing homes and community facilities and the less 'political' the pollutants, the better the chance of the new source being constructed and operated.

<u>The air pollution control agency</u>

The role of the air pollution control agency in the authorisation process for a new stationary source of air pollution is to determine whether or not to grant a permit, and to impose anticipatory controls by means of conditions to any permit, so that the new source meets the legal and administrative requirements in force. This will involve imposing conditions on emissions by using equipment performance standards, emission standards, air quality standards, and other means (Chapter 3). The legal and administrative requirements may be national, regional or local, but they will normally leave the air pollution control agency scope to negotiate more stringent pollution controls than the minima specified. Another function of the agency is to ensure that newly constructed sources (and other existing sources) meet whatever conditions are imposed, or general legal requirements, by means of various enforcement measures.

The performance of the air pollution control agency can be discussed in terms of the outome of the permit decision, the conditions applied to it, and the attention paid to locational considerations in deciding upon it.

Grant of permit

Air pollution control agencies are basically single purpose organisations. Although their general goal is to reduce air pollution or to prevent it from increasing significantly, the legal powers at their disposal are normally specific, though they vary. Thus, provided a new source meets certain criteria (eg emission levels or performance standards) then there will be no grounds for refusing it the necessary permits. Thus, of all the projects studied, only Dow Chemical Chemicals' manufacturing plant in California was refused an air pollution permit and then only because no offset rule was in operation at the time.

The air pollution control officials designated to deal with the permitting of new sources are normally engineers. (In England, for example, the Industrial Air Pollution Inspectorate is staffed almost entirely by chemical engineers.) As O'Hare et al put it:

> The basic philosophy of the profession is that if two engineers disagree about the best way to do something, a few hours with a computer and a blackboard will result in their agreement on a single approach. (11)

It follows that the air pollution controllers will generally be able to agree a set of conditions for a new source provided the developer is prepared to expend the necessary resources, or adopt appropriate practices, to ensure that the rules are met. Thus, even in the creosote storage plant case in Louisiana where exemption was first granted and then denied, there was never any doubt that the air pollution permit would have been granted in the end. In the new town glass fibre works case, a permit was eventually granted after agreement between the controllers and the developer, despite the expression of concern by IAPI.

Although most air pollution control agencies are unitary, they are usually subject to at least an element of political control. The way in which the relevant rules are interpreted will determine the policy context of the agencies. Thus, the British environmental health authorities are answerable to a committee of elected members and most American pollution control agencies are answerable to boards of nominated members. This political control is frequently somewhat remote from public accountability (the British Industrial Air Pollution Inspectorate is especially independent of political and thus public control) and hence not easily susceptible to pressure. Nevertheless, the element of political control does ensure that objectives other than reducing air pollution become important in the work of the agencies. For example, political representatives may be well aware of the necessity not to lose existing sources of employment and revenue, and to attract new ones. The financial costs to the developer and the social costs to the community of controlling pollution will thus often become very explicit in the agency's decision making. For example, the appointed Secretary of the North Carolina Department of Natural Resources and Community Development stated in public that all the necessary air pollution and other permits for which his agency was responsible would be forthcoming in the interests of local economic development. Similarly, IAPI (which expressly considers economic conditions - Chapter 6) supported Leathers Chemicals in St Helens when the local authority sought to close the sulphuric acid works down.

It is apparent that the necessary permits will be forthcoming for all new stationary sources of air pollution, albeit frequently after a period of negotiation and some delay, providing the developer is willing to undertake the necessary control measures to meet the pollution control agency's rules.

Even if a source is refused in the first instance, providing the developer is prepared to bargain seriously , the air pollution control agency will eventually grant the necessary air pollution discharge permit if its rules permit, though there may be considerable delays and compliance may be costly.[12] The seeming rigidity of the US ambient air quality standards may eventually mean that air pollution control agency rules will become less flexible. However, experience suggests that inflexibility, once demonstrated, is soon successfully challenged in air pollution control. The introduction of offset arrangements as a result of the Dow Chemicals manufacturing plant case in California is an example of this process of regulatory amendment and accommodation.

Permit conditions

Downing has argued that, no matter what the air pollution control system, bargaining between the source of pollution and the responsible control agency always takes place, and that laws which ignore costs will be compromised.[13] Acccording to him, bargaining, delay, technical issues, economic impacts, voluntary compliance and reluctance to resort to penalties are found in all cases. Certainly, negotiation took place in all those cases examined in this study where major emission sources were involved.

It is possible to visualise these negotiations with the polluter as the air pollution control agency trying to increase the level of air pollution control above the legal minimum requirements and the developer usually resisting this, because his capital and/or revenue expenditure on control costs would be correspondingly increased. As the parameters determining the point of compromise are so numerous, it follows that there will be considerable variations in performance between agencies, and perhaps between the outcomes in respect of different new sources within the same agency's jurisdiction. Outcomes will to some extend depend upon the <u>attitude</u> and <u>knowledge</u> of <u>officials</u>. Examples of such variations are seen in the particulate emission limit set by the Florida Department of Environmental Regulation on the resources recovery plant in 1977 (0.08 gr/ft^3); the EPA permit for the Oregon resources recovery plant in 1980 (0.04 gr/ft^3); and the Oregon Department of Environmental Quality's proposed limit of 0.015 gr/ft^3 in 1982 for the energy recovery facility.

The scope for negotiation by the air pollution control agency, and its success in controlling new sources of air pollution, will be affected by its own financial and personnel resources, by its procedures (including consultations with other bodies) as well as by the laws, regulations and guidance under which it operates. Thus the weakness of the staffing resources of the Louisiana Department of Natural Resources resulted in vacillation by the air quality division over the Palmer Barge Line permit exemption in the creosote storage plant case. Similarly, the failure to consult adequately led the Tameside environmental health department to make unsubstantiated and erroneous judgements about the pollution to be expected from Sterling Moulding's new resin manufacturing process.

The effectiveness of external scrutiny in ensuring appropriate implementation of legal and administrative requirements by the agency will be dependent on the formal public participation arrangements and on the amount of information available about its activities in general as well as about the specific controls it intends to impose upon any particular new source. Thus, several American air pollution control agencies increased the stringency of their conditions as a result of public pressure. Examples include the Maryland air management administration's controls on the solvent recycling plant at Childs and the Bay Area Air Quality Management District's controls over the Chevron California refinery modification. Similarly, the politically responsive nature of the Bolton environmental health department helped to achieve stringent controls at Chloride's new lead battery works.

The degree of such external inspection is a crucial determinant of the nature of the relationship between the air pollution control agency and the developer. If a decision is likely to be scrutinised by the courts or at appeal, the temptation may be to 'play it by the book' and perhaps to eschew innovation or experimentation. This was the situation in the North Carolina oil refinery permit application case where the air pollution controllers were anxious to be seen to be following the letter of their rules scrupulously because of its high public and media profile.

This scrutiny can serve to prevent an agency developing too sympathetic an attitude towards the industrialist's position. A close relationship between the controller and the controlled, without a strong external moderating influence, can lead to decisions which favour the polluter rather than the potentially polluted. This was probably the case where IAPI supported Leathers Chemicals in the St Helens sulphuric acid works case and Ferro-Alloys in the Glossop molybdenum smelter case when both company's operations were giving rise to serious pollution problems.

Location

While suitable anticipatory technical controls may be agreed, the unitary nature of air pollution control agencies ensures that they will not usually consider the location of a new source (proximity to receptors, local topography, etc) in setting conditions, even if they may be aware that local circumstances can be very important in determining damage. One reason for this is that the rules implemented by air pollution control agencies are not usually subtle enough to take location into account. Indeed, reference to land use considerations was deleted from the US Clean Air Act in 1977 (Chapter

4) and from the Texas Air Control Board's rules at around the same time (Chapter A3). The approach of the director of the Bay Area Air Quality Management District epitomises this eschewal of locational consideration: 'We dont care where a plant goes as long as it meets the standards. You could put a coal-fired plant in downtown San Francisco if it can meet the standards'.[14] In the United States the levels of air pollution in an air quality region (which may extend for hundreds of miles) determine the rules to be applied while more local considerations are largely ignored. The sole concession to locational considerations which is generally made in the United Kingdom by air pollution controllers is in regard to chimney height modification.

A second reason for ignoring the location of sources is that agencies would regard it as inequitable to penalise the developer of one new source by imposing stricter conditions than upon another with a similar plant, simply because of his choice of site. The air pollution control agency alone, therefore, cannot implement a policy of minimising pollution damage. It will, in practice, leave any decisions as to the appropriateness of location to others (usually the land use planning agency). This is exemplified by the creosote storage plant case in Louisiana where the air quality section of the Department of Natural Resources postponed consideration of the grant of its air pollution permit until the coastal management section had completed its deliberations on land use issues.

It is apparent that, in general, the more rules that have to be followed, and the more air pollution permits that have to be obtained, the greater the chance of the project being delayed. The numerous federal, state and local permits required for the California chemical plant provided ample opportunities for opponents to cause delays. The more opportunity there is for public participation and for third party legal redress, the more difficulty the developer will have in obtaining his permit and the more stringent will be the conditions. The Chevron case in California provides an example. Work could only proceed at the company's risk once Citizens for a Better Environment appealed against the grant of an air construction permit to the district hearing board. Such difficulty will be exacerbated when a politically sensitive pollutant is involved, as in the Oregon energy recovery plant case where prospective emissions of dioxin were an important factor in refusal. Thus, a contested new stationary source of air pollution is likely to gain its air pollution permit more speedily where there are few rules and where the public is least involved. The Crewe Chemicals formulation plant in Yorkshire and the UKF fertilizer plant extension in Cheshire provide typical British examples of permits being granted speedily by the Industrial Air Pollution Inspectorate using the technically unconstrained and procedurally confidential 'best practicable means' approach.

The outcome of the air pollution control agency's consideration of a developer's application to construct a new air pollution source can be expressed in the form of a hypothesis which appears to be true from the evidence of the case studies analysed:

> Negotiations between the air pollution control agency and the developer may be protracted but will almost always result in the granting of a permit with the precise degree

of control exercised varying, and being more stringent where there is significant public participation, but characteristically taking little or no account of the geographical location of the air pollution source and hence of the actual damage likely to be caused in that location.

The land use planning agency

There is no doubt but that the ultimate decision as to whether to permit a new stationary source of air pollution to be constructed rests with the land use planning agency and not with the air pollution control agency. As Morell and Singer put it, in discussing the siting of new energy facilities in the USA:

> In general, acquisition of local siting approval has been the most difficult hurdle. Local governments tend to act fairly rapidly on permit requests (usually within a year) but they may decide to reject the facility. (15)

Though there may be appeals against the local land use planning agency's decision and though other agencies may be involved, it is essentially the local agency which determines whether or not the project is to be built. In the United States discretionary land use approvals have often not been forthcoming 'because local authorities would not balance local desires versus statewide interest in both environmental quality and industrial management'.[16]

The essentially local land use planning control agency has multiple objectives which will usually include the promotion of suitable employment sources and local revenues, minimisation of consequential public financial costs, the amelioration or preservation of the visual environment and the minimisation of air pollution (though they may not all be explicitly stated). All proposed new stationary sources of air pollution will involve the consideration of several sets of conflicting land use planning objectives. Further, it is unlikely that the policy context of the agency (eg its plans) will have taken into account the ramifications of the proposed source. Each decision will, therefore, usually require the costs and benefits of the development to be assessed by the agency's officers and elected representatives on an ad hoc basis.

The performance of the land use planning agency in considering a new source of air pollution may be discussed in terms of the outcome of the decision, the conditions attached to any permit and the control techniques employed to mitigate the effects of air pollution.

Permit decision

There are two distinct processes at work in the land use planning agency in considering a new air pollution source. The first is evaluation of the general advantages and disadvantages of the proposal. This provides the basis for the second, negotiation with the developer to reduce the environmental and social costs while increasing the community benefits of the development. Both officials and, frequently, politicians are involved in these processes.

Blowers has castigated land use planning as being a short-term incremental process precisely because policies seldom allow difficult decisions, such as those concerning air pollution sources, to be taken on any but an ad hoc basis.[17] He concluded that planning tends to reflect the existing pattern of power in society and that power over the implementation of planning policy is dispersed. Basically, he argued that planning is a political rather than a technical activity and agreed that it essentially consists of a series of negotiations:

> Planning... mediates various interests, seeks to achieve consensus and attempts to co-ordinate and guide activities to avoid future conflicts... Within the limitations prescribed by the necessity to ensure the maintenance of the prevailing pattern of social relationships, planners exert considerable influence and power. (18)

Support for these assertions may be found in the case studies. A previously adopted land use planning policy context appears to have had little influence on the various decisions involving air pollution sources studied, except in the Bolton sewage sludge incinerator case where the provisions of the informal local plan were instrumental in preventing development. (Several authorities reacted to proposed developments by formulating general policies once applications had been received : for example Midland City Council in Texas on asphalt plants.) Wherever a major employer was involved, the local planning authority sought to grant permission, reflecting the company's local economic influence. This approach was exemplified by Richmond's response to the Chevron Californian oil refinery modification and by Cheshire's attitude to the UKF fertilizer plant extension. Mediation was a role commonly adopted by planners in many of the case studies. For example, in both Bolton cases (the lead battery plant and the sewage sludge incinerator) the planning officers were essentially acting as mediators rather than as initiators in the pollution control decisions.

The role of land use planners as mediators in dealing with the siting of a new facility has been caricatured by O'Hare et al thus:

> The reason opposition exists is that different groups have different values and experiences. The way to deal with it is by increasing public participation: get everyone together in public hearings; be sure that everyone's view is heard by everyone else, and that the government agencies in charge know how their constituents feel about things. (19)

As they pointed out, however, opposition may actually harden when more facts are revealed. The constant harping on a particular type of pollution, perhaps because of regulatory requirements, can elevate its importance well beyond that merited in the circumstances concerned. Examples of this phenomenon are the way in which the effects of dioxin were dwelt upon in the Oregon energy recovery facility case and those of creosote were exaggerated in the Louisiana storage plant case.

Healy and Rosenberg expressed the view that there will always be winners and losers in the land use planning process:

> Unfortunately, even the most astute and sensitive planning will not be able to make everyone at least as well off as before. Some will gain and others lose, whether by unchecked development or by carefully conceived land policies. (20)

Land use planning agencies, being predominantly local, are usually only too conscious of the need to take account of the local opinions and the political muscle of the potential losers from a new air pollution source. They are thus much more susceptible to public and media pressure than air pollution agencies. The attitude of elected representatives is thus an important factor in determining decisions. The political context ensures a responsiveness which in environmental matters is largely independent of party politics in Britain, as in the USA. This responsiveness was evident in, for example, the reaction of the elected representatives in Midland, Texas, to the objections raised by the public to the asphalt plant. The response of the three Tameside councillors, who nearly persuaded the council to prohibit construction, in the resin manufacturing mill case provides another instance of political susceptibility to public pressure. In both instances the air pollution control agencies could be seen to be much less responsive to public pressure than the land use planning agencies.

The number of factors involved in deciding whether to permit a new source of air pollution makes the outcome in any particular case very difficult to predict. It is not surprising, therefore, to find that the literature does not provide a great deal of guidance. For example, Hall reviewed games theory and other techniques for trying to maximise the advantages of an outcome to various groups, but concluded that these were theoretical devices and not working tools.(21)

Because any evaluation is likely to prove inconclusive, notwithstanding the fact that the developer will often be an outsider and the objectors local, the prevailing ethos of land use planning will usually be to permit the development(22) but to negotiate to mitigate its impacts. This will not be the situation, however, where the proposed new source is obviously entirely environmentally unsatisfactory (because of its nature, or its location, or both) or palpably politically unacceptable (perhaps because of the emotive nature of the pollutant involved). The decision reached will usually tend to reflect the local power structure, rather than the intrinsic merits of the issue. This was the case in Louisiana where their previous experience of creosote pollution caused the influential residents of St Tammany Parish to refuse an environmentally innocuous storage plant.

Although the land use planning agency may often be minded to grant permission to an industrialist to construct a new stationary source of air pollution, there will be at least some uncertainty about the outcome because of the accessibility of local representatives to resident opinion. Thus, there are sometimes differences of opinion between professional planners and their political masters. The advice of the officers was overriden, for example, in the Bolton sewage sludge incinerator case and, at least initially, in the Cheshire fertilizer plant extension case.

In general, the outcome is less certain than in the case of the air pollution permit, especially if the site concerned is not allocated for industry in local plans because the land use planning agency's powers are more discretionary. Thus, in the cases examined, four of the 16 developments were refused land use planning permits (Spectron at Childs, Maryland; Petroplex at Midland, Texas; Palmer Barge Line in St Tammany, Louisiana; and the North West Water Authority in Bolton). In each case (except Childs, Maryland, where other factors supervened) the site concerned was not zoned for industry.

Permit conditions

The land use planning agency will clearly have some difficulty in negotiating on behalf of all the groups it represents, will need to allow at least some public participation and will be concerned with a large number of items, many of which (including air pollution control) will be complex. It will require expertise to be available either in-house or through a network to assist in the process of negotiation. The land use planning agency may seek further air pollution controls, over and above those decreed by the air pollution control agency, as well as amelioration of social, economic or amenity impacts.

The importance of these negotiations in the highly political land use planning decision making process can be seen in most of the cases where approval was granted. Perhaps the most obvious examples are the agreements signed by Chloride and Bolton in the lead battery case and by Spectron and Cecil County, Maryland, in the solvent recycling case and the agreed Oregon City planning conditions requiring the installation of a scrubber on the energy recovery facility. Some conditions demanded of the developer may concern matters beyond the confines of his proposed site, as in the case of the Chevron contribution to road design plans in Richmond, California.

Miller and Wood found that the most important parameters in the evaluation of local planning authority performance in the control of pollution were the costs of the decision, the influence of the public, the attitudes of elected representatives, the effectiveness of consultations and the availability of policy guidance.[23] The case histories provide considerable support for this analysis.

It is significant that, as mentioned above, no large scale employers were refused land use permits in the cases examined and that, consequently, the costs of decisions to the local community were generally low. The refusals meted out did not entail the areas concerned foregoing large revenue and/or employment benefits. Public participation arrangements in land use planning agencies are generally more developed than in air pollution control agencies. The influence of the public on the land use planning authority's decision was perhaps most apparent in the Louisiana creosote storage plant case and in the Bolton incinerator case in which permits were refused by elected representatives following recommendations from officers which were either neutral or supportive of the projects. The effectiveness of consultations was evident in the Bolton lead battery plant case where environmental health officers were instrumental in negotiating agreement to very low emissions.

Other important factors in reaching a decision are the financial and personnel resources of the agency, the attitudes and knowledge of officials, and the precise legal powers available to it.[24] The non-availability of in-house specialist staffing may not be a problem for land use planning agencies in dealing with pollution if they have the necessary financial resources. Thus both Cheshire and the new town development corporation hired consultants to help them evaluate the nature and effects of new plants proposed in their areas. The City of Richmond and Oregon City dealt with the problem of expertise in a different manner by arranging for applicants to hire consultants to provide technical appraisals in the oil refinery modifiction and energy recovery plant cases respectively.

While few planning officers in the cases studied had any marked attitude to, or extensive technical knowledge of, pollution, many of those in the English land use planning departments were able to draw upon the expertise of their colleagues in environmental health departments (for example, in the Glossop molybdenum smelter case). The importance of the range of legal powers available to the land use planning agency was underlined in the new town glass fibre works case where pollution control conditions were appended to the lease for the site. The inability of Kirklees Metropolitan Borough Council to take action until Crewe Chemicals had formally changed the use of its chemical formulation plant site is another example of the importance of the nature of the legal powers available. The annexation powers of the City of Midland, Texas, also proved to be important in resolving pollution problems from the asphalt plant.

Ledger has confirmed many of these findings. She concluded that, generally, 'the achievement of meaningful planning control of pollution was largely dependent upon consultation and co-operation with other pollution control agencies'[(25)] and that:

> The most significant restriction on the realisation of a thorough system of pollution preventionand control by planning in practice is connected with the attitudes of planning officers

and local planning authorities towards implementing and enforcing these controls. (26)

Control techniques

The staff and elected representatives of land use planning agencies, having very little knowledge of pollution and little inclination to acquire it, may too readily take the air pollution control agency's permit at face value. This may lead to neglect of the fact that consideration of the location of the source rests solely with the land use planning agency, as does the use of land use planning techniques for pollution control. Consideration of land use controls over a source may thus fall between two stools. This was, effectively, what happened in the St Helens sulphuric acid works case, where location close to housing areas led to avoidable pollution problems. Similarly, the opponents to the Childs solvent recycling plant in Maryland had to remind the local land use planning agency that the state air management administration's rules did not allow that administration to consider location in deciding to grant its permit.

Tensions may arise between the local land use planning agency and the air pollution control agency, particularly when the planners seek to refuse the development, or to impose more stringent conditions than the air pollution controllers. Jones has stressed also that conflicts often exist between levels of government in the control of air pollution due to the clash of wider and local interests and to personal differences.[27] These were evident, for example, in the UKF fertilizer plant extension case and the Bolton lead battery works case. Here the land use planning authorities (with the help of environmental health officers) sought to impose planning controls which were fiercely resisted by IAPI because they usurped its powers.

Tensions may also arise, of course, between the land use planning agency and the objectors. Objectors may be seeking denial of the permit when the agency is minded to grant it, or may not agree with the control techniques used by land use planning agencies in seeking to reduce air pollution. Such tensions were evident, for example, in the objections to the grant of the land use permit in the North Carolina oil refinery case where land use conditions relating to air pollution were not applied and in the objections to the higher chimney suggested in the Glossop molybdenum smelter case by the land use planners after consultation with the air pollution control agencies.

It will be recalled that, in Chapter 3, land use planning techniques for controlling pollution (apart from those involving the imposition of conditions requiring emissions limitations or monitoring of emissions or concentrations) could be divided into four classes. These were: project location and design techniques; controls over the intensity of use of land; location and spatial distribution controls; and growth controls. In fact, the range of land use planning techniques of air pollution control employed in the case studies was limited to occasional use of a few of the available project location and design techniques. Where conditions were imposed by the land use planning agencies, these mostly related to emission levels or to monitoring. Thus, the Oregon City conditions on the energy recovery facility and Bolton's conditions in the agreement on the lead battery works both involved emissions limitations and monitoring. Many land use planning agencies omitted to impose any pollution control conditions. For example, the final permission in the UKF fertilizer plant extension case and the Solano County permit in the California chemical production facility case had no appended air pollution control conditions.

Four project location and design techniques were employed in one or other of the case studies: siting of industry with respect to terrain; siting of industry with respect to sensitive receptors; use of buffer zones; and design and arrangement of buildings (Chapter 3). The only example of siting with respect to terrain was the proposed relocation of the Maryland solvent recycling plant from its valley site to a more open situation. Pollution from both the Bolton sewage sludge incinerator and the Oregon energy recovery facility would have been exacerbated by their valley sites.

The developers in several of the case studies carefully sited industry with respect to sensitive receptors. For example, both the Bolton lead battery works and the Florida resources recovery plant were located well away from the nearest houses. The Texas asphalt plant is a notable example of a proposal that could easily have been located on land in the developer's ownership further from a residential area. The decision not to permit any emissions at all at the locations concerned was taken (at least implicitly) in the four cases where land use planning permits were refused.

The use of buffer zones within the site boundary to reduce the effects of pollution occurred in only two cases : the retention of existing woodland at the North Carolina oil refinery site; and the use of a planted mound at the Bolton lead battery works site. Landscaping conditions were used in several cases, such as the Florida resources recovery plant, but these were not designed to reduce air pollution concentrations.

The design and arrangement of buildings to reduce pollution was evident in several instances. For example, the number of stacks was reduced during negotiations on the Bolton lead battery works. Conditions requiring high chimneys (to disperse pollution to reduce its effects) were employed in, for example, the new town glass fibre works case and the Glossop molybdenum smelter case.

Environmental impact assessment (EIA) was employed in the Florida resource recovery facility case (under the power plant siting act provisions), in the North Carolina oil refinery case, in the California oil refinery modification case and in the California chemical manufacturing facility case. In each instance it appears to have highlighted some environmental problems and led to the formulation of controls to help to mitigate these. (However, these controls were not always applied by the land use planning agencies. For example, the air pollution controls finally imposed in the California oil refinery modification case by the air management district owed something to the EIA.)

As with air pollution permitting, the more land use planning permits that are involved, the greater the chance of the project being delayed (witness the time taken in the North Carolina oil refinery and Louisiana creosote storage plant cases where a variety of local and state permits had to be obtained). The likely outcome of the land use planning agency's deliberations can be expressed in the form of a hypothesis which appears to be true in the case studies analysed:

> The land use planning agency ultimately decides whether or not to allow a new source of air pollution to be constructed and, because its evaluation will frequently prove inconclusive (reflecting conflict between its objectives), it will usually seek to approve the source after negotiating increases in its benefits and reductions in its air pollution impacts but will not utilise many of the planning control techniques at its disposal.

The objectors

Someone will always object to a new stationary source of air pollution if he believes it will cause damage to him or something he values. While the precise site, type of pollution and locality will condition responses, air pollution is an emotive topic and a convenient focus for those who may also, or even primarily, object to a new project for a variety of other reasons (eg traffic, visual impact, property values: see also Chapter 2). As Morell and Magorian put it:

> Those who oppose a proposed...facility for such legitimate reasons, however, may well realise that they can mobilise much more support for their

> cause from others by raising the specter of fear. (28)

Royston concluded that: 'at least two factors are required to start a conflict, namely, the existence of a threat of pollution, and a population or interest group concerned about a particular environmental dimension'.(29) The high level of local objection to new sources of pollution:

> ...shows clearly the immediate, local nature of environmental concerns, and hence how essential it is for the enterprise to work with the local community, addressing local fears and concerns and meeting local needs. All too often this is not done... (30)

As O'Hare et al expressed it, local objectors frequently have:

> ...no reason to expect the developer to change his mind, alter his project, choose another site, or heed the public's concern. In fact, they perceive themselves as only having power to delay or stop the project... (31)

Caldwell et al confirmed that, all too often, difficulties were generated by 'the perceived conflict between economic growth and air quality, especially from the viewpoint of industry'.(32) They felt that citizen involvement in decisions involving air pollution in a democracy was healthy, especially as the private sector had frequently ignored its real social responsibilities in the pursuit of profit.

The role of the objectors can be analysed according first to the types of objectors involved and then to seven factors based upon those put forward by Kimber and Richardson as affecting the success or failure of environmental pressure groups in influencing the siting process.[33] The parameters are: information; liaison with officials; liaison with legislators; nature of argument; media attention; resources; and sanctions.[34]

Types of objector

Gladwin was able to distinguish nine different types of opponent to proposed developments, ranging from local residents to foreign governments. He categorised these as governmental or non-governmental, local or non-local and found that most conflicts involved two or more types of opponents which had a tendency to form coalitions. Government agencies were frequently embroiled in environmental controversies but national environmental groups were only involved in certain types of conflict and, while regional and local environmental groups were active in a broader range of disputes, local residents 'appear more willing to oppose anything posing a perceived threat'.[35] Even so, locally based opponents were present in less than 50% of the conflicts he studied.

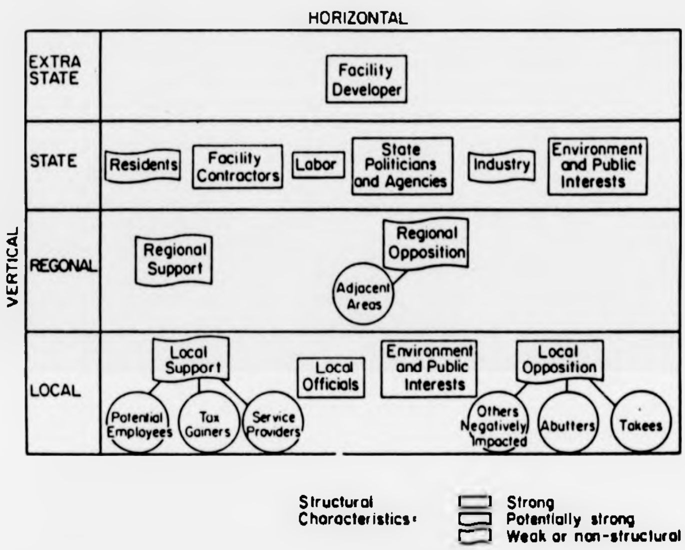
Of the case histories examined here, only the Florida resources recovery facility, the new town glass fibre works and the St Helens sulphuric acid works went through the process from application to construction without significant objections being raised. In each of these instances objectors soon protested against the operation of the new sources.

The number and type of local objectors varies with the population density of the area concerned and with the composition of that population. The socio-economic status of the residents of the locality will be important in determining both the importance attributed to the likely pollution and the weight attached to the benefits brought by the industry. This determination will depend upon the existing nature of the area and the employment, affluence and aspirations of the residents. Thus, the predominantly well-to-do residents of St Tammany Parish, Louisiana, were not greatly interested in attracting new industrial development and objected to the creosote storage plant.

For some groups of local residents, the disadvantages of a proposed development may always outweigh its advantages. This characteristic is likely to be particularly marked where they live across the local government boundary and hence share none of the local revenue benefits of the development while still suffering from the pollution. Such consciousness of local tax revenues is especially notable in the USA. Thus the objections of, for example, the Chester and Vale Royal district councils to the Cheshire fertilizer plant extension and of the residents of New Hanover County and of Wrightsville Beach to the North Carolina oil refinery were raised on behalf of those who could perceive little local economic benefit from the developments proposed but who feared that they would be affected by the pollution arising from them.

Figure 8.2 shows Morell and Magorians's model of the differentiation of the various opponent and proponent groups in an American setting.[36] (With little modification the model would also apply to the UK.) Even within the groups there will be variations. For some, generally those opposed on principle to industrial development,

FIGURE 8.2 GROUPS INVOLVED IN FACILITY SITING



Note: Sizes of boxes are not meant to indicate relative size of groups. Were this done, the box at the state level showing "residents" would be many times the size of the rest. The developer in this diagram is shown to be from out of state. This needn't be the case (could be shown at state level).

Source: reference 36

no mitigation of environmental and other impacts may ever be sufficient to gain acquiescence.(37) It is, for example, difficult to imagine that the chairman of Residents for Unpolluted Neighbourhoods in the Maryland solvent recycling plant case, or the Oregon City commissioner in the energy recovery facility case, would ever have been satisfied no matter what concessions the developers might have made.

Objectors may speak for themselves and/or channel their objections through the air pollution control and land use planning agencies. They may ally themselves with the local branch of a national environmental group, may join a pre-existing local pressure group or set up their own organisation. On the whole, general public interest environmental groups prefer to concentrate their resources at the national level, to influence the making of policy.(38) However, there are many locally-based environmental groups who are consulted regularly by local governments and they can be expected to support objections to a new pollution source which they decide will cause damage. Very localised environmental groups often tend to oppose specific developments rather than consider broader strategies for shaping the environment.(39)

Of the cases examined, only the California chemical works and the California oil refinery modification attracted the attention of national pressure groups (the Sierra Club and Citizens for a Better Environment respectively). Even here the representation of these groups was more akin to the only regional group entering the lists in the cases examined: the Oregon Environmental Council in the energy recovery facility case. Many of the other case histories show the intervention of local chapters of national groups (such as the National Wildlife Federation in the Louisiana creosote storage plant case), of pre-existing local groups (such as the residents' association in the Bolton incinerator case) and of groups specially created to contest particular developments (such as Carolina Coastal Crossroads in the oil refinery case).

Information

Objectors need adequate information on which to base their case and appropriate public participation arrangements to give access to the decision-making process.[40] They also require time to utilise the information before the crucial decisions are made by the control agencies. The availability of information in the United States as a consequence of the freedom of information legislation and, where they apply, requirements for environmental impact assessment, are significant advantages for objectors seeking to marshal their case. Thus, Citizens for a Better Environment never had any difficulty in obtaining the information the group needed to counter Chevron's California oil refinery proposals, though Citizens did complain about lack of time to assimilate some of these data. On the other hand, objectors in the Tameside resin manufacturing plant case had neither the information nor the time they required to present a cogent argument before the initial decision had been taken.

The time at which information is provided will be crucial in determining the objectors' response to it. As Messina and Sanderson reported, on the basis of several US siting case studies:

> It was strategically important that people receive information before they had relinquished their neutral positions and before they developed a negative impression of the information supplier. Once they took a position on either the proposed project or on the information supplier, additional information became almost valueless.
> (emphasis in original) (41)

The public can be effectively excluded from a decision not only by the withholding of information but by the failure to find the resources to maintain vigilance through a lengthy dispute, as at the Windscale inquiry into the reprocessing of spent nuclear fuel in the UK.[42] It is precisely because, in both the United Kingdom and the United States, the land use planning process is concerned with change and is relatively open to the public that public participation in the process of bargaining to limit air pollution is much greater than in the air pollution control process. Thus, the public planning inquiry into the fertilizer plant extension in Cheshire provided the local residents with a rare opportunity to voice their discontent with the previous performance of UKF because IAPI had provided no opportunity for participation in its control activities. The same was true of the residents' participation in the land use planning agency hearings in the Maryland solvent recycling plant case, though limited access to the state air pollution control process had been available.

Liaison with officials

There is a clear need for objectors to understand the process of administrative decision making and to be able to contribute to it through consultation or the presentation of a case. Effective public participation arrangements are necessary for this to take place. This contribution may be 'advice-giving' or concerned with 'error-detection' or may be 'negotiated'.(43) The type of contribution will depend on the attitude and professionalism of the air pollution control and land use planning agency officials and on their preparedness to accept public comment.

In most of the cases studied, whether an alliance was formed with their locally elected government or whether (more frequently) objectors had to fight both the local jurisdiction and the developer, the relationships between the land use planning agency and objectors involved 'advice-giving' and 'error-detection'. Where the views of land use planning agencies coincided with those of the objectors (for example, the views of St Tammany Parish council in the Louisiana creosote storage plant case and of the elected borough members in the Bolton sewage sludge incinerator case) relationships between officials and objectors may have been 'negotiated' but without any evidence of improper collaboration.

Relationships between air pollution control agencies and objectors varied between virtual non-existence (for example, in the St Helens sulphuric acid works case) through advice-giving (for example, the advice tendered to the environmental health department in the Cheshire fertilizer plant extension case) to error-detection (for example, the activities of the Oregon Environmental Council in the energy recovery facility case). The liaison established between the North Carolina air pollution control agency and the local land use planning agency by the Little Elk Creek Civic Association in the solvent recycling case was an example of making use of the public's right of access to both administrators and information to gain more stringent controls. Both advice-giving and error detection were involved.

Liaison with legislators

Caldwell et al contended that it is the right of local and broader action groups to determine the future of their own environment and that governments should respond to such groups. They felt, however, that elected representatives are often unable to represent the views of the public.[44] It is clear from the case studies that the better the formal and informal links objectors have with elected representatives, the more chance they have of success. Gaining the support of individuals or organisations with political 'muscle' is clearly invaluable. The more local and issue'orientated the government, the more elected representatives will be susceptible to political pressure.[45] Equally, objectors will generally have less power to exert such influence the fewer they are in relation to the population of the local jurisdiction concerned.

Some politicians will not need to be influenced by objectors but rather will themselves galvanise opposition. For example, the councillor in the St Helens sulphuric acid plant case and the commissioner in the Oregon energy recovery facility case were instrumental both in focussing the efforts of objectors and in leading the objectors' case. In other instances the elected representatives were swayed by objections into opposing and eventually preventing the establishment of new sources (for example, the Louisiana creosote storage plant and the Bolton sewage sludge incinerator cases).

Nature of argument

Kimber and Richardson suggested that:

> Most development issues involve a fine balance of economic against environmental benefits and it is one of the tasks of amenity groups to present policy-makers with a balance of argument which is weighted less in favour of the economic interests than has hitherto been the case. (46)

Theoretically, public decision-making demands that rational argument be advanced. However, there may well be tactical advantages to objectors in employing hyperbole and even misrepresentation, especially in the early days when opinions are formed. Such methods may help to mobilise public and hence political support for stopping a project, though they are obviously potentially dangerous weapons and may recoil on the objectors as the permitting process progresses.

In most of the cases examined the objectors' presentations were confined to rational argument but nevertheless the outcomes frequently had little to do with the merits of the cases put forward by objecting groups. Thus, it is to be doubted that the aborted Louisiana creosote storage plant would have generated the degree of pollution claimed by the objectors or that the Leathers sulphuric acid works in St Helens would have been denied planning permission had objections been raised earlier. One interesting feature is that some of the most satisfactory outcomes for objectors arose when one group concentrated on rational argument while another resorted to hyperbole. The activities of the Little Elk Creek Civic Association and Residents for Unpolluted

Neighbourhoods in the Maryland solvent recycling plant case and the Oregon Environmental Council and the city commissioner's group in the Oregon energy recovery facility case can certainly be categorised in this way.

Media attention

The environmental movement has, on the whole, been skilfull in utilising the media to put over its viewpoint on both national and local issues. As Frieden stated: 'Environmentalists'... vision of environmental quality attracts popular support, and they have shown exceptional skill in presenting their views to the media and to the courts'.[47] Reporters naturally enjoy investigating controversies and will frequently sympathise with the objectors against a large corporation. The media tend to be more concerned about environmental issues than might be expected from their ownership, providing objectors with substantial advantages in pressing their case.[48] The more media exist in a locality, the more this is likely to be true.

Many of the cases investigated in this study demonstrate that objecting groups can secure considerable advantage if they are able to enlist the support of the local media. There is no doubt that the regular reports and editorials of the Wilmington Star on the North Carolina oil refinery and the articles in The Oregonian on the energy recovery facility (notwithstanding editorial support for the project) had considerable influence on public opinion. Similarly, the article in the Washington Post on the Maryland solvent recovery plant had a marked effect by instigating a formal investigation. Where large existing plants were involved (eg the Chevron refinery, the Cheshire fertilizer plant) it was notable that the local papers tended to be more balanced in their presentation of objectors' and proponents' viewpoints and to devote less space to the issues than in many other cases.

Resources

Objectors require appropriate financial, technical, organisational and personal resources, and effective leadership. The involvement of existing environmental groups usually confers better access to these resources. Local residents may find it relatively easy to obtain money and informed advice from among their own ranks if they live in an affluent area. Typically, objectors group together very rapidly and, as a result of this impetus, are able to acquire sufficient information, knowledge, financial resources and skills to engage in meaningful, if sometimes unequal, battle against a developer. For example, the residents in the area around the proposed Bolton incinerator grouped together to pool their expertise and to raise financial resources.

Despite the ability of objectors to marshal sufficient resources to mount a campaign, their relative disadvantage in comparison with the developers was demonstrated several times in the case histories. The team of lawyers assembled by Chevron to fight the lone advocate from Citizens for a Better Environment over the oil refinery modification before the Bay Area Air Quality Management District Hearing Board is a case in point. Objectors may sometimes be fortunate in obtaining the support of a wealthy individual or concern in redressing the balance of resources relative to the developer. Thus, the rich property owner in the North Carolina oil refinery case financed the making of a propaganda film, the mounting of legal arguments and, presumably, the advertising campaign.

Sanctions

Objectors will frequently use every tool at their disposal, including legal challenges and manoeuvres, to induce procedural delays to achieve their goals. In the US context Caldwell et al have remarked upon the frequency of citizens' reliance upon the legal process in air quality controversies.(49) Resort to the courts raises the costs borne by the developer and imposes uncertainties on him. Legal action may be initiated by the objectors themselves or they may be able to persuade the air pollution control agency, or more usually, the land use planning agency to take this step. For example, the residents of Glossop attempted to force the closure of Ferro-Alloys in the molybdenum smelter case by taking out a High Court writ, but had to abandon the procedure for want of money. Again, objectors persuaded the City of Midland to take legal action against Petroplex in the Texas asphalt plant case.

The threat of procedural delay can be useful to objectors in negotiating mitigation of environmental impacts or other concessions. This mitigation by negotiation is perhaps more likely with large companies that are conscious of their environmental reputations:

> The fact that modern corporations are increasingly anxious to present a good public image can only assist environmental groups in applying successful pressure against development proposals. (50)

Thus, BECO was very anxious to negotiate mitigation measures with the North Carolina agencies and with objectors to the proposed oil refinery in order to foreclose the possibility of court cases and lengthy appeal procedures. Similarly, one reason why Chloride agreed to stringent emission controls in the Bolton lead battery plant case was to avoid a refusal of planning permission and hence the delay engendered by a public inquiry.

Objectors may even be able to stop a project by means of such sanctions. They may, for example, demand more and more concessions until the developer's amelioration costs become so high that the project ceases to be viable. This appears to have been the tactic employed by the Oregon Environmental Council in demanding stringent emission limitations in the energy recovery plant case. It was also the intention of the Glossop residents to increase pollution control costs in the hope that Ferro-Alloys might be forced to relocate the molybdenum smelter.

Objectors may also employ quasi-legal 'social' tactics such as pickets, the staging of organised demonstrations and protests at public meetings, etc. Action to close roads near the Texas asphalt plant by Midland County, at the behest of residents, fell into this category. Morell and Magorian given the example of a trench being dug across the access road to a plant by a local government.(51) Union action may sometimes be utilised to frustrate a developer. Some activity by objectors may cross the boundary into the extra-legal category. The attempt to arrange the razing of Spectron's Providence solvent recycling works in North Carolina was a tragic example of this type of action.

It is possible to advance a further hypothesis, which appears to hold true in the cases examined:

> The more personal, personnel, financial, legal and technical resources objectors have, the greater their power, the more information and time they have, the more access to the decision process they have and the greater their support in the media, the greater their chance of stopping or seriously delaying a proposed new stationary source of air pollution.

The authorisation process

The main elements of the authorisation process were illustrated in Figure 2.1. The outline shown there, together with the above discussion, make one thing abundantly clear: the more permits that have to be obtained and the more permitting agencies that are involved, the greater the chance of the developer's proposal being seriously delayed or stopped. The developer, after all, requires all the relevant permits to proceed, whereas the objectors only require one to be withheld or refused.

In one of the instances examined in this study, the developer in the Louisiana creosote storage plant case found himself faced by refusals of local and state land use permits, a postponement of the decision on the air pollution permit and a requirement to obtain a water pollution permit. He withdrew. Similarly, Dow withdrew from its

California chemical production facility site in the face of a large number of environmental requirements and the unusual refusal of an air pollution permit. When it appeared that Metro had obtained, or would obtain, all its permits to construct the Oregon energy recovery facility, it was defeated by another attack, through the initiative ballot process.

One other procedural factor may also be important in determining the outcome: the more laws, regulations and rules which apply to the permitting activities of a given agency, the greater the chance that the proposal will run foul of one of them because the agency's scope for manoeuvre will be diminished. In the case histories examined, this proved to be far less important that the multiplicity of agencies and permits required. However, Dow Chemical Company was refused an air pollution permit for its manufacturing plant because it was unable, under the specific rules then existing, to furnish offsets from a pre-existing plant close by in California. This is the only example of refusal of an air pollution permit found in the case histories.

It would be over-ambitious to attempt to predict the outcome of the authorisation process precisely. The most that can be achieved is probably the postulation of a hypotheses about the nature of the process which appears to be true in those cases examined:

> The more permits that have to be obtained, the more rules and laws that have to be observed, the more permitting agencies that are involved and the more points of public access that exist in the permitting process, the greater the

chance of a new stationary source of air pollution being permitted only on the basis of very onerous control conditions and/or of being seriously delayed, or of being stopped altogether.

Implementation of controls

The stress on implementation in the air pollution control literature probably dates from Crenson's study of air pollution control in the neighbouring communities of East Chicago, Illinois, and Gary, Indiana.[52] He applied Bachrach and Baratz's idea of non-decision making to the air pollution control process. They had concluded that:

> Non-decision making is a means by which demands for change in the existing allocation of benefits in the community can be suffocated before they are ever voiced: or kept covert, or killed before they gain access to the relevant decision making arena; or failing all these things, maimed or destroyed in the decision implementing stage of the policy process. (53)

Crenson's main contention was that powerful interests are capable, by the use of their power or even (as in his case of US Steel) simply by reputation and without having to do anything, of reducing air pollution to a 'non-issue' by keeping it off the public agenda and hence preventing enforcement action, at least for a period of time.[54] Since the time of Crenson's study in the early 1970's environmental consciousness has grown to such a degree that pollution is seldom a 'non-issue', especially when objectors have a formal opportunity to protest, as is usually the case when a new or expanded air pollution source is contemplated.

Once authorisation for a new or modified stationary source of air pollution has been granted, the degree of pollution arising from its operation may be less or, more usually, greater than the anticipated level. Thus, in the cases examined, the St Helens sulphuric acid plant emitted far more sulphur dioxide than expected and caused considerable damage. Similarly, the Florida resources recovery facility gave rise to much more odour and smoke than forecast. On the other hand, the Bolton lead battery plant has frequently emitted considerably less lead than the amount permitted. There appear to be several reasons for these variations in the expected performance of new or modified sources.

Perhaps the most obvious reason is the introduction of design changes between approval by the land use planning agency and construction. These can lead to emissions quite different from those considered appropriate by the planning agency.[(55)] Thus, once land use planning approval had been given, substantial changes to the design of the proposed Oregon energy recovery facility took place before it was aborted: a considerable reduction in capacity was agreed with the state Department of Environmental Quality and the type of air pollution control equipment was substantially modified. Similarly, several changes in the design of the Florida resources recovery plant occurred once land use planning approval had been given, following further negotiation with the air pollution control agency.

Some construction of new or modified sources of air pollution may arise without the express permission of the land use planning agency and hence give rise to emissions quite unanticipated by that agency, although known to and approved by the air pollution control agency. Case study examples of such instances are the Texas asphalt plant, which was constructed without the approval of Midland City; and the Yorkshire chemical formulation plant, which remained for a time in general industrial use and hence did not require planning permission.

Even where construction approved by the land use planning agency takes place, there are numerous parameters determining the extent of compliance with the conditions set by the control authorities. These can include the nature of the controls demanded, the acceptability of the controls to the developer, the developer's attitude to pollution control, the enforcement of control by the air pollution control agency and by the land use planning agency and the vigilance of the public.

Even where the conditions set by the land use planning and air pollution control agencies are met in the first instance, it is important to remember that:

> Achieving original compliance is no necessary indication that continuing compliance will be achieved. The incentives inducing the former often have little impact in terms of achieving the latter. (56)

Brady and Bower list many of the technical reasons why a plant may not continue in compliance, including unanticipated changes in production process variables and the inadequate operation and maintenace of equipment.[57] This list obviously may also apply to original compliance.

Nature of conditions

Where the conditions set by the land use planning agency or the air pollution control agency require the installation of certain physical items (eg a chimney of specified height, an electrostatic precipitator or an air filtration system) compliance is easy to check by either agency and initial pollution problems should not normally arise. Thus, the Glossop molybdenum smelter and the new town glass fibre works were constructed with specified chimney heights and the Bolton lead battery plant was constructed with an air collection and filtration system to the satisfaction of the planning authorities.

However, checks that the continuing operation of these types of equipment is within specification can realistically only be undertaken by the air pollution control agency, which has the competent staff. Similarly, emission control conditions that require direct monitoring or the checking of a company's own monitoring records will generally be the responsibility of the air pollution control agency because of its superior technical resources. Provided agency staffing is sufficient, conditions relating to the operation of equipment and emissions limitations can be checked relatively easily. Thus, it was easy to detect that the Florida resources recovery plant was frequently not complying with emission limitation conditions while it was operated by RRDC. Similarly, the pollution control authorities found it easy to check that the Bolton lead battery works was initially being operated within the set conditions. The environmental health department later discovered from the company's own records that it was no longer in compliance and renegotiated maintenance arrangements.

Compliance with other types of condition (eg requiring housekeeping and other general methods of pollution abatement or the avoidance of nuisance) may be more difficult to assess. The Maryland solvent recycling plant generally satisfied the few fixed emission limitation conditions relating to it but still gave rise to serious pollution. Similarly, it was difficult to determine whether the Glossop molybdenum smelter, which was subject to rather general air pollution control limitations, was in compliance with controls.

Acceptability of conditions to developer

There can be little doubt that the degree to which there is compliance with air pollution control conditions upon a new or modified source will depend to a considerable extent on their acceptability to the developer. If he accedes to conditions only grudgingly as the price for his permission, then his commitment to them may be low. Where, on the other hand, the developer negotiates the conditions with the air pollution control authority and the land use planning agency, he is likely to be much more committed to them. Thus (though it is too early to demonstrate it), Chevron should be capable of complying with the conditions freely negotiated between the company and the Bay Area Air Quality Management District in the California oil refinery modification case. Chloride suggested its own lead emission limitation levels in the Bolton lead battery plant and has generally been proud to demonstrate compliance with them. On the other hand, conditions imposed on the Florida resources recovery plant by numerous agencies may have contributed to the negative attitude and non-compliance of the original developer of the facility. Certainly, conditions imposed by both the St Helens council and IAPI on the sulphuric acid plant, without significant consultation or negotiation, seem to have been disregarded at the outset of operations, resulting in serious pollution problems.

Attitude of developer

Irrespective of the type of conditions, their acceptability or otherwise, and of the energy with which they are enforced by the control agencies, a crucial determinant of the performance of any plant will be the priority given to pollution control by the developer. Most developers will be anxious to accord a level of attention that avoids the difficulties that beset such operations as the Maryland solvent recycling plant (which was closed down for a period) and the St Helens sulphuric acid works (which led to the developer being involved in considerable expenditure on legal expertise). Nevertheless, the range of developer's attitudes exemplified by the case studies examined is considerable.

In the Florida resources recovery plant case the departure of RRDC and its replacement by a new operating company led to a marked improvement in the performance of the plant and a diminution in the level of complaint from local residents. Similarly, the take over of the Cheshire fertilizer plant by UKF from the previous company led to significant reductions in pollution. Comparison between the attitude of Chloride in the Bolton lead battery plant case (voluntarily accepting low emissions) and Leathers in the early years of the St Helens sulphuric acid plant case (when serious problems arose) offers convincing testimony of the importance of the priority accorded to pollution control by the developer. The Chloride case itself offers an example of the importance of management concern. The falling away of maintenance of pollution control equipment following a change of senior personnel led to a deterioration in emission levels which was rectified when the new managers reintegrated a maintenance schedule into the operation of the works. The improvement in pollution control performance at the Yorkshire chemical formulation plant following the change of company ownership from Crewe Chemicals to Pennine Chemical Services provides yet another illustration of the importance of management objectives in determining the level of pollution from a given source.

Air pollution control agency enforcement

Active implementation of controls by the air pollution control agency is known to have occurred in all but one of the cases where the source was constructed. Generally, air pollution control agencies prefer to discuss problems and agree solutions rather than take active sanctions. Nevertheless, the state of Maryland forced the closure of the solvent recycling plant, to enable it to re-equip, in the 1970's and it has subsequently continued to fight for implementation of controls and improvement in performance. Such stringent application of the air pollution control agency's sanctions is very unusual. Evidence of more normal types of implementation of controls is provided by the state of Florida and Dade County in trying to enforce conditions to reduce pollution from the resources recovery plant; the Bay Area Air

Quality Management District's repeated action to improve performance at Chevron's Richmond, California, oil refinery before the modification took place; and IAPI's efforts to improve the performance of Leathers Chemicals' sulphuric acid works. Fines were utilised in each of these cases and, over the years, the pollution control agencies do appear to have had some success in reducing air pollution levels in the cases examined.

Land use planning agency enforcement

The land use planning agency's powers of retrospective control are insubstantial in comparison with its anticipatory powers (Chapter 3). Further, the enforcement powers available to them are rather weak and there is a consequent reluctance to employ them. Land use planning agencies are often unable to resist applications to vary planning conditions once a new development is operating (Chapters 4 and 6). These factors, coupled with a relative lack of technical competence in air pollution control, might lead to the expectation that they would take little interest in enforcing pollution control conditions or in trying to ameliorate serious pollution problems once sources have been constructed. In fact, in the case studies examined, the land use planning agencies were more active in implementation than might have been expected. The reason for this is presumably the local nature of their jurisdiction and their readiness to try to respond to vocal manifestations of public opinion.

Of the ten instances examined where construction took place, active implementation was undertaken by the land use planning agency in six cases. For example, in the Maryland solvent recycling case it was Cecil County's action in harrying Spectron at the Providence plant and refusing discretionary permits at the Childs site that led to the agreement to construct a new facility. It was Midland City's determination to act on the Petroplex asphalt plant in Texas which led to annexation, the demand for a permit application, refusal of the discretionary permit and subsequent removal of the plant. The Kirklees Metropolitan Borough Council planning department used its powers of enforcement to try to improve the pollution control performance of Crewe Chemicals' formulation plant. It lost its case at the public inquiry but its energy in pursuing the company reflected the inadequacy of the environmental health department's air pollution control powers and its frustration at the inoperability of its planning conditions. St Helens utilised first enforcement action and then a discontinuance order to try to close Leathers Chemicals' sulphuric acid plant. The known potential compensation cost of closure, several million pounds, showed the level of concern by the local authority.

While the land use planning agency may not always be successful in attempting to implement its conditions or its general powers to control pollution from an existing source, it may thus sometimes achieve drastic remedies such as closure. In general, however, the retrospective powers of land use planning agencies over air pollution are weak compared to those of air pollution control agencies.

Vigilance of the public

Vigorous complaint by the public about pollution from a newly constructed source is a crucial lever in ensuring active implementation of conditions. Thus, it was the complaints of the public about the Texas asphalt plant that led to its removal following land use planning agency action. Similarly, the departure of RRDC from Florida and the subsequent improved performance of the resources recovery plant was a direct consequence of public complaint. Equally, the enforcement activities by Cecil County and the state of Maryland in the solvent recycling plant case flowed from public outcry. Much the same is true of the attempts to control pollution from the Yorkshire chemical formulation plant, the St Helens sulphuric acid plant and the Glossop molybdenum smelter. Again, the voluntary decision by Sterling Mouldings not to proceed with construction of the resin manufacturing plant in Tameside, once permission had been granted, was a direct consequence of the public protest about the pollution from its previous activities.

Overall, it is possible to advance a hypothesis about the nature of the implementation of controls over new or modified sources of air pollution which is true in the instances investigated:

> Once a new source of air pollution has been approved, the more closely the type of pollution control equipment is specified, the more the developer has been involved in negotiating the conditions, the higher the priority given to pollution by the developer, the more the air pollution control and (particularly) the land use planning agencies

insist on implementation of conditions and the more the public protests about pollution incidents, the greater will be the degree of control over pollution.

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9 US/UK COMPARISON OF ANTICIPATORY CONTROLS AND THEIR IMPLEMENTATION

The United States and United Kingdom systems of anticipatory control over new or modified sources of atmospheric pollution are compared in this chapter. Conclusions about the nature of control in the two countries are drawn, utilising the case histories (some features of which were summarised in Tables 5.1 and 7.1, which can be compared) to exemplify the observations made. An attempt is made to evaluate the two systems, according to the roles of the actors identified in the procedural model, using the criteria advanced in Chapter 2. It will be recalled that efficiency is used to give a measure of the maximisation of net benefits (ie all the gains to the developer and the community minus the costs of all types) attributable to the new source of air pollution. Cost-effectiveness is often employed to describe the least cost method of achieving a given level of pollution control. Outcome and procedural equity are measures of fairness in decisions about new pollution sources. Effectiveness is a measure of how well controls operate in practice.

This chapter follows broadly the same structure as Chapter 8. Thus, the first section is devoted to a discussion of the role of the developer and the nature of the project. In this, the different approaches in the United States and the United Kingdom to mitigation and the distinctive effects on siting decisions of the characteristics of the project and of the developer are examined. The differences between the apparent efficiency, equity and effectiveness of the developer's treatment in the siting process in the two countries are then analysed. Much the same pattern is followed for the air pollution control agency, the land use planning agency and the objectors. In each case observations about the ramifications of the various factors shown in Figure 8.1 are made if they differ significantly in America and Britain. The sections of Chapter 8 dealing with the authorisation process as a whole and with the implementation of controls have no parallel in this chapter. Rather, a comparative analysis and an evaluation of the US and UK anticipatory control systems are presented in Chapter 10.

The developer

Mitigation

The process of bargaining, which includes modification of the proposed project and the offering of concessions to the control agencies and to the local community, is perhaps more overt in the United States than in the United Kingdom because it is more public. However, the developer's relationship with the air pollution control agency in the United States is likely to be more cautious and restrained than in the United Kingdom. Despite all the rules (Chapter 4), there may be considerable uncertainty about the precise nature of the controls to be demanded in America, partly because changes in either federal or state rules during the permitting process may affect the outcome. Other reasons include the complexity of the rules, the varying interpretations placed upon them by the developer and the air pollution control agency and the degree of external scrutiny of the permitting process. In the United Kingdom, on the other hand, the general nature of 'best practicable means' or local authority controls is well known and the relationship between the developer and the control agency is thus likely to be much less uncertain, though the precise details may need to be ironed out. The absence of external scrutiny may also mean that the air pollution control agency will be more overtly sympathetic to the developer's position than in the US.

Examples of the uncertainty in US requirements can be seen in the Oregon energy recovery facility case. Here, stipulations of permissible levels of sulphur dioxide emissions were progressively lowered as more air pollution modelling was undertaken but hydrocarbon offset requirements were not, in the end, demanded when initially it had seemed that they would be. Similarly, the developer in the California chemical manufacturing facility case was astounded to find that the rules of the air pollution control agency then current effectively prohibited development (a very rare instance of refusal by such an agency). In the UK, the Chloride lead battery plant case in Bolton was an unusual instance of the Industrial Air Pollution Inspectorate's (IAPI) air pollution control requirements changing as negotiations progressed. No examples of the refusal of air pollution permits were found in the British case studies (or in general - see Chapter 6). Indeed, the developer was generally able to rely on IAPI's support whenever controls were publicly discussed, as in the Cheshire fertilizer plant extension and the Glossop molybdenum smelter cases.

The amount of information demanded of the developer by the air pollution control agency differs markedly between the two countries. In the United States it can take a developer several months and the expenditure of large sums of money (eg on ambient air quality monitoring) to assemble the information required for a permit application. Applications, which are subject to public scrutiny, are seldom deemed 'complete' by agencies until yet more information is furnished. In the United Kingdom, on the other hand, the amount of information demanded is seldom great (and is very unlikely to involve such intricacies as ambient air quality monitoring) and it is not usually subject to external inspection. Besides confirming these differences as to data requirements, the case studies also show that the time taken to process the permits was substantial in several American instances, particularly the ten months taken for the North Carolina oil refinery, whilst being generally brief in Britain. Furthermore, in America the developer may have to obtain several different air pollution permits, perhaps involving both state and federal agencies. In Britain, on the other hand, it is unusual for more than one application and one agency to be involved.

There was some similarity in the nature of the developer's relationship with the land use planning agency in both countries, arising from the need for negotiation because of the uncertainty of the outcome. The seeming predictability of the US zoning system is illusory because of the requirements for various types of ancilliary permits and the opportunities they provide for delay or outright refusal. Similarly, though the development plans in the United Kingdom provide valuable guidance as to the likely acceptability of a development, the decision is still taken essentially, as in the United States, on a case by case basis. Johnson has remarked that, in general, the American land use planning system is a great deal more flexible than the British system and that very often, the persistent developer will eventually obtain his permit.[1] However, this does not necessarily apply to new sources of air pollution, where deep public antagonism may change the outcome.

Thus, of the eight American cases examined, three land use planning agencies, St Tammany Parish in the Louisiana creosote storage plant case, Midland City in the Texas asphalt plant case and Cecil County at the Childs site in the Maryland solvent recycling plant case, refused permission to develop. The North Carolina state coastal planning agency also initially refused to allow the Brunswick County plan to be altered to permit development but later accepted a revised plan. In Britain, on the other hand, only Bolton in the sewage sludge incinerator case refused permission for a new source initially, though Kirklees Borough Council started to issue refusals once pollution problems had started to occur in the Yorkshire chemical formulation plant case.

The biggest difference in the relationship between the developer and the land use planning agency in the two countries probably concerns the appeal procedure. An industrial developer appealing to hearing boards or to the courts in the states with the stronger land use planning control systems will have little chance of success if the correct procedures have been carried through (though he may have more in states with weaker controls). The local jurisdiction is free to make up its own mind irrespective of federal and state policy pressures. Where a state land use planning agency exists this is usually powerless to overrule a decision by the local jurisdiction. On the other hand, the UK developer (and the local planning authority) is aware that an appeal to the Department of the Environment is reasonably likely to prove successful, especially if the party in government is determined to encourage business. In Britain, therefore, a developer approaching a local authority knows that it must take account of central government policy, which will often tend to be overwhelmingly in his favour.

Notwithstanding the general impression of American developer/land use planning agency relationships, the developer of a new air pollution source in the United States will have less power than the planning agency. The developer's only recourse will often be to locate his development elsewhere if he cannot agree mitigation conditions. In the United Kingdom, on the other hand, the developer will have the greater power because of the likelihood of central government support on appeal but the local authority can use the delay endemic in the appeal procedure as a method of gaining concessions by threatening refusal. In the Bolton lead battery plant case, for example, Chloride was anxious to avoid the delays associated with an appeal against refusal of planning permission and was thus particularly amenable to bargaining. In the new town fibre glass manufacturing plant case the new town was the landlord and thus in a particularly strong bargaining position.

There was only one appeal to a non-local hearing board by the developer among the US cases studied, though there were several to the locally elected body which were all refused. The appeal to the Louisiana state Coastal Commission was refused in the creosote storage case, just as the appeal to St Tammany Parish Council had been denied.

In the UK, four cases were the subject of appeal inquiries at some stage: the Bolton incinerator, the Yorkshire chemical formulation plant extension, the Cheshire fertilizer plant extension and the St Helens sulphuric acid plant. Only in the incinerator case did the developer not gain his desired decision. Nevertheless, concessions to mitigate impacts are often offered by developers at public inquiries in the UK, as evidenced by the ameliorations suggested in the Bolton incinerator case.

The small size of many local authorities in the United States means that the developer must pay more attention to the various project impacts on the immediate local community than in Britain. This is likely to lead to offers of more significant modification of the project and of more substantial 'financial' incentives to the local community in the form of planning gains. The payment for traffic management and road design work by Chevron in Richmond, California as a condition of modifying its oil refinery is a good example of the latter type of concession.

Generally, the developer in the United States requires far more permits than the British developer. Thus, the North Carolina oil refinery needed over ten permits and, notwithstanding the attempts of state officials to co-ordinate the granting of these and to keep track of the application, BECO was hard-pressed to maintain its schedule through the regulatory process. Similarly, numerous federal, state and local permits were required in both the Florida resources recovery plant case and in the California chemical works case. In the eight United States case studies, only the latter application foundered on the environmental regulations of other than a land use planning agency. Even here it is likely that Dow Chemicals would have received its air pollution permit if it had waited for the offset provision rules to be changed. In the UK case studies there was not even evidence of any delay in gaining permissions being engendered by air pollution control regulations. Other non-land use planning environmental permits were not required in the British cases.

The developer in the United States tends to be far more embroiled in legal battles than his British counterpart. Thus, only one British case, the St Helens sulphuric acid manufacturing plant, actually reached the courts; and this was over an enforcement issue. On the other hand, the courts were involved in the Maryland solvent recycling plant case (to such an extent that the developer qualified as a lawyer in order to conduct the legal arguments), the Texas asphalt plant case, the California oil refinery modification case and the California chemical plant case. Quasi-judicial appeal procedures were also involved in the Louisiana creosote storage plant, North Carolina oil refinery and Oregon energy recovery plant cases.

Project and developer characteristics

The effect on local revenues of a large development in the USA can be substantial and local governments are frequently influenced by this. Project benefits can be substantial. Thus, Solano County in the California chemical plant case, Brunswick County in the North Carolina oil refinery case and Oregon City in the energy recovery facility case were anxious to welcome these substantial developments. The importance attached to this revenue is exemplified by Oregon City extracting a condition that if Metro (which had tax-exempt status), rather than a private company, were to build and operate the plant it would pay the equivalent of the local taxes to the city authorities.

Because of the different system of financing local government in the United Kingdom and the larger size of local authorities (Chapter 6) the revenue attractions of a large new source of air pollution are much smaller than in the United States. It is comparatively rare for a UK developer of an industrial site to offer incentives to the local authority, other than the incidental benefit of the project in increasing or maintaining local employment. This factor alone can be highly significant, however, as the efforts of Bolton to ensure that Chloride did not construct its lead battery plant elsewhere testify.

Perhaps the most important difference between the USA and the UK in comparing attitudes to the developer is the much lower level of public distrust of business interests in the UK. In the United States the violation of environmental law carries much less of a stigma in the business world than it does in Britain. Business performance in the USA tends to be judged almost exclusively by economic rather than social criteria. As Vogel put it:

> In a society without a Queen's Honors List, the only socially recognised measure of achievement in business is the 'bottom line'. ...
>
> While businessmen in America who 'stand up' to regulatory agencies - even to the extent of violating the law - are often regarded as heros by other members of their industry, the opposite is true in Britain. (2)

Thus, in the case studies examined, marked opposition to developers in Britain did not generally arise unless or until the adverse environmental performance of their plants was apparent and their reputation had deteriorated. This was true, for example, in the St Helens sulphuric acid plant case and in the Yorkshire chemical formulation plant case. Only in the Bolton incinerator case did significant opposition arise prior to approval. In the United States, on the other hand, there was marked opposition to development in several of the cases studied (eg the Louisiana creosote storage plant and the North Carolina oil refinery) before approvals were granted. In closer parallel to the British experience, there was opposition to the Florida resources recovery facility and to the Maryland solvent recycling plant only when these developments were in operation.

Contrary to the expectations aroused by the greater social responsibility of business in Britain and Vogel's assertion about environmental concern, the developers' attitudes to air pollution do not appear to have been markedly different in the US and the UK in several of the cases studied. Clear attempts by developers to meet their environmental responsibilities are perhaps seen most clearly in the Bolton lead battery plant and the North Carolina oil refinery cases. In both instances, companies made conspicuous efforts to meet not only legal requirements but to go considerably beyond them in accepting or proposing mitigating, non-mandatory modifications and in adopting a co-operative posture. Equally, the attitude of four other companies, Leathers in the St Helens sulphuric acid works case, Crewe Chemicals in the Yorkshire chemical formulation plant case, Petroplex in the Texas asphalt plant case and Spectron in the Maryland solvent recycling facility case, showed little concern for their environmental responsibilities. In particular, Spectron's reputation in Cecil County, Maryland, was so unedifying that it had little support in its siting dispute despite the fact that it conferred the considerable benefit of employing 50 people.

The balance of evidence from the other case studies, while not overwhelming, does tend to support the general expectation of British business. Thus, while authorised construction did not take place in five of the US case histories examined, the British developers were eventually able to satisfy the control authorities without the latter having to use financial penalties.

Though the <u>feasibility of control</u> of air pollution does not appear to be a factor which influenced the outcome of the cases differently in the two countries, it is probably true that the American public reacts more vigorously to 'political' or controversial <u>types of pollution</u> than the British do. One reason for this may be because the Americans have a greater belief that they can affect the outcome of a decision to allow the source to be sited. Another reason may be the greater distrust of industry. As Wildavsky has pointed out:

> Try to read a newspaper or news magazine, listen to radio, or watch television; on any day some alarm bells will be ringing. What are Americans afraid of? Nothing much, really, except the food they eat, the water they drink, the air they breathe, the land they live on and the energy they use... How can we explain the sudden, widespread, across the board concern about environmental pollution and personal contamination that has arisen in the Western world in general and with particular force in the United States? (3)

Vogel felt that the explanation for this phenomenon is widespread suspicion of business.(4)

It is instructive that the opposition to the pollutants from the Dow chemical plant in California, to the dioxins from the energy recovery facility in Oregon, to the creosote from the storage plant in Louisiana and to the suspected carcinogens from the solvent recycling plant in Childs, Maryland, was particularly vigorous. By contrast, the opposition to the lead battery plant in Bolton was positively muted, through the campaign aginst the molybdenum smelter in Glossop used some American tactics in making emotive complaints about the dangers of heavy metal pollution.

The effect of the nature of the site on air pollution levels should generally favour the developer in the US because population densities are much lower than in the UK. It should therefore be easier to site a new source of air pollution well away from local residents to reduce the likely damage. Thus, the North Carolina oil refinery, the Texas asphalt plant and the Florida resource recovery plant were all at least half a mile from the nearest dwelling and the number of people resident within a quarter of a mile of several of the other American sources was very limited. Nevertheless, this lack of immediate proximity does not appear to have reduced the level of objection to the proposals. In the UK, on the other hand, all the proposed sources were within less than half a mile of the nearest houses. The problems posed by the St Helens sulphuric acid plant and the Tameside resin manufacturing plant were particularly exacerbated by the very close proximity of existing residential areas.

Evaluation

The degree of efficiency achieved in the permitting process depends on several factors. One is the cost of the transaction to the developer. It is quite clear that these are likely to be much higher in the United States than in the United Kingdom. The fees to be paid for applications to various agencies are the first evidence of this; quite apart from the costs of providing voluminous information, of fighting appeals and court cases, and generally negotiating a pathway through a maze of environmental regulations. Thus, the cost to BECO of its attempt to site an oil refinery in North Carolina was put at $3,000,000 whereas Metro and Wheelabrator-Frye together spent over $2,000,000 in the Oregon energy recovery facility case.

Another factor is the cost to the developer of complying with all the relevant new source environmental regulations. the evidence from the United States discussed in Chapter 4 indicated that this was not an important factor in locational decisions. As Leonard has reported, 'the costs of complying with environmental regulations are not emerging as a decisive factor in most industrial decisions concerning desirable plant locations...'.(5) Nevertheless, the costs of control can be high and the recently encouraged flexiblity in meeting pollution control objectives has been welcomed by developers. An example of this is the use of 'bubble' conditions in the California oil refinery modification case, to allow Chevron to choose its own methods of achieving the net emission decreases required.

In the United Kingdom, in particular, it appears that the developer's local influence may result in pollution damage higher than the optimum level due to inadequate controls. The benefits of the project to the local community, on the other hand, are probably likely to be greater in America than in the United Kingdom. These factors may result in a higher local net benefit and thus a greater degree of efficiency in the USA. Similarly, the ease of locating a new source on a remote site in America will increase efficiency, since the assimilative properties of the environment will help to reduce the damage experienced by neighbours. Thus, it seems very unlikely that the outcome in the Louisiana creosote storage plant case was efficient, as the advantages of the project were tangible and the possible environmental costs were very small. This case also illustrates the fact that a 'political' pollutant will frequently be so emotive that there is little possibility of an efficient outcome in either country.

Outcome equity is probably greater for the developer in the UK as applications in different parts of the country have a greater chance of being treated equally than in the US, where there is a greater risk of refusal by the local land use planning agency.

In both countries, public equity may be inversely proportional to the influence of the developer. Certainly, in either the USA or the UK an existing company offering substantial local employment will seldom lose a battle to expand or modify its premises, irrespective of the air pollution resulting. The outcome equity associated with the benefits of the project will obviously depend on precisely who gains from them and who bears the costs of the damage. The greater availability of benefits to local residents in the United States because of the smaller size of local authorities and the nature of the local revenue base should lead to a more equitable outcome in that country. The larger population of most local jurisdictions in the United Kingdom will make it more difficult than in the USA for the minority directly affected by pollution from a new source to convince the majority to reject it, especially where the benefits to the larger population are substantial. This factor thus reduces the likelihood of outcome equity for the local community in the UK.

Procedural equity is similar in the two countries so far as the developer is concerned because there is an equal right of appeal against the decisions of the local land use planning agency. In principle, developers in the United States have a greater right of appeal against the decisions of the air pollution control agency but there is very seldom a need to exercise such a right in either country.

It is possible that the effectiveness of air pollution control conditions will prove greater in the UK than in the US because the majority of UK companies probably show a higher degree of environmental responsibility than their American counterparts and thus are motivated to achieve a greater degree of co-operation with the air pollution control agencies. Planning conditions relating to air pollution control may also prove more effective in the UK, for similar reasons.

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The air pollution control agency

The system of air pollution control in the USA may be characterised as comprehensive, with each application being decided according to a clearly specified set of goals (air pollution concentration standards) and a comprehensive plan (the state implementation plan) to implement these standards. Though the detailed regulations are arcane (for example, those relating to the prevention of significant deterioration), air pollution controllers have a full range of anticipatory powers at their disposal to limit pollution from most new or modified sources. Their freedom of action is, however, more circumscribed than in Britain. They are also subject to much more rapid rule changes and more frequent staff turnover than in the UK.

In Britain, on the other hand, the policy context is quite different. There is no plan to reduce pollutant levels, each application is decided on an ad hoc basis and certain types of source are subject to relatively uncomplicated anticipatory controls typified by 'best practicable means'. Other sources are not subject to any air pollution control agency anticipatory controls.

Grant of permit

The fragmentation of control over air pollution in the United Kingdom, with different types of industrial sources and mobile sources under the aegis of different agencies is less likely to inconvenience an industrialist in pursuing his application than the division of functions between federal, state or regional (and sometimes local) agencies in the United States. Thus, in the United States the developers had to deal with both federal and state or regional air pollution control agencies in, for example, the North Carolina oil refinery and the California chemical plant cases. In addition, RRDC also had to deal with Dade County air pollution controllers in the Florida resources recovery plant case. In the UK, on the other hand, initially only Chloride in the Bolton led batter works case had to deal with both the Industrial Air Pollution Inspectorate and the local environmental health department, though the Inspectorate also became involved in the later stages of the Yorkshire chemical formulation plant proceedings.

Knoepfel and Weidner felt that Britain has only a 'national rump programme' of air pollution control.(6) While it is quite obvious that the British system of pollution control is indeed incomplete in comparison with the American, their analysis seems to miss both the full extent and the sophistication of British controls over air pollution, particularly underrating IAPI's anticipatory controls. However, the partial nature of British air pollution control is well exemplified by the lack of anticipatory controls imposed by the air pollution control agencies in, for example, the new town fibre glass plant and the Yorkshire chemical formulation plant cases. The efforts of the local authorities to employ land use planning powers in these cases testifies to this lacuna. Lack of comprehensive anticipatory control is not a solely British characteristic, however. The way in which US companies can avoid meeting regulations is exemplified by the decision to locate the Petroplex asphalt plant exactly half a mile from the nearest house in order to gain a permit exemption.

The principal differences in the way the air pollution control agencies undertake their responsibilities in the United Kingdom and in the United States appear to lie in the degree of formalisation of control, in the impact of this on consequent room for manoeuvre, and in the degree of external inspection.

The freedom of manoeuvre in interpreting the US rules is limited by the tightly prescribed policy context. It would not be possible, for example, for a major new source to be located in an non-attainment area without the provision of offsets. The Dow chemical plant case in California demonstrates the lack of flexiblity to make decisions about major sources which might be locally desirable because of their revenue, employment and other benefits. This is not to say that the US air pollution agencies are completely without freedom of manoeuvre. Palmer Barge Lines were faced by a belated requirement to apply for an air pollution permit in the Louisiana creosote storage plant case, after initially being told no such permit would be necessary. The differences in particulate emission levels between the Florida resources recovery facility and the two Oregon recovery facility permissions (0.015-0.08 gr/ft^3) also demonstrate the variations in the degree of control that are possible in the US system.

Nevertheless, by comparison, the British Industrial Air Pollution Inspectorate may have considerably greater discretion in interpreting the meaning of best practicable means in relation to a particular new pollution source, if only because the absence of ambient standards means that prohibition is never necessary. The best practicable means for the general type of works may be publicly known but the history of the Inspectorate indicates the progressive and co-operative nature of the relationship between IAPI and the developer once the source has been constructed.

The manoeuvrability inherent in British anticipatory controls is demonstrated by the Bolton lead battery plant case, where emission standards far less permissive than those normally required under 'best practicable means' were agreed by IAPI. It may also be seen in the Glossop molybdenum smelter case and in the St Helens sulphuric acid works case where widely varying chimney height requirements were imposed once problems had arisen.

Comparisons between the knowledge and attitude of US and UK air pollution controllers are difficult to draw, though the highly specialised industrial air pollution inspectors might be expected to be the most knowledgeable air pollution controllers. US air pollution control officials may be more bureaucratic than their British counterparts since they must be very careful not only to follow the appropriate regulations but to be seen to do so. Thus, the air pollution controllers in the Maryland solvent recycling case were very anxious to be seen to be considering the permit application for the Childs site very carefully and strictly according to the regulations. Those responsible for the North Carolina oil refinery permit quite openly admitted prolonging their examination because of the likely challenges from objectors.

Obtaining an air pollution permit is frequently a more time-consuming business in the United States than in the United Kingdom and there may be appeals and court cases to prolong the process. It is noticeable, for example, that EPA took several months to make its PSD determination in all three cases where it was involved. However, a consent will eventually be issued in the USA if the rules permit, just as it will in the United Kingdom. Despite the differences in legal provisions, negotiations are universal in both countries and it is almost unheard of for a serious applicant to be refused a permit.

Conditions and location

Air pollution control conditions appear to be more stringent and onerous in the USA than in Britain. It seems logical to equate the US 'best available control technology' with the British 'best practicable means' since both take the economic costs of control into account. However, there is no British equivalent of the use of 'lowest achievable emission rate' in non-attainment areas or of the complex monitoring conditions that are often utilised. For example, no British case involved conditions as onerous as those imposed by North Carolina on the BECO oil refinery which required several expensive ambient pollution monitoring programmes.

The relationship between the air pollution control agency and the land use planning agency is likely to be closer, and consultation between these agencies is likely to be greater, in the UK than in the US because they often operate at the same level of government and because their decisions are both usually taken on a case by case basis. It is quite common for environmental health department officers in English districts to ask their colleagues in planning departments to append conditions relating to pollution control. This is seen, for example, in the case of the new town glass fibre works and the Yorkshire chemical formulation plant. That such consultation does not always take place is evident from the St Helens sulphuric acid plant case: the Glossop molybdenum smelter case shows that it sometimes results in disagreements between the two local authority-based agencies.

This use of planning conditions is unlikely to be either so easy to achieve or so necessary in the United States. In the US case studies planning conditions were only employed in two instances: by Oregon City in the energy recovery facility case; and by the Florida state power plant siting agency in the resources recovery facility case. The somewhat distant relationship between IAPI and the local planning authorities in the UK is probably more akin to the US situation. Administrative and legal tensions regarding the use of planning conditions to control pollution between the higher jurisidiction air pollution control agency and the local land use planning agency appear less evident in the USA, presumably because the primacy of the air pollution control agency is clearer, and because it is more open to public participation than its UK equivalent.

There appear to be few differences in the way air pollution control agencies deal with the location of a source in the US and the UK. In both countries it is left to the land use planning agency to state whether a given site is appropriate or not, though advice may sometimes be tendered by the air pollution control agency (especially by the environmental health department in Britain). Perhaps the most obvious difference is that some account of location may be taken by the air pollution control agency in the UK by prescribing higher chimneys where a source is in close proximity to housing or other sensitive land uses. The new town glass fibre works and the Glossop molybdenun smelter furnish examples of this method of control. Chimney height is not widely used in the US as a means of abatement, though some subtle tightening of conditions may occur where it is evident that a source is likely to cause damage to a nearby residential area. The additional activated carbon filter proposed for the Spectron plant at Childs, Maryland, following discussions with residents would be an example. In general, however, even less consideration will typically be paid to the precise location of the source in the US than in the UK.

Evaluation

Blowers has expressed the difficulties of comparing air pollution control systems in the US and the UK:

> It is virtually impossible to evaluate the relative merits of the alternative systems of control. The American approach is comprehensive, available for scrutiny, and seeks to avoid inequalities between industries, states or geographical areas. But it is cumbersome, complex and costly. The British system operates flexibly, and according to local economic and environmental circumstances, but it relies heavily on administrative discretion and a close relationship between government and industry remote from effective public challenge. (7)

It is extremely difficult to compare the efficiency of the air pollution control systems in the United States and the United Kingdom in relation to new sources because of a severe shortage of data. The granting of permits by both US and UK agencies, with virtually no refusals, cannot always lead to an efficient outcome since there will be circumstances in which the costs of damage arising in a particular location will be greater than the benefits of the new source (the 'conditions inappropriate' case in Figure 1.1).

The general lack, in both countries, of substantial variation of conditions to reflect location must be economically inefficient because the capacities of different environments to assimilate a given level of pollution vary. Because the intensity of land use tends to be lower in the US, the cost of damage from similar pollution sources should be less there than in the UK.

It is apparent that the US system should lead to greater anticipatory control over new sources of air pollution, as there can be little doubt that US controls tend, on the whole, not only to be more comprehensive but to be more stringent. There is no British equivalent of an offset policy for nonattainment areas, for example. Conditions on new sources (ie non-offset conditions) are probably also more exacting in the US. Thus, the developers of the Oregon energy recovery facility claimed it would have the highest level of pollution control for an energy recovery plant in the world, and would thus minimise damage costs borne by third parties. The damage likely to arise from new sources of air pollution should therefore be correspondingly less in the United States. These benefits, however, are bought at the expense of greater administrative costs, both within the control agency and within the developer's organisation and, seemingly, at the expense of greater technical control and monitoring equipment costs.

The fact that negotiations are almost universal between the air pollution control agency and the developer in the two countries will tend to lead to lower costs to the developer and perhaps to a more economically efficient outcome than would result from the arbitrary imposition of controls.

In some instances in the United States (for example, the purchase of offsets by funding reductions in emissions from other companies' sources) the outcome may be inefficient in that the developer has to pay too high a price (the conditions may be 'too strong' in the terms used in Figure 1.1). The greater degree of public participation in the United States may sometimes decrease efficiency by resulting in the tightening of conditions already stringent enough to achieve the optimal level of pollution. There must be a suspicion that the conditions demanded of BECO in the North Carolina oil refinery case, and the guarantee of an inflation adjusted sum of $70,000 per annum to enable collection of garden refuse extracted from Metro in the Oregon energy recovery facility case were 'too strong' and likely to lead to an inefficient outcome. Such outcomes may not be unique to the US because it might also be argued that Chloride utilised controls which were unnecessarily stringent in the Bolton lead acid battery case.

On the other hand, it seems that decisions may sometimes be inefficient in the UK for a different reason. Insufficient control may be applied (the conditions may be 'too weak') and the residual pollution problem may result in high damage costs. This certainly appears to have been true, for example, in the St Helens sulphuric acid works case where very severe pollution damage occurred. In other instances, such as the Yorkshire chemical formulation plant case, no anticipatory controls were used and subsequent pollution damage costs showed that this was an inefficient solution.

Since anticipatory control costs are much lower than retrospective control costs (Chapter 1), it would seem more efficient to err on the side of anticipatory controls which are too strong rather than too weak. In this sense, at least, the United States system of anticipatory controls over new sources may be more efficient than the UK system.

The system of controls over new sources must, to a large extent, be typical of the general air pollution control systems in the two countries. While both the US and the UK have made significant strides in reducing air pollution levels this has been achieved in the USA at much greater proportionate costs than in the UK, where expenditure on both personnel and equipment is far lower (Chapters 4 and 6). O'Riordan, in analysing the role of environmental quality objectives in both the United States and the United Kingdom, surmised that the United States Clean Air Act lacks balance because of the nature of the legislative process in that country, whereas best practicable means carries with it the 'balancing' procedure still wanting there. While identifying the general historic trend from a system embodying only ad hoc emission controls in the most polluted areas towards the setting of emission consents within the context of regional environmental quality objectives, he concluded that:

> In the final analysis, it appears that abatement technology will improve regardless of which method is applied, and that the rate of improvement will largely be dictated by economic and political considerations. The use of the law in the United States ...encourages intervention by environmental groups, but even the most dedicated environmental lawyers admit that such decisions should ultimately be political in the sense that the social and economic repercussions of harsh pollution control be set against the gains to public health and amenity. (8)

It would thus appear that the UK system in general is probably more cost-effective than the US system in that similar reductions in pollution levels have been achieved at lower cost. As Asimow has stated:

> Individually negotiated emission limitations may be more stringent than those imposed by a general rule because a rule must accommodate the least efficient producer who is to remain in business... The British negotiated settlement approach avoids the adversary, confrontational style so characteristic of American environmental regulation... But particular low-visibility compromises may be more lenient than would be achieved through a system of strict, relatively inflexible regulations... On balance, it appears that the non-adversarial British approach is at least equally effective in improving environmental quality and operates at a lower cost with much less friction. (9)

However, if the British system of controls over new sources administered by air pollution control agencies is more cost-effective than the American, it does not necessarily follow that it is more efficient, since the costs of pollution damage in Britain might be greater.

Outcome equity is perhaps likely to be higher in the US than in the UK. In general, the developer is equitably treated in both countries by being involved in negotiations determining the eventual outcome and hence influencing it, by being granted a permit and, in relation to other developers, by not being given a significantly location-dependent decision. The local residents, on the other hand, are inequitably treated by both the virtually certain grant of the permit and the relative uniformity of conditions imposed in both countries since they may have to bear damage costs well above the optimum level because of the characteristics of the specific location. Because of rather stricter conditions on new sources in the US (and lower population densities) local residents are likely to be less subject to pollution from a new stationary source of air pollution than in the UK and hence to be more equitably treated.

Procedural equity is also likely to be higher in the United States. There are far greater opportunities for participation and for objection in the US than in the UK, and the outcome can be, and is, influenced by the representations of third parties. The activities of Citizens for a Better Environment in the California oil refinery modification case in demanding an appeal and of the local residents in the Texas asphalt plant case in requiring a permit exemption hearing have no equivalent in the UK. There are, of course, particiation costs but these can yield substantial dividends in the stringency of conditions applied to air pollution permits.

Evidence relating to the effectivness of the two systems of control over new sources of air pollution is difficult to obtain. As Blowers has stated:

> It is very difficult to evaluate the effectiveness of the system of controls now applied in the United States. On the one hand it is argued that it has secured cleaner air and protected clean areas from worsening conditions. On the other it is argued that it has slowed economic growth, precluded the development of more effective control technologies, and focussed on new sources while ensuring the maintenance of existing high pollution sources. (10)

These evaluation problems apply equally to the United Kingdom system in general and to controls over new sources in both countries in particular. It would be expected that a system in which controls were discussed co-operatively should lead to more effective implementation than one in which they are imposed by rule. Thus, Lundquist, in a study of air pollution control policies in the United States and Sweden, contended that:

> 1. The more open and conflict-oriented the political system the more immediate and substantial the response to problems of environmental quality but the less substantial and successful the implementation of adopted policy alternatives.
>
> 2. The more closed and consensus-oriented the political system, the slower and more incremental the response to problems of environmental quality and the more deliberate and successful the implementation of adopted policy alternatives. (11)

He concluded that there was, in fact, little discernible difference in effectiveness between the two countries, a conclusion which would hold were the UK substituted for Sweden as the example of the more closed system. He felt that American implementation had been better than might have been anticipated, largely because of the constraints and incentives provided by the Clean Air Act itself and in particular because of the numerous provisions for public participation and citizen litigation afforded by the act.(12)

Lundquist's view of lack of substantial difference in the effectiveness of environmental regulation between countries with open and relatively closed implementation procedures was confirmed by Knoepfel and Weidner.(13) They further argued that there is likely to be a higher degree of compliance with formal conditions in closed systems, where bargaining by consent, rather than coercion, is more apparent.

While neither the UK nor the US system precisely corresponds to the extremes of closed and open systems there does appear to be some evidence that non-compliance might be greater in the United States than in the UK. Certainly the attitude of developers to non-compliance in the United States appears to be more relaxed than in Britain, notwithstanding the relative number and size of the fines imposed. Fines in the US can typically be many thousands of dollars as compared to the usual UK fines of less than a hundred pounds. This is exemplified by the numerous fines levied on the Chevron oil refinery in California and on the solvent recycling plant in Maryland. In Britain, the St Helens sulphuric acid works was the only case where enforcement action was taken in the courts, resulting in a fine of £25. This difference in penalties would be anticipated where radical new initiatives in control had been taken in one of the countries concerned. However, where penalties are the major operative sanction, the activities of enforcement staff are crucial to implementation of controls. If air pollution control agency financial and personnel resource budgets are cut, as they have been in the United States (Chapter 4) then enforcement activities will diminish and unpenalised non-compliance will increase. Nevertheless, there was no British equivalent in the cases studied of the two Bay Area Air Quality Management District enforcement staff present almost full-time at the Chevron oil refinery in California.

Air pollution control agencies in both the US and the UK have substantial difficulties in remedying pollution problems once they have arisen. Thus, in the Maryland solvent recycling plant case even the sanction of closure for a period of months did not prevent the re-emergence of air pollution problems. Similarly, the panoply of regulations in the Florida resources recovery plant case was insufficient to prevent numerous complaints from residents living over half a mile away. Successful prosecution of Leathers Chemicals in the St Helens sulphuric acid works case did not prevent a reoccurrence of problems. The Yorkshire chemical formulation plant and the Glossop molybdenum smelter provide other instances where the powers of air pollution controllers proved ineffective once pollution problems had arisen.

The land use planning agency

At first glance, the British and American approaches to land use planning are the reverse of their approaches to air pollution control. Thus, while the United States has a comprehensive national air pollution control system in which decisions on particular applications are used to implement statutory plans, its approach to land use control is partial, fragmented and very variable in different parts of the country. The United Kingdom approach to air pollution control is similar - partial and fragmented - but its land use planning system is a comprehensive national one in which decisions on applications are used to implement statutory plans.

Johnson has explained some of the reasons for the differences of approach between the two countries:

> As a nation with the historic task of developing a frontier, the United States evolved an individualist ethic, prizing the freedom of each person to use property as he or she wishes, limited only by the equal right of others. Thus its planning ethos favours growth and strongly supports the ambitious private developer in most instances. Land is expected to be developed to its 'highest and best use'...
>
> British planning practice has been cordial to private development also, but with the sense of the 'frontier' more remote in its history, has been much more inclined to preserve rural environments and historic townscapes... Overall, Britain's view of the public interest is more communitarian than the American, valuing public goods that transcend the aims of particular individuals and businesses. Thus, British citizens have been less suspicious of governmental power over private property and accorded more deference to the planning function. (14)

The growth of suburbanisation within a clear urban-rural boundary in Britain and the ubiquitous suburban sprawl in the United States are apparent to any observer. This difference offers convincing testimony as to the relative power of the planning systems to control the location of new development.[15] This, in turn, reflects the basic objectives of the two systems:

> Those of the British land use planning system, ...are to preserve open land, preserve agriculture and contain urban growth... Land use planning and control in the United States are intended to guide development, which is not merely accepted but sought. (16)

While the American system may not be able to prevent development, it can control the kind of development that takes place.[17]

Haar characterised the differences between the planning systems as follows in 1964:

> [In Britain] the essence of planning control is that all development - broadly defined as any material change of use - requires official permission. The American system of land-use controls differs in that it is largely voluntary and, with its maze of statutes, structurally far more complex... and far less centralised as to its sources. (18)

Britain possesses, as Garner and Callies put it: 'a single coherent system, whereas the American is perhaps scarcely a system at all'.[19] Indeed it has been said that the United States is a nation where 'town planning starts not with a plan, but with a mortgage'.[20]

Delafons believed that:

> The American and British approaches to the problem of controlling private development represent almost the opposite extremes in planning methods. But the distinction between a formal system of regulatory controls, which eschews discretion as far as possible, and the alternative of exercising control as a discretionary power in government is perhaps more apparent than real. (21)

In practice, therefore, the land use planning systems are not quite so different as they seem. The US planning system has more <u>powers</u> than at first appear obvious and, as explained in Chapter 4, the range of these has grown substantially since Haar and Delafons were writing. Indeed, one commentator has stated that the advent of cluster zoning and planned urban developments in the United States that require individual permits and the likelihood of simplified planning zones in the United Kingdom indicate that the two systems are converging so quickly that their positions may soon be reversed.(22) In view of the current efforts to deregulate and simplify planning controls in Britain, Delafons' comment, made 25 years ago, is pertinent:

> It would be pointless to abandon the initiative which has passed to the public authorities in favour of a regulatory system which is appropriate where the initiative still rests with the private developer. (23)

British planning authorities, with at least 20 years more experience of land use controls behind them than their US counterparts, tend to have better financial and personnel resources. They employ more professional planners and are held in higher regard than US planning agencies. This difference in esteem stems from:

> Widely held cultural values, such as commitment to land-use planning; the influential role of public officialdom and the acceptance of that role; and a standard of public conduct which Americans may rightfully envy. (24)

This difference of view about the reliability of local government officials led to the setting up of the complex US decision machinery (and the search for clear decision criteria in zoning and ordinances), as Heidenheimer et al explained:

> The suspicion of municipal officials, born in the machine era of American politics, led the reformers to create a multitude of citizens'

> boards and commissions, whose separation from city hall was intended to guarantee that public planning could be carried on in isolation from the corrupting influences of party politics. The proliferation of such commissions... produced fragmentation and deadlock... (25)

Local government in Britain, by contrast, is generally trusted to take decisions:

> In American cities the city council, while it may be officially designated as the power center in the community, rarely reaches policy decisions until the various interest groups in the city have fought out policy conflicts among themselves. In British local government, however, both formal and actual power reside in the city council and its working subcommittees. Together, they constitute the crucial decison making centre of the community. Policy making tends to be carried on intra-governmentally, by elected or appointed officials, rather than in extra-governmental settings... (26)

In contrast to the pluralist pressures on US planning agencies, in Britain:

> Planners do not experience the same degree of pressure from either powerful private interest groups or citizen lobbies that American planners must continually confront. ...the European city planner is typically less responsive to external pressures. (27)

In the United States there is far greater variation, in both plan-making and zoning activity, between different authorities than in the United Kingdom. There is also far more complexity. Though the extent of what the British would term 'permitted development' is much wider in the United States, in parts of some states at least 30 sets of development regulations may apply to some developments, even if the sites concerned are properly classified under the state land use law and appropriately zoned. Further, there are the various federal laws:

> Well-intentioned as they are, the federal laws add yet another series of landuse regulations that restrict the use of land, a series of regulations that is difficult to co-ordinate, much less prune or delete. (28)

The Reagan administration's professed intention of reducing controls on localities has not been significantly fulfilled and the permit maze continues to frustrate developers.

Hall has probably offered the most succinct comparison between the government responses to environmental issues in the United States and Britain:

> The American planning system... is much more diverse, much more localised, much more multi-centered than its European counterpart. The hand of central (Federal or State) government is less evident and is felt more through grant support than through direct interference and regulation of local government activity... The bureaucracy at every level of government, but particularly within the Federal system, is far weaker because of the tradition of recycling the higher levels after every executive election. The politicians are much less committed to party ideologies, partly because these are weaker at a local level anyway and partly because in some states (as in California) party politics are outlawed at local level. Consequently, politics are more transactional, more committed to wheeler-dealering and trading of issues and votes, than would normally be the case in Europe. The community interests tend to be better defined and better organized, partly because of the traditional diversity of the country, which is if anything becoming greater rather than less (because of the record level of immigration during the 1970s). The media, despite the TV networks, the news magazines, and newspaper syndicates, are more concerned with local issues, about which national party platforms may have little directly to say. All this adds up to a much more free-wheeling, rapidly-shifting, diversified pattern of politics than is normally seen in Britain. (29)

Permit decision

It is apparent that, as a consequence of these differences, British land use planning agencies are likely to be more active and influential in shaping the outcome of decisions than their US counterparts:

> Moreover, since a good part of the power, both political and financial, stems from their relations with national agencies, [British] local officials are not so totally dependent on the local political situation, and they have more manoeuvrability than does the American city executive in negotiating with local interest groups. (30)

It is nevertheless the case that, despite the greater range of anticipatory powers available to American air pollution controllers, land use planning agencies have to make the final decision to grant or refuse approval for a new source.

The variation in land use control systems in the USA is exemplified by the weak systems in Louisiana and Texas (where county zoning is forbidden) and the stronger ones in Oregon and California. The lack of dependence of American local authorities on financial aid from the state or federal treasury and the fact that appeal is to the courts, rather than to central government, means that there is far less central control over the land use decisions made by US agencies, and a far greater variety of response to particular applications. As many American municipalities are small in area, local elected representatives and appointees concerned with planning decisions are more accessible and hence more susceptible to pressure from their constituents than is the case in Britain. The quality of American planning staff is sometimes low and turnover tends to be high. These factors again may contribute to the less consistent approach to decision-making on proposals for development in the USA.

In the case studies examined, the variety of response ranged from outright rejection (for example, of the Spectron application to start solvent recycling operations at Childs, Maryland) through the imposition of detailed air pollution control conditions (imposed by Oregon City on the Metro energy recovery facility) to rapid unconditional acceptance (eg Solano County's response to the Dow Chemicals proposal in California). In the UK cases the responses also varied but overall there was much more uniformity of decision than in the US. Thus, in seven of the eight British case studies planning permission was granted, or would have been granted, with conditions relating to pollution control. The <u>costs of the decision</u> are overtly considered by land use planning agencies in both countries: projects offering major benefits are seldom refused.

There is more <u>consultation</u> and co-operation between planners and pollution controllers in the UK than in the USA, though there is also more conflict. In Louisiana and Texas for example, there is rarely any contact between the two types of agency and the Texas Air Control Board deleted the requirement to consider land use from its rules. In the case study examples, there was co-operation in Dade County, Florida and in the EIA process in the California oil refinery modification case. In Oregon, state air pollution permits cannot be granted unless the local government has already agreed to the development concerned. In Britain, the St Helens sulphuric acid case was the only example of non-co-operation though marked conflicts arose in the Cheshire fertilizer plant extension case and in the Bolton lead battery works case.

There was little discernible diference between the attitudes and knowledge of planners about pollution in the two countries. Planners generally tend to take a rather neutral role in decisions involving air pollution. Thus, despite the more professional and active nature of British planning authorities, any conditions they may impose are usually added at the request of environmental health officers (as in the Bolton lead battery plant case and the new town glass fibre plant case). There are exceptions, which depend to some extent on whether in-house advice is available. For example, the planning officers in Cheshire (who had no other county expertise to call on) were actively concerned with air pollution control in the fertilizer plant extension case. Cheshire County Council hired consultants to provide expertise (as did Oregon City, in framing its conditions). Nevertheless, UK land use planning authorities are more likely to take an interest in pollution matters without being prompted by objectors than their US equivalents.

The parochialism, the independence and the susceptibility to political pressure of US land use planning agencies provide a political context which makes them more likely to resist a new stationary source of air pollution than their British counterparts. The local policy orientation of much land use planning in the USA means that the representations of a small number of opponents to a new air pollution source, or the incentives offered by the developer, can have a disproportionate effect on the outcome. There is more information available on most applications in the US than in the UK, and consequently often more informed and purposeful public pressure to refuse an application.

American land use planning agencies do have the discretion to refuse developments, even though the zoning may be appropriate. Thus, the agencies in, for example, the Maryland and Oregon cases could equally have accepted or refused the developments concerned. In fact, the Maryland agency refused the solvent recycling plant largely on procedural grounds, whereas Oregon City accepted the energy recovery facility.

An additional factor militating against construction of such sources in the United States is the number of agencies involved in granting land use permits apart from the local government responsible for zoning, since this multiplicity increases the opportunities for delay or refusal. In the eight cases examined in the United States, there were three refusals at the local level (the Maryland solvent recycling plant, the Texas asphalt plant and the Louisiana creosote storage plant) and two refusals at the state level (the Louisiana coastal use permit and the North Carolina coastal plan - later reversed). The eight UK cases included only one refusal - the Bolton sewage sludge incinerator.

Permit conditions

It is inevitable that an application to construct or extend a new air pollution source will involve conflict between planning objectives. These may be most acute in the British planning system, where there is less apparent certainty and stronger adherence to planning policies. However, they also arise in the United States, not least between the objectives of various agencies which may have to issue land use permits under conflicting legislation. It is significant that the only British refusal of a permit stemmed from conflict with policies embodied in an informal local plan (the Bolton incinerator case) and that the three refusals by American local land use planning agencies were all made in the absence of a strong relevant policy context. These applications, for the Louisiana creosote storage plant, the Texas asphalt plant and the Maryland solvent recycling plant could all have been granted without obvious conflict with the local policies in force when the applications were submitted.

The negotiation of concessions of a non-environmental nature is perhaps more common in the United States than in Britain. Thus, the agreement of Chevron to contribute towards road design costs in California and of Metro to pay the equivalent of property taxes to Oregon City appear to have had no parallel in the British case studies. Generally, it may be more onerous to meet the conditions imposed by land use planning agencies in the US than in Britain, because of the costs involved. While British planning authorities do seek similar planning gains, their attempts are usually confined to commercial development and do not extend to industrial air pollution sources.

Two factors militate towards the greater use of planning conditions relating to the control of air pollution in Britain than in the United States. The first is the more comprehensive nature of the US air pollution control system and hence the lack of need for planning conditions. The second is the more comprehensive nature of the British planning system and hence the ability to consider and utilise conditions limiting air pollution. In the US cases, Oregon City was the only local agency employing planning conditions - imposing nine on the energy recovery facility. (A state power plant siting agency also used such conditions in the Florida resources recovery case.) In the British cases, as mentioned above, the local authorities imposed conditions relating to air pollution on every one of their planning permissions though the central government deleted them in the Cheshire fertilizer extension case.

Control techniques

There appear to have been few significant differences in the use of control techniques by the land use planning agencies in the two countries. The comprehensive UK land use planning system presupposes that all decisions about new sources of air pollution will be taken within the context of the statutory development plan, whereas the partial US system is based upon a variable array of land use controls and plan making is usually completely divorced from the control of development. While many British plans do contain policies relating to air pollution control, this is comparatively rare in the United States, where co-operation between land use planning agencies and air pollution control agencies is unusual in most states, The Richmond, California, plan did provide for buffers between land uses, however.

It might therefore be expected that the use of planning techniques which could only be employed in the plan-making process (growth controls, location and spatial distribution controls and controls over the intensity of use of land - see Chapter 3) would be greater in the UK than in the US. In fact, this study showed little evidence of the use of any of these techniques in either country and little indication that the pollution control *policy context* was specified sufficiently clearly in land use plans to allow land use planning agencies to act in accordance with it.

Land use planning agencies in both the US and the UK used refusal of permission and hence prohibition of emissions as one technique. The use of planning conditions limiting emissions or requiring the monitoring of air pollution was far more common in the UK than in the US. British planners also placed more faith in the use of high chimneys to disperse pollutants than their US counterparts. (As indicated earlier, chimney height conditions were used in the Bolton incinerator, the Glossop molybdenum smelter and the new town glass fibre works cases.)

There were few differences discernible between the use of techniques such as detailed site design, buffer zones, siting with respect to terrain, or siting with respect to sensitive land uses in the case studies in the two countries. Such use was severely limited. The Maryland solvent recycling plant negotiated relocation did provide one American example of removal of a pollution source from a valley and its reconstruction on a flat site in an industrial area.

There were four American examples of the use of environmental impact assessment (the North Carolina oil refinery, the California oil refinery modification, the California chemical plant and the Florida resource recovery plant) and no British examples. However, the information revealed in the two British cases where a public inquiry into the granting of a permission was involved (the Cheshire fertilizer plant extension and the Bolton incinerator) was significant, if less comprehensive in scope. In each instance where either an EIA or a British permission inquiry took place environmental problems appear to have been more clearly identified with benefit to their subsequent mitigation. The US EIA's may, by providing information about likely impacts from major developments, have supplied more ammunition for project opponents, but this did not cause projects to be refused by land use planning agencies in the cases concerned. American EIS's do not appear to have modified attitudes in the North Carolina and California oil refinery and California chemical plant cases, merely the tactics of opponents.

None of the tensions between land use planning agencies and pollution control agencies so evident in Britain in the cases involving works controlled by the Industrial Air Pollution Inspectorate (for example, the Bolton lead battery works) seem to arise in the United States. The relationship between planning and air pollution control was stressed in some of the United States cases (for example, in the Texas asphalt plant and the Maryland solvent recycling plant cases) but it does not appear to have led to acrimony. Even in the Oregon energy recovery facility case, where planning conditions were imposed by the local land use planning agency, there was no dispute between the control agencies.

Evaluation

It is as difficult to compare the efficiency of the land use planning controls in the United States and the United Kingdom in relation to new air pollution sources as it is to compare the efficiency of air pollution controls. There are obvious problems of reconciling conflicting objectives in both countries. These are reflected in the difficulty of a local land use planning agency establishing economic efficiency in general and, in particular, through the use of negotiated conditions.

The UK planning system involves a single permit. This is normally granted within two or three months; though more complex applications, such as those involving significant air pollution, often take longer. Although much of the cost of land use planning is borne by ratepayers and taxpayers in the UK, the developer pays a fee and may have to bear substantial costs in providing information and, possibly, in suffering delay. These costs and delays may become very significant if lengthy public inquiries are held but total application processing costs will usually be a tiny proportion of total project costs.

In the United States, though the land use planning system costs the taxpayer very little, the costs, including fines, to the developer of obtaining a number of land use permits can be very substantial. Several land use permits (or their equivalent) were required, for example, in the North Carolina oil refinery and the California chemical works cases. Thus, more land use permits may be required and more information has to be provided than in the UK, increasing the developer's costs substantially. The $200,000 paid by Chevron for its environmental impact report on the California oil refinery modification was more than any UK developer had to pay. The land use planning agency's decision process can often take longer in the United States (again increasing the developer's costs) than in the United Kingdom, but this is not apparent from the case studies. The times taken to decide upon applications in the instances examined appear to have been broadly similar.

One inefficient outcome of a land use planning agency's decision is the refusal of a permit to a development which would have caused few environmental problems, perhaps because of the political nature of a pollutant. This is more likely to happen in the United States than in the United Kingdom and the Louisiana creosote storage plant and the Texas asphalt plant could be quoted as examples of this type of decision. Another sub-optimal outcome is the situation in which permission is granted to construct a source which is fundamentally incompatible with its neighbours and incapable of being ameliorated by conditions. The case studies indicate that this is probably more likely to arise in the United Kingdom; as witness the St Helens sulphuric acid works case and the original decision in the Glossop molybdenum smelter case.

As with air pollution controls, the fact that negotiations usually take place between the developer and the planning agency in both countries should tend to avoid the imposition of grossly inefficient conditions since both actors seek to satisfy their own objectives. The land use planning agency's attempts to increase benefits and reduce impacts will cover a wider range of considerations than the air pollution control agency's and will probably lead to a more efficient outcome. However, this is unlikely to be at the optimal point, since the negotiated conditions will be determined by how much the local jurisdiction desires the development in question.

It is difficult to generalise about the relative stringency of the conditions imposed upon new stationary sources of air pollution in the US and UK, though it seems that land use planning agencies are more likely to consider air pollution in the UK than in the US, if only because the environmental health officers of their own local government will press them to do so. The existence in the UK of central government guidance on conditions and of its planning inspectorate ensure that professional planners are very aware of government policy when determining conditions and this leads to considerable uniformity. Therefore, conditions are perhaps more likely to be 'too weak' rather than 'too strong' (Figure 1.1), whereas the reverse is probably true in the USA. On the whole, the types of conditions negotiated by the City of Richmond in the California oil refinery modification case and by Oregon City in the energy recovery facility case are probably more efficient than many British outcomes, since some compensation is being paid to the local community for the pollution and other costs incurred.

The outcome equity of a decision to locate a new stationary source of air pollution may be higher in the United States than in the United Kingdom because the conditions imposed on the development may be more stringent. The residents in the immediate locality of a new source of air pollution in the UK, however, may be inequitably treated because they suffer damage while they gain nothing from it. It is probable that the developer in the United States is more likely to be treated inequitably than in Britain by having a development refused, on 'political' or emotive grounds, which might legitimately have been permitted. There are fewer refusals in the UK and, since the developer usually has a strong position (due to the presumption of eventual permission) in the negotiation of conditions these should not be unfair on him.

The land use planning agency normally explicitly considers different parties in reaching its decision. In general, it is very likely that local residents and other objectors will gain from the negotiations with the developer, as additional mitigation is agreed, though they may well be left worse off than without the new source. Some form of compensation for those directly affected is more likely to be agreed in the United States than in the United Kingdom, if only because local authorities tend to have much smaller populations and narrower territorial interests in America.

Procedural equity is likely to be higher in the United States before any appeal because of the greater opportunities for public participation and objection in that country and the right of third party appeal against decisions. Only if the government refuses a development (as in the Bolton incinerator case) and the developer appeals or if the development is so obviously controversial that it is 'called in' by central government (as in the Cheshire fertilizer plant extension case) do objectors have the right to be heard in land use planning decisions in Britain (though they can and do make written representations before a local authority has made its decision).

Arrangements for public participation in, and appeal against, land use planning decisions are generally greater than in the case of the air pollution control agency in both the US and the UK. Local media concern with environmental issues in the US probably leads to greater public knowledge of potential pollution problems than in the UK. This, the greater availability of information in the US (because of the right of citizens to inspect the files held by local planning agencies) and the real opportunities of appealing to the courts decisions already appealed to the local government must mean that, overall, procedural equity is higher than in the UK. The appeals to the courts by the developer in the Maryland solvent recycling case and by objectors in the California chemical works case had no equivalent in the British cases. The appeal to the Oregon Land Use Board of Appeals by the objectors was not dissimilar to a British planning appeal to central government.

If an appeal is heard in the UK, however, the developer, the land use planning agency and the objectors all have ample opportunity to present their case and cross-examine the evidence of others, whereas their rights are more limited in the United States. Major British inquiries bear little relationship to American hearings on zoning or land use permit decisions. Rather they are comparable to, but go beyond, American rule-making procedures. They are prolonged, highly contentious, and governed by strict rules of procedure. Though none of the four public inquiries in the case studies was lengthy, they may last many months in particularly contentious cases. Because time and expertise are required to participate in inquiry proceedings, public involvement is usually more apparent than real. However, this is generally preferable to the sometimes farcical time-limited involvement of the American citizenry in public hearings, which may be limited to a five minute presentation.

Notwithstanding what appears to be a real superiority in procedural equity in the US compared with the UK, Vogel reported that, on balance, public perception of procedural equity is greater in the United Kingdom:

> Siting decisions are more likely to be accepted as legitimate in Britain - even when they go against a particular developer - because they are perceived as having been decided on their merits. In America, on the other hand, the substantive issues often tend to be obscured by procedural ones. In addition, because each planning application in Britain is considered on an ad hoc basis, the outcomes in any particular case do not necessarily establish any precedent for future public policy. In the United States, however, because the approval of new facilities is, in principle, governed by the application of a complex set of detailed rules, each denial of a permit is seen as establishing a precedent for future governmental restriction, thus adding to the tension between regulatory authorities and business. (31)

As with air pollution controls, evidence about the effectiveness of the two land use planning systems in implementing controls over new sources is very hard to obtain. When construction takes place where permission has either not been applied for or has been denied it is usually possible to force the dismantling of the offending development through the courts in both countries. This might be expected to be achieved more easily in the UK than in the US because there is less scope for argument about the facts. On the other hand, the greater freedom from central government control may tend to make the land use planning agency more effective in remedying pollution problems in the US than in Britain. Thus, Cecil County succeeded in gaining agreement to relocate in the Maryland solvent recyling case and the City of Midland succeeded in removing the unauthorised Texas asphalt plant whereas Kirklees Borough failed to have the unauthorised tanks removed in the chemical formulation plant case because its arguments were rejected by central government.

Since there is an element of negotiation involved in both countries, the conditions imposed should be reasonably capable of implementation as the developer will have more incentive to meet them if he has been party to their formulation. The centralised nature of the planning system in Britain, with technical guidance offered to local jurisdictions, has meant that conditions should generally be formulated in a manner capable of implementation and, indeed, there is great emphasis upon this in central government advice.(32) British planning controls over air pollution from new sources should notionally be more effective than American controls in this respect.

Further, land use planning agencies in Britain would be expected to secure better enforcement of planning conditions over air pollution than in the US, because they are better equipped to detect violations, having larger staffs and close relationships with environmental health departments. The complexities of US land use law allow more opportunity for interpretation and the non-enforcement of certain planning violations is almost institutionalised.[33] In most of the British case studies, adherence to planning conditions was secured (for example in the new town glass fibre works case). However, as a result of a public inquiry, the St Helens authority was frustrated by central government in its attempts to enforce conditions relating to pollution control in the sulphuric acid works case. The difficulties of obtaining satisfactory adherence to the air pollution control conditions set by the state power plant siting section in the Florida resources recovery facility case is the only US illustration of this problem (and here enforcement was left to the air pollution control agencies).

In both countries, it appears that the enforcement of conditions, particularly those relating to the operation rather than the construction of the premises, leaves much to be desired. It is clear that the inadequate effectiveness of both systems is, in some instances, due to the imprecise way in which conditions are couched. Thus, the worst example of ineffective implementation was the inability of the St Helens Council to win an enforcement case under the planning legislation in the sulphuric acid plant case because of the imprecision of the original conditions. In other instances, however, the personnel involved or the legal redress at their disposal may be inadequate. Conditions relating to physical location or design (eg number or height of chimneys) are usually capable of enforcement because a single inspection can reveal any problems and there can be little dispute about the interpretation of the permission. There are obviously more British case study examples of this type of control (eg the Glossop molybdenum smelter, the new town glass fibre works) than American, though the Oregon energy recovery facility was to include a scrubber demanded by Oregon City, the planning agency. Planners in the US and the UK have stated that planning conditions are sometimes no more than a successful bluff that they have little hope of enforcing.[34]

The objectors

The role of objectors in regard to the grant of a permit by the air pollution control agency is markedly different in the UK and the US. In the United Kingdom, there is no public or political involvement in the decisions of IAPI, which have never been challenged in the courts. Similarly, there is virtually no political, and no public, involvement in the decisions of environmental health departments in relation to new sources: decisions are taken by salaried officials. In the United States, on the other hand, there are provisions for open access to air pollution control agency files relating to new sources and there are usually provisions for public hearings, and for appeals against the agency decisions by the developer and (sometimes) by third parties. It is not uncommon for further recourse to be taken to the courts.

While it is almost unheard of for objectors to cause the air pollution control agency to refuse its permit (even in the California chemical works refusal, the objectors' role was encouraging rather than causative) it is quite common for them to win concessions on the permit conditions in the United States. Examples include the activated carbon filter in the Maryland solvent recycling case and the increased percentage of sulphur dioxide removal in the Oregon energy recovery facility case. In view of the paucity of opportunity for public involvement outlined above it is not surprising that such concessions are much less common in Britain. None of the British case histories provides evidence of an air pollution control agency tightening its conditions at the behest of objectors before construction commenced. While US objectors may not succeed in causing a permit to be refused, the Texas asphalt plant case and the California oil refinery modification case provide examples of formal appeals by objectors against the grant of air pollution permits.

As well as facilitating public access to nearly all non-commercially confidential files, US agency officials are prepared to discuss the merits of an individual case before a decision has been taken. Indeed, they frequently welcome pressure from public interest groups because they feel it can result in the justification of a permit in which the conditions are less biased towards the needs of industry. An example of such positive involvement, albeit manifested in an adversarial manner, would be the role of Citizens for a Better Environment in the California oil refinery modification case, where the nature of the conditions changed from 'no net increase' to requirements for a 'net decrease' in emissions. This willingness to discuss particular cases prior to approval in any other than the most general terms (and then only rarely) is conspicuously absent in Britain, where liaison with officials is consequently less. While both the National Commission on Air Quality in the US[35] and the Royal Commission on Environmental Pollution in the UK[36] have criticised the respective arrangements for public participation, there is no doubt that the formal rights of the public to be involved and to take legal action are much greater in the US.

There are generally ample opportunities for objectors to participate in the land use plan preparation process in both countries. But most applications to construct new stationary sources of air pollution tend not to be in accord with the detail of pre-existing plans. Their special characteristics are such that they virtually all have to be dealt with in an ad hoc manner, even where the land is allocated for industrial use in the plan - as is often the case in Britain.

The role of objectors in the grant of a permit by the land use planning agency differs between the US and the UK. In the United States, objectors have the right to see virtually all the information held by the planning and zoning department of a local jurisdication, have the right to object in writing, have the right to be present at many meetings and have the right to speak at a public hearing for a prescribed period of time. This type of participation occurred in many of the US case studies. For example, there can be no doubt as to the influence of objectors in the decisions to refuse the Louisiana creosote storage plant, the Maryland Childs solvent recycling plant and the Texas asphalt plant, or in determining the conditions in the Oregon energy recovery facility case.

In the United Kingdom, though a register of applications is kept, applications are often advertised or notified, and objectors have the right to see the planning application and to write to the authority to object, they have no right to see other relevant material (the comments of those consulted, for example) and none to be heard at the committee or council meeting at which the decision is taken. A hearing to objectors is sometimes permitted, as in the Tameside resin manufacturing plant case, but this is not common practice. In the UK, as in the US, controversial decisions will often be taken by elected politicians rather than by salaried officials, and they are answerable, at least in principle, to the objectors and other members of the electorate at the ballot box.

Third parties in the United States may object to a planning decision and have the right to be heard (according to local circumstances) by the elected body if the decision was originally taken by a nominated body and to appeal to the courts. In the cases studied, the objectors appealed to the council of Oregon City and to the Land Use Board of Appeals in the energy recovery facility case and to the courts against Solano County in the California chemical manufacturing plant case. These opportunities for public participation in the land use decision making process are not limited to the local level, as the North Carolina oil refinery case and the Louisiana creosote storage plant cases illustrate. In both, hearings were held by state commissions before a permit was granted (after an initial refusal) in the one case and rejected in the other.

British objectors have no third party right of appeal unless they can prove that some legal requirement was not met (when their appeal would be to the courts). However, should the developer appeal against a refusal or the nature of conditions imposed, then the objectors may take as long as they wish to present their case at a public inquiry and they may cross-examine the witnesses called by the developer. The appeal process in the UK, therefore, gives the objectors a potentially excellent platform from which to make their case. (They can also participate in written representations appeals.) They may wield considerable influence at these inquiries by winning environmental concessions from the developer (as in the Bolton incinerator case).

Because local authorities are generally bigger in the United Kingdom than in the USA, the proportion of their resident population suffering the effects of pollution from a new source is likely to be smaller than would be the case in America. Liaison with legislators will also tend to be less close in Britain. Similarly, the number of people who stand to benefit from the employment opportunities provided by investment in new facilities, or the expansion of existing ones who are actually resident in the local government area concerned is likely to be greater in the UK. Thus, public access to the British decision-making process does not guarantee that environmental objections will triumph. As Vogel stated:

> Unlike the case of pollution control, where the lack of opportunities for public participation may result in relatively less weight being given to environmental conditions, in the case of the planning system, it is often precisely the relative accountability of local planning authorities to public pressures that undermines the political influence of amenity interests. (37)

Johnson observed that the American political culture appears to sanction and motivate citizen participation more than does the British. Citizens have a constitutional right to participate and tend, accordingly, to pursue their own interests unashamedly. In Great Britain by contrast, public participation tends to be justified on broader political and administrative grounds, and is ostensibly geared to 'good planning' for the whole community.(38)

Citizen participation to secure the rejection of unwanted intrusions of projects (or persons) has proved easier in the United States. Objectors thus have a considerably better chance of preventing the construction (and, to a lesser extent, the expansion) of a new stationary source of air pollution through the land use control process in the US than in the UK. They also have a much better chance of winning meaningful concessions in the form of mitigation measures. In the case studies, the four US examples of land use permit refusals contrast with only one in Britain (the Bolton incinerator). There was no British equivalent of the Oregon energy recovery facility case, in which, first, land use use planning conditions were tightened at the behest of objectors and, second, an initiative ballot was won by the objectors to defeat the project after the land use permit had been granted.

Types of objector and their influence

There are thus many more opportunities for public participation in the United States than in the United Kingdom.[39] Enloe felt that the growth of the environmental movement in the United States owed much to these opportunities:

> The analysis of environmental politics demonstrates that citizen access to scientific expertise and governmental fragmentation providing a multitude of alternative access points both enhance the launching of an effective citizen movement. (40)

O'Riordan reported that British groups are ill-staffed and ill-equipped compared with their American counterparts but, because of the nature of the system, they can be surprisingly effective:

> Whereas the British seem to prefer peaceful compromise through orderly consultation, the Americans prefer adversary politics where argument and counter argument is laid out before some arbitrating individual or tribunal... In the British context people usually (though decreasingly) trust the policy maker and his advisers to assimilate and evaluate the arguments. In general, too, any negotition is conducted over a longer period on a face-to-face basis. In the States, there is often a presumption of mistrust and suspicion on all sides (though this is becoming less evident) and usually lawyers act as intermediaries between the negotiating parties. The presence of lawyers often makes the discussions highly technical and subject to clearly laid down rules which must be precisely followed. In Britain, rules are rarely spelt out, and if they exist are rarely made public, so each case is considered on its merits. This permits considerable flexibility in policy-making compared with the greater rigidity and legal specification required in the United States. (41)

The heavy reliance on legal debate and process in the American system is illustrated in several of the case studies. For example, the objectors were represented by a lawyer before the Air Control Board in the Texas asphalt plant case. In the California oil refinery modification case Chevron protested through the courts that Citizens for a Better Environment had no right to appeal and then used four lawyers to help defeat that appeal.

There are few environmental pressure groups mainly concerned with air pollution in the UK (with the obvious exception of the National Society for Clean Air) whereas there are both national and local environmental groups specialising in air pollution control in the United States. The Clean Air Coalition, mentioned in Chapter 4, provides a national focus for pressure group involvement in air pollution control. The Citizens for a Better Environment group, which was active in the California oil refinery modification case, is a good example of specialised organisation for involvement in air pollution issues at the local level.

While both countries have national pressure groups concerned with environmental planning issues, generally the resources of, say, the Sierra Club with its several hundred staff, far outweigh those of say, the Council for the Preservation of Rural England. There are, of course, countless local amenity societies and residents' groups in both countries that are capable of providing a focus for a campaign against a new source; and new groups may spring up locally to fight particular proposals.

In the USA environmental pressure groups and other objector groupings tend to have more finance, more personnel, more legal and technical resources, more time and more information than their counterparts in the United Kingdom. Thus American pressure groups like the Sierra Club are often able to attract the best graduates of the elite law schools to their Washington offices.(42) They are thus able to mount thorough, professional, well-argued opposition to a wider range of new pollution sources than in the UK and, on the whole, have a much greater influence on the outcome in any particular case then their British counterparts. The nature of the argument in objectors' cases varied considerably in both countries.

By having the ability to cause delay by the use of appeal procedures involving the courts, US objectors also have greater effective sanctions against the developer of a new stationary pollution source than objectors in the UK. It was this sanction which BECO was anxious to avoid by making numerous environmental concessions in the North Carolina oil refinery case. The superior organisation of the US objectors in using the courts, and mobilising opinion, and the general professionalism of tactics was evident, for example, in the commissioning of a film in the North Carolina oil refinery case and in securing a ballot in the Oregon energy recovery facility case. The size and composition of the population affected by the case study new sources varied within the US and UK but was not an important factor in explaining the difference of objectors' responses in the two countries.

Another factor in the relative success of American objectors' campaigns is the proliferation of local television and radio stations and of local newspapers. Skilful use of these widespread media opportunities ensures that the views of opponents to a new source in the United States receive wider coverage than in the United Kingdom. The media attention provided by the Oregonian (in the energy recovery case) and the Wilmington Star (in the North Carolina oil refinery case) had a considerable effect in alerting and mobilising public opinion. The objectors in the Texas asphalt plant case became locally celebrated as a result of their numerous appearances on the television. There is no equivalent to these cases of high profile mobilisation of media support among the British examples studied.

Evaluation

Stopping a project will only be compatible with the achievement of economic efficiency where it would have been environmentally unacceptable (Figure 1.1). However, it is quite possible that objectors mounting a reasoned case will secure modifications to the project which render the outcome more efficient because they may be able to win, or support the control agnecies in winning, reductions in damage costs and increases in benefits from the new source. As Knödgen has reported, there are significant advantages to be gained from involving the public:

> Firms and state or local officials who attempt to overlook public concern, or to hinder or reduce their sometimes time consuming participation even risk provoking increasing environmental conflicts. A more efficient strategy for locating successfully seems to be careful consideration of environmental protection in selecting the appropriate site and the improvement of public participation. (43)

The winning of mitigation measures by objectors is more likely to happen in the United States than in Britain and it would appear that the permissions granted in the California oil refinery modification case and (though they were not built) in the North Carolina oil refinery and the Oregon energy recovery facility cases, reflected successes of this type. Equally, however, the inefficient outcome of refusal of an environmental acceptable development as a result of objections is more likely to occur in the United States than in Britain. Thus, the Louisiana creosote storage plant and, arguably, the Texas asphalt plant were refused when little environmental pollution would have arisen.

It seems unlikely that the stopping of a project by objectors will always be equitable as the developer will have invested a great deal of time and money to no avail. However, the winning of modifications or other benefits from a developer may well lead to a more equitable outcome as the disadvantages of the project may then be compensated by local benefits. As seen above, both these types of outcome are more likely in the United States than in Britain. The inequitable outcome of the developer gaining his permit, and the local objectors gaining little compensation and bearing substantial costs, is more likely in Britain than in the USA. Thus, in the Glossop molybdenum smelter case the objectors still had to bear the pollution damage although the developer incurred some additional cost in installing a higher chimney.

Procedural equity is obviously served by the objectors' possession of adequate resources and the opportunity to utilise them in disputing the granting of permits. Procedural equity is thus far greater in the United States than in the United Kingdom. The number of avenues open to the objectors in the Dow chemicals plant case or to the opponents of the energy recovery facility in Oregon were much more extensive than those available, for example, to the objectors in the Cheshire fertilizer plant extension case.

If the proposed development would have resulted in large damage costs and is stopped by objectors, their action will have been an effective anticipatory pollution control measure. This outcome is more likely in the United States than in Britain and examples include the Childs solvent recycling plant in Maryland.

Similarly, objectors may be able to influence agencies to attach conditions to a permission for a new or modified source which may improve the effectiveness of pollution control. This is again more likely in the US than in the UK. Though the plants were never built, objectors acting to secure requirements for the activated carbon filter in the Maryland solvent recycling plant case and for the sulphur dioxide scrubber in the Oregon energy recovery facility case probably fell into this category.

It was very notable that opposition to far more sources arose in Britain than in the USA after permission had been granted. This led to forceful demands to effect enforcement action or to refuse further planning permission for modification in, for example, the Yorkshire chemical formulation plant and the Cheshire fertilizer plant cases. In the St Helens sulphuric acid plant case the election of a member to the local authority to implement improvements was an unusual demonstration of depth of feeling.

In the United States only the Maryland solvent recovery plant and the Florida resources recovery plant demonstrate post-operation growth of objection. It is ironic that in Britain, where the effectiveness of retrospective powers is notoriously poor, objectors should characteristically be more active after permissions have been granted.

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10 CONCLUSIONS

This chapter draws together the findings of the study to satisfy the four objectives put forward in Chapter 1. The first section tabulates the six hypotheses about the nature of the authorisation process and its implementation derived in Chapter 8. The next section of the chapter contains an analysis and evaluation of the differences between the siting process as a whole for a new air pollution source in the US and the UK. This parallels the discussion of the common elements of the authorisation process and of the implementation of controls in Chapter 8. Significant differences in the effect of the various factors shown in Figure 8.1 on the effectiveness of the two national systems are mentioned using the procedural framework advanced in Chapter 2. This enables the shortcomings of the US and UK systems to be identified in the following section.

The final section of the chapter is devoted to recommendations for overcoming these shortcomings. It is divided into three parts. The first contains suggestions, which apply equally in both countries, for improving anticipatory controls over new or modified air pollution sources and their implementation. The next is concerned specifically with the United States system and the last with that in the United Kingdom. Many of these suggestions for improving practice would require considerable further investigation and refinement before they could be implemented satisfactorily. Accordingly, several recommendations for further research are set out. It is hoped that, together, the conclusions and recommendations will meet the aim of this study expressed in Chapter 1: to assist in improving the utilisation of prospective controls over new or modified sources of air pollution.

New source siting hypotheses

Clearly, the outcome of any particular application to develop a new or modified source of air pollution will depend on a great number of factors, as suggested in Chapter 2. Analysis of the literature, of the eight case studies in the United States, and of the eight in the United Kingdom, enabled six general hypotheses concerning the outcome of the process to be advanced in Chapter 8. These related to: the roles of each of the actors in the authorisation process for a new air pollution source (the developer, the air pollution control agency, the land use planning agency, the objectors); the nature of the authorisation process as a whole; and the implementation of controls. They are presented in Table 10.1.

These hypotheses hold true in the cases examined in both countries and there can, therefore, be a strong presumption that they are generally applicable. Together they provide some guidance as to the likely outcome of an application to site a new source.

The US and UK authorisation processes and the implementation of controls

This section draws together the analysis in Chapter 9 to present conclusions about the differences in the nature of the siting process for a new source of air pollution in the United States and the United Kingdom. The contrasts between the ways in which new source controls are implemented in the two countries are examined in the evaluation of effectiveness.

TABLE 10.1 HYPOTHESES CONCERNING THE AUTHORISATION PROCESS FOR A STATIONARY SOURCE OF AIR POLLUTION

1. The more open the attitude of the developer, the greater the developer's local influence, the greater the benefits offered by the project, the more the developer is prepared to negotiate with, and make meaningful concessions to the control agencies and local residents, the more industrial the previous use of the site and the surrounding area, the further the site from existing homes and community facilities and the less 'political' the pollutants, the better the chance of the new source being constructed and operated.

2. Negotiations between the air pollution control agency and the developer may be protracted but will almost always result in the granting of a permit with the precise degree of control exercised varying, and being more stringent where there is significant public participation, but characteristically taking little or no account of the geographic location of the air pollution source and hence of the actual damage likely to be caused in that location.

3. The land use planing agency will ultimately decide whether or not to allow a new source of air pollution to be constructed and, because its evaluation will frequently prove incon-clusive (reflecting conflict between its objectives) it will usually seek to approve the source after negotiating increases in its benefits and reductions in its air pollution impacts but will not use many of the planning control techniques at its disposal.

4. The more personal, personnel, financial, legal and technical resources objectors have, the greater their power, the more information and time they have, the more access to the decision process they have and the greater their support in the media, the greater their chance of stopping or seriously delaying a proposed new stationary source of air pollution.

5. The more permits that have to be obtained, the more rules and laws that have to be observed, the more permitting agencies that are involved and the more points of public access that exist in the permitting process, the greater the chance of the new stationary source of air pollution being permitted on the basis of very onerous control conditions and/or of being seriously delayed, or of being stopped altogether.

6. Once a new source of air pollution has been approved, the more closely the type of pollution control equipment is specified, the more the developer has been involved in negotiating the conditions, the higher the priority given to pollution by the developer, the more the air pollution control and (particularly) the land use planning agency insist on implementation of conditions and the more the public protest about pollution incidents, the greater will be the degree of control over pollution.

The authorisation process

There appear to be surprising similiarities between the two apparently very different control systems. Notwithstanding the adversarial, public, standard-based approach to regulation in the US and the co-operative, private, ad hoc approach in the UK, the universality of bargaining and of the tendency to grant air pollution permits to serious applicants are clearly demonstrated by the case study histories presented. The importance of land use planning agencies in taking decisions affecting local air pollution levels is obvious in both countries. Further, the two systems appear to be converging. This convergence is evidenced by the British adoption, as a member of the European Economic Community, of certain air pollution targets; and by the increasing use of co-operative mechanisms, such as one-stop permitting, emissions banking and discretionary emission reductions in the USA. In land use planning control, the American use of flexible zoning instruments like planned unit developments and the British interest in simplified planning zones testify to this movement towards a 'mid-Atlantic regulatory system' with a number of common features.

Nevertheless, the authorisation process for a new source of air pollution involves a number of elements which differ significantly between the UK and the US. Because there is less trust of public servants, politicians and business in the US than in the UK, the rules of government tend to be written in far more detail and consequently there are more environmental laws and rules to be observed, and permits to be obtained. For major developments in the US, it is not uncommon for over a dozen different environmental permissions to be required from federal, state and local government and for public participation and appeal procedures to apply to many of these, frequently involving the use of the courts. However, with the exception of discretionary land use planning permits, the effect of these regulations tends to be to delay, and possibly eventually to force withdrawal from, a project, rather than to stop it outright. In the United Kingdom planning permission is normally the only significant environmental hurdle to be cleared (though this can involve a multitude of ameliorative requirements).

This study has provided ample evidence of the much greater resort to the courts in the United States than in the United Kingdom in the siting of new air pollution sources. This appears to be true of American and British environmental regulation in general. Thus, Vogel has suggested that:

> The effectiveness and the legitimacy of British environmental policy appear to rest on three elements, none of which exists in the United States to the extent each does in Britain: a highly respected civil service, a business community that places a high value on acting 'responsibly', and a public that is not unduly suspicious of business-government co-operation.(1)

Asimow contended that Britain is a nation of remarkably few laws, rules and regulations and that many of the latter relate to more trivial matters than in America. He argued that, whilst part of the reason is the greater tendency in the UK to write controversial requirements in the statutes rather than into rules:

> The most significant explanation seems to flow from the deep cultural differences between the countries. Americans traditionally distrust officials and favour advisory procedures and judicial interventionalism. In Britain, on the other hand, people are comfortable in relying on official discretion to strike compromises and make

> individualised judgements which are never reviewed by the courts. (2)

Asimow argued that political opposition to the substance of a government decision is directed against the procedure by which it is taken, citing the controvery over rule-making in the US and over major public inquiries in the UK.

Vogel felt that Britain had managed to strike a balance between the needs of amenity and industry, largely by striving for a consensus while the United States adversarial rule-making approach left both industry and environmentalists dissatisfied. He asserted that:

> <u>Each nation regulates the environment in much the same manner that it does everything else</u>. Compared to that of other capitalist democracies, American public policy does tend to be relatively coercive across a broad range of issue-areas. Similarly, British public policy, when compared to that of other capitalist politics, does tend to emphasise consultation with those interest groups affected by particular governmental decisions. (3) (emphasis in original)

Certain pollutants are associated with well publicised health hazards and their dangers have become emotive, 'political' issues. This study suggests that such pollutants tend to arouse more public hostility in the US than in the UK, partly as a result of the greater publicity given to such pollutants and partly because of a greater tendency to assume that some pollutants are 'unsafe at any concentration'.

It might be expected that the higher density of population in the UK, and hence the generally closer proximity of polluter and polluted, would lead to greater difficulties in gaining approval to construct a new source of air pollution. But this proximity factor tends to be counteracted by the long history of experience of industrialisation and the relatively low level of distrust of industry in relation to the USA.

The greater dependence of local authorities on local taxes (and hence on new industry) in the United States, because of the much lower proportion of funding from central government direct grants, would be expected to encourage the local land use planning agencies to give permissions more readily than in the United Kingdom. There is indeed evidence from this study that it is the smaller, rather than the more remunerative larger developments, which are refused in the United States. US local authorities with a substantial existing tax base will not be greatly influenced by the prospect of further but proportionately insignificant property tax revenue. Conversely, the poorer authorities may be particularly anxious to secure substantial new developments.

Virtually all the factors examined in Chapter 9 indicate that the developer of a new stationary source of air pollution will have a greater chance of constructing the plant in the United Kingdom than in the United States, irrespective of the environmental merits of the proposal. If constructed, a source would be expected to be subject to more stringent controls in the US than in the UK. Corporate or economic interests will generally prove more powerful than environmental interests in the UK; but not necessarily in the United States, except where modifications of existing major plants are concerned. The most important determinants in the land use planning agency's decision on a new source of air pollution in the United States appear to be the costs of the decision to the local community, the influence of the public and the attitudes of elected representatives. In the United Kingdom these same factors, together with the effectiveness of consultations, seem to be most crucial.

Evaluation

Evaluation of the two systems of anticipatory control over new sources of air pollution is difficult. Vogel summed up his view of the two general environmental regulation systems as follows;

> Neither approach is 'better'. Each stems from a particular set of historical circumstances and each has advantages and shortcomings. The contemporary British, or co-operative approach is probably more efficient since it significantly diminishes the likelihood that unnecessary environmental constraints will be imposed on business. It also dispenses with the considerable procedural costs inherent in the adversarial mode of regulation. On the other hand, the adversarial or contemporary American approach is probably more effective: it substantially enhances the likelihood that regulations that are needed will in fact be enforced. It can also bring about changes in corporate practices far more rapidly. (4)

Despite Vogel's conclusion, this study indicates that so far as air pollution from new sources is concerned, the American system may be marginally more efficient than the British.

While the numbers of rules, laws, permits and permitting agencies would seem to be inversely proportional to the cost-effectiveness of the authorisation process itself, it is possible that one of the procedures may reveal an anticipatory method by which the desired level of pollution control can be achieved more cheaply. In general, however, efficiency demands a minimisation of the number and duration of permit procedures and, in this sense at least, the British system must be more efficient than the American system. Because efficiency also requires that the costs of pollution damage from the proposed development be minimised and borne by the developer, the more stringent mitigation conditions often imposed in the United States may be more efficient than British conditions.

Generally, whereas higher transaction costs and, possibly, higher control costs will increase the developer's expenditure in the USA, and may thus be inefficient, the costs of damage in the UK may be higher and also be inefficient. Because anticipatory controls are relatively cheap to implement, the costs of the authorisation process and of the more stringent controls in the United States may be a small proportion of total project costs and be marginally more efficient than parallel British controls. Similarly, although the greater degree of public participation in the United States may result in some delays, efficiency may not necessarily be compromosed if agreement is reached and if anticipatory controls are negotiated. It would thus appear that the US system may be inefficiently biased against the developer and that the UK system may be inefficiently biased against the objectors.

Both outcome and procedural equity demand that a full array of environmental protection measures are brought to bear and that as much relevant information as possible be made available to both the control agencies and the public before binding decisions are reached. Only by such full disclosure, meaningful public participation and the fair operation of agency processes can equity be achieved and, as importantly, be seen to be achieved. It is therefore probable that outcome equity is higher in the United States than in the United Kingdom, since it is more likely that, in the US system, mitigation measures, compensatory actions, etc will be negotiated to ensure that the few do not suffer without compensationn for the benefit of the many when a new stationary source of air pollution is contemplated. The developer, however, is perhaps more likely to be unjustly treated in the USA than in the UK, because of the greater variety of response to identical proposals.

Procedural equity is generally higher in the United States than in Britain because of the much greater opportunities for public involvement and appeal. The UK planning inquiry, where it takes place, provides an exception to this general rule.

The effectiveness of the outcome is likely to be much greater if the mitigation measures are agreed during negotiations, rather than imposed unilaterally, since implementation inevitably relies on a measure of voluntary co-operation. On the other hand, the more different agencies that are involved, the greater the chance that implementation will not be complete and thus that effectiveness will be compromised. Both these factors would tend to suggest that the effectiveness of the controls imposed on air pollution from British new sources should be greater than those on their American equivalents. On the other hand, greater public involvement in the US may lead to closer scrutiny of the potential pollution problems and the control measures agreed and hence to a more effective decision. The greater array and stringency of both anticipatory and retrospective controls available in the US should also result in better effectiveness than in the UK. The relative weights of these counteracting factors would determine whether Vogel's conclusion (above) about the greater effectiveness of US environmental controls was justified.

In fact, the evidence from this study suggests that the reality is that the implementation of controls imposed on new sources of air pollution is not markedly more effective in one country than the other. Though conditions tend to be more complex and onerous in <u>nature</u> in the United States than in Britain, their <u>acceptability</u> does not appear to vary greatly. The <u>attitude</u> of the developers did not appear to be markedly different, though it would have been expected that British developers would have been the more concerned to meet their commitments.

Similarly, though US <u>air pollution control agencies</u> were more prepared to use sanctions against developers than their British counterparts, the general activity levels of air pollution controllers in enforcement in the two countries were broadly similar. It appears that <u>land use planning agencies</u> have considerable difficulties in achieving adherence to conditions in both countries, probably because of the imprecision in specifying the type of controls to be employed and the means of enforcing them. The degree of <u>public vigiliance</u> does not seem to differ between the two countries. Once sources have been constructed, complaint is vociferous wherever problems arise. The eventual reductions in pollution damage achieved in each of the cases examined indicate that both systems can be effective. This study also shows that pollution abatement perhaps depends on the attitude of the management of the organisation responsible for the pollution source than on any other factor in both countries.

Shortcomings of the US and UK anticipatory air pollution control systems

In the United States the developer's transaction costs are very high in comparison to the United Kingdom. The costs of providing information, of paying permit application fees and of employing staff to undertake the siting process are all greater than in the UK. The greater recourse to the courts in the United Stats further increases the developer's costs. In the United States it could be argued that the position of the developer is inequitably weak in comparison to that of potential objectors,partly because of acute public sensitivity to 'political pollutants' and partly because of the number of opportunities objectors have for delaying the application process.

In the United Kingdom, the larger size of local authorities and the system of local government finance have the effect that the developer has less chance of compensating those directly affected by pollution than is the case in the USA - where smaller local authority areas often mean that those suffering pollution also have more likelihood of gaining some compensatory benefit from a development through increases in local taxation revenues.

The air pollution control agency in the United States has to administer an extremely complex and expensive system of controls which can be somewhat arbitrary in nature, despite the existence of a notionally comprehensive strategic control plan. The scope for discretion, while quite considerable, has defined bounds. For example, it does not extend to permitting major sources to locate in non-attainment areas (which are often so classified on the basis of inadequate monitoring information) without the provision of offsets (the calculation of which is often rather nebulous). While consideration of regional or sub-regional ambient air pollution concentrations is elaborate, compared with the attention given to such matters in the UK system, there is usually less consideration of the immediate effects of pollution on near neighbours of the proposed source than in Britain. In the US there are frequently two, and sometimes three, agencies involved in considering a new source. These agencies have to contend with rules that change much more frequently than in Britain and a higher staff turnover.

In the United Kingdom, on the other hand, air pollution control agencies take decisions without much regard for ambient pollution levels. Whilst giving consideration to the proximity of sensitive receptors, the control response tends to be limited to requiring higher chimneys to promote greater dispersal. The Industrial Air Pollution Inspectorate possesses comprehensive anticipatory powers but those of local authority environmental health oficers are so inadequate that they frequently request their colleagues in planning departments to incorporate air pollution control conditions in planning permissions or agreements. This lack of comprehensive local powers is made more serious by the fact that air pollution consents are never refused in the United Kingdom if the specified technical requirements are met. There was never any question in all the cases studied but that air pollution permits would be forthcoming. Not only is there a general lack of policy guidance about appropriate air pollution ambient levels but the process of negotiation with the developer is carried on with little of the countervailing public input which has proved so valuable in moderating air pollution control decisions in the United States. Indeed, unlike the United States, where some third party appeal rights exist, there is no public right to appeal against air pollution control decisions.

Despite the existence of a comprehensive anticipatory air pollution control system in the USA, the ultimate decision about whether or not to allow a new source to be constructed is still taken by the <u>land use planning agency</u>. American planning agencies are typically much smaller and more politically influenced in their operation than in Britain. The controls at their disposal are more fragmentary and weaker than is the case in the UK and they are usually deployed with little regard for the provision of a land use policy plan. The small size of local governments with land use planning jurisdication can lead to very parochial attitudes, which variously can be either unfairly prejudicial to an unknown developer, or can lead to a strong desire to attract a major tax-yielding development at almost any social cost. Many land use decisions are taken by appointed representatives withough the benefit of recommendations by professional planners. The outcome of a land use planning decision is therefore less predictable than in the United Kingdom. Oral public participation at meetings to decide planning issues and at subsequent appeals before the elected local government representatives is often limited to five minutes per person, without the right to cross-examine. Staff quality is often poorer in local land use planning agencies than in Britain, and turnover is higher because of the fee-funded and federal programme grant-aided nature of much of the work. There are frequently conflicts between state and local land use planning procedures and the total number of agencies with land use control responsibilities in any one case will often be much larger than in Britain.

The United Kingdom land use planning system has features that lead to a stronger bias towards decisions in favour of the developer than in the United States. In comparison to the United States, the public has much less access to information in advance of planning decisions. Its comparative lack of access to environmental impact data is particularly noteworthy. While public inquiries can be lengthy and expensive for those involved, the contrast between information availability in cases where such inquiries are held and that obtaining at the time when initial decisions are made by the local planning authority is often enormous. A further significant difference compared to the US in regard to objectors' access to, and influence on, decision making is that there is no third party right of appeal against the decision of the land use planning agency.

Objectors in the United States frequently have a choice of numerous permitting procedures which they could attempt to influence to block a developer. This can sometimes lead to the preparation of insufficiently strong cases because of a diffusion of effort. Overall, however, objectors in the United Kingdom have less information and access to decision making procedures and fewer rights of appeal against siting decisions than in the USA. In addition, the media devote far less space and time to environmental matters than their counterparts in the United States. The taxation system in the UK, which permits charities to increase the size of gifts they receive by reclaiming tax, is less favourable to environmental pressure groups than in the US. Again, these groups are generally less well-staffed than their more numerous United States counterparts.

The authorisation process in the United States, in comparison with the United Kingdom, is far more complex, requires more permits, involves more agencies, is more expensive, is subject to more frequent variations and changes in rules and involves much greater recourse to the courts. There is greater public suspicion of both business and officials than in the UK, with public involvement in the system consequently being of a more adversarial nature. The transaction costs and control costs in the United States are both greater than in the UK.

In Britain, the authorisation process is more secretive and furnishes fewer anticipatory controls than in the United States. The system is, with the exception of the public planning inquiry, biased against objectors and provides fewer opportunities for compensating those suffering the pollution from new sources. The damage costs from new sources are probably greater than in America.

The <u>implementation</u> of planning conditions (but not air pollution control conditions) is probably weaker in the US than in the UK. Further, it seems likely that there is a lesser degree of voluntary compliance by the developer with the conditions imposed by both types of control agency. The availability of retrospective powers, the incidence of formal enforcement action and the level of penalties imposed are all much less in the United Kingdom than in the United States. As would be expected, therefore, the numbers of staff allocated to the enforcement of air pollution conditions are much smaller than in the USA in proportion to population and there is a greater reliance on public complaint as an indicator of problems. Budget cuts in both countries have hindered the implementation of anticipatory controls.

<u>Improving anticipatory powers and their implementation</u>

It is apparent that there are advantages and disadvantages in the systems of control adopted in both countries. It follows that it should be possible to improve both. Asimow believed that:

> Each country has something to teach the other. American rulemaking procedures have improved the quality of rules and furnished a sense of participation very satisfying to the persons who must live with the rules. Similarly, British inquiry procedures, for all their defects, have brought the people closer to government decisions having critical effects on their lives. Neither country will, or should, abandon these procedures, though they must be pruned from time to time, lest the desire to make procedures acceptable to those affected overwhelms competing values of efficiency

> and accuracy. Both countries should begin the process of judicious sampling of the other's fumbling attempts to involve the public in critical administrative decisions. (5)

Vogel concurred:

> To a certain extent, each society does have something to teach the other. The British would probably benefit from more clearly defined standards, a greater willingness on the part of government to prosecute, and increased opportunities for public participation in the policy process. For America, on the other hand, more flexible regulations and closer consultation with business might well result both in more sensible rules and more reasonable enforcement policies. (6)

Hall has offered general advice about the assessment of new air pollution sources and other important projects. He believed that, having decided whether a new project is viable in financial terms, the positive and negative effects of the investment on other people should be considered. Despite the difficulties, the groups upon which the costs and benefits would fall should be identified, to judge the distributional consequences. These external costs and benefits should then be allowed to affect the decision as to whether to proceed or not. His analysis led to the recommendation that:

> Above all, because of the great uncertainty inherent in nearly every planning decision, the golden rule remains: do the minimum necessary, and leave tomorrow's decision for tomorrow. (7)

It appears that, in certain circumstances, environmental mediation could have a role to play in reaching a solution to siting disputes in both the US and the UK. Mediation involves the assistance of a mediator in negotiations between the parties in a dispute over a new development. While it is not easy to state precisely when mediation will help negotiations towards completion, there appear to be four requisites to its success - a stalemate or the recognition that stalemate is inevitable, voluntary participation, some room for flexibility, and a means of implementing agreements.[8]

Similarly, financial compensation or compensation in kind may also have a role to play in both the US and the UK. Frieden has described a case where monetary compensation was paid in California[9] and Knödgen one in West Germany.[10] Though such payments may be controversial, and though there may be considerable problems of determining who should receive the payments, the use of compensatory measures can increase economic efficiency, as pointed out in Chapter 2.

One of the more interesting findings of this comparative study is the revelation of how little planning techniques for the reduction of air pollution were used in either the US or the UK. There are probably two reasons for this. The first is that many of the available techniques were inappropriate in the case study circumstances (especially those techniques requiring implementation at the plan making stage). The second is that there is clearly a serious lack of knowledge by planners about the available techniques. There is real scope for the development of planning guidelines on the use of pollution control techniques such as buffer zones, the design and arrangement of buildings, siting with respect to terrain, etc. Equally, there is a need for compilation and collation of the scattered existing knowledge on planning techniques for controlling pollution; presenting the resulting information as a manual for practising planners. Such a document would be of equal utility in the United States and the United Kingdom.

Equally, in both countries there is a need for a source-book for planners on air pollution information, on consultation opportunities and requirements, and on other sources of advice. This publication would be specific to the country concerned. (A document along the lines of that published on environmental impact assessment in the UK(11) is envisaged.) Such source-books, together with the techniques manual, would do much to equip land use planning agencies in both countries better to undertake their responsibilities in new source control.

Perhaps the greatest impediments to better performance in authorising and then supervising new sources of air pollution in both countries are attitudinal - whether attitudes of intransigence or indifference. The attitude of the developer in the United States has been characterised as sometimes lacking in concern for the environment. The same could be said of some developers in the UK. There is a need for the introduction of environmental issues involving industry (and particularly the new source authorisation system) into business school curricula in both countries. Similarly, air pollution controllers need education and training in the role of land use planning agencies in air pollution control and, of course, planners should have equivalent knowledge about the role of air pollution control agencies as well as extended training in the use of appropriate planning techniques. The attitudes of politicians taking land use decisions can also be very important and could be improved by short courses and other such methods.

There is scope for considerable further research in relation both to understanding the effects of the anticipatory control systems on the siting process in both countries and to improving their functioning. There is obviously considerably more work to be undertaken in relation to the six hypotheses about the nature of the authorisation process. For instance, the factors included in the hypotheses are capable of substantial further refinement to improve their potential to predict outcomes. The undertaking and analysis of brief case studies of siting disputes in the United States and the United Kingdom would be necessary to isolate further the roles of the various factors and their relative weights. It would also be interesting to discover whether the hypotheses are likely to hold true for countries other than the United States and the United Kingdom.

There is a need for further investigation of the relative efficiency and equity of the two anticipatory systems. In particular, the costs of air pollution control and of air pollution damage would merit more investigation, especially in the UK. Similarly, there is scope for further research on all the various costs and benefits of planning decisions involving new stationary sources of air pollution and on the reconciliation of environmental and economic objectives by the use of compensation and planning gain approaches.

Clearly, the opportunity also exists for substantial research on mediation, planning techniques and information sources, and on the attitudes of developers, pollution controllers, planners and politicians to anticipatory control in order to facilitate the above suggestions for improvement of performance in the systems of both the UK and the USA.

United States

Other researchers have made a number of suggestions directed specifically to improving the siting process for both new air pollution sources and for industry generally in the United States. Duerkson made several recommendations for 'quiet reform'. He suggested that federal, state and local agencies could improve management by such methods as the designation of lead agencies, the appointment of a single project manager, the use of agreed timetables for decision making, etc. He felt that companies needed to assess potential environmental impacts earlier, to use a more open project-planning process with early government and citizen participation, and to increase the use of alternative methods for settling siting disputes such as mediation and mitigation. Specifically, he thought there was a need for greater use of scoping,[12] the compilation of permit guides and earlier release of information. Duerkson concluded that:

> The most promising methods of improving the efficiency of the environmental and land-use regulatory system are those that stress co-operation and negotiation. The innovative initiatives discussed... offer relief without deforming the system, but they will work only if all the players in the siting game co-operate. (13) (emphasis in original)

O'Hare et al were more pessimistic than Duerkson about conventional reforms but argued for many of the same methods: negotiation, earlier provision of information, mitigation, compensation and mediation. They proposed that a siting agreement be signed between the developer and the local community before formal permits were applied for:

> This agreement specifies the nature of the project in detail, with local concerns taken account of, and the operating rules that will govern the community and developer both. It is established either by the parties themselves or, if negotiations run aground, by the arbitration panel. (14)

These concerns would include, but not be confined to, air pollution and other environmental problems.

Morell and Magorian insisted that the siting decision must be left in local hands but argued that extensive mitigation of impacts, negotiation on non-environmental concerns and compensation could be successful in winning local approval; though each technique had its limitations and some opponents would remain unconvinced whatever concessions were made by the developer. Agreement could:

> ...best be accomplished by extensive mitigation of their adverse impact accompanied by negotiated compensation...A siting policy that aims to reduce inevitable losses to an acceptable level for those who are harmed and to build citizen respect through balanced sequential, and timely procedures is not only carefully conceived but, more importantly, should also prove effective in clearing the political impediments to successful siting in the United States... This structure is in accord with the political realities of... siting controversies, and very different from the myth of preemption. (15)

The present study confirms that a number of these suggestions for 'quiet reform' would undoubtedly improve the process of authorisation of new sources of air pollution. This is particularly true of those relating to the use of lead agencies, the earlier release of information by companies, the increased use of mitigation measures and mediation, and the use of compensation payments to those directly affected by air pollution (and other adverse impacts). Comparison with Britain also indicates that greater co-operation in implementing controls could prove fruitful. In particular, the building of consensus between the developer and all the other parties involved by the use of state co-ordinators, and external mediators in appropriate circumstances, could expedite many siting disputes, reduce developers' transaction costs and reduce the incidence of resort to the courts.

A number of suggestions for more radical reform can be advanced. The most obvious of these, following comparison with Britain, is the desirability of local government reform. The structure of the local government system in the USA is not dissimilar from that of the UK in the mid-and late nineteenth century. The situation in which the mean population size of counties and municipalities is only just over 10,000, with much fragmentation of local jurisdication within continuous urban areas, is obviously ripe for reform. Rationalisation would also need to take account of the extra and ever increasing number of townships, school districts, and other special purpose districts - presently over some 60,000 in total. Hagman strongly advocated such reform,(16) which would reduce parochialism and local taxation anomalies whilst providing a firmer base for the recruitment and retention of more adequate numbers of professionally trained staff.

This present study shows that there is a clear need to simplify the air pollution control system for new sources. This must be achieved without weakening its performance capability. One area of improvement would be to eliminate the use of modelling exercises based on notional rather than monitored ambient air pollution levels. This approach has been seen (as in the Oregon energy recovery plant case) to lead to enormously complex and almost incomprehensible prevention of significant deterioration (PSD) calculations. There must be a very strong argument for combining the new source performance standards, best available control technology and lowest achievable emission rate requirements into a single set of standards for major and minor sources, while retaining the offset requirements currently applied in non-attainment areas (Chapter 4). The Bay Area Air Quality Management District's new source rule provides an example of how this reform might be pursued.

Similarly, the division of permit responsibilities between federal, state and (sometimes) local agencies leads to needless duplication. Consideration should be given to allocating all clean air permit functions to the states (which might then delegate them for particular areas) subject to active monitoring and the right of intervention by the Environmental Protection Agency (EPA). Such an allocation would reserve to EPA certain sanctions for inadequate performance such as grant withdrawal and construction moratoria. Greater priority needs to be given by the states to the enforcement of new source conditions by the allocation of more staff and greater use of sanctions where co-operative bargaining proves ineffective.

Again, by comparison with the UK, the performance of the United States anticipatory control system would benefit from a strengthening of the land use planning system. At a general level, the case studies indicated that the opportunity exists to improve the systems as between states, with Louisiana, Texas and North Carolina appearing to have weaker controls than Oregon and California, for example. Specifically, wider use of zoning systems and of requirements that zoning be in accord with the land use plan would remove many difficulties over the siting of new air pollution sources. The case studies also show that there is often a need to increase the competence and staffing levels of local land use planning agencies. Land use planning reform would have to be introduced state by state. The experience of those communities affected by proposals to construct new sources of air pollution and by the environmental impact of other major industrial proposals could provide the focus for a national campaign by environmental pressure groups for improvement of the land use planning system. Local hearing procedures need to be improved, perhaps by agreeing who should be called in advance and extending the length of time allowed for submissions.

There is clearly also scope for the simplification of state land use permit procedures. There would be particular benefit in reducing procedural delay by the operation of the large number of state permit procedures co-ordinated by means of joint hearings, etc. The increased use of environmental impact assessment as a shared basis for evaluating the environmental effects of a new soouce could be one method of facilitating this joint operation of permit systems. Notwithstanding the comments of Morell and Magorian (above) there may well need to be provision to allow state views to override those of local governments in certain circumstances. This could perhaps be accomplished by the setting up of a state appeal system (equivalent to the British central government planning appeal), to which the developer could have recourse as of right and which objectors could harness if a sufficient proportion of those resident within a certain radius of the proposed source petitioned for it. The enforcement of both local and state land use permit conditions could with benefit be strengthened by increasing the level of penalties and the priority of ensuring compliance in land use agencies.

Clearly, many of these proposals are likely to prove difficult to implement. This is why the 'quiet reforms' are so attractive, though this study indicates that the current use of 'one-stop' or co-ordinated state permit procedures is not proving very effective. The increased use of mitigation and compensation measures should improve the climate of opinion for the achievement of the various reforms suggested and help to shift the balance of advantage in siting new sources of air pollution towards the developer.

There is a need for considerable research on appropriate formulations of local government reform, on the technical implications of simplifying the current air pollution control law and on the feasibility and implications of delegation of air pollution control responsibiities. Similarly, there is scope for investigation of the repercussions and acceptability of state override of local land use planning decisions, of strengthening planning controls and of simplifying state land use permit procedures.

United Kingdom

Several ways in which anticipatory control over air pollution in the UK might be improved and siting problems eased have been suggested. The Royal Commission on Environmental Pollution urged the adoption of guide values in the UK in 1976.[17] The guide values would not have had the same implications as US standards but they would have provided criteria against which siting decisions could be made. The commission also recommended the demise of the Industrial Air Pollution Inspectorate and its reconstitution in the form of 'Her Majesty's Pollution Inspectorate', dealing with all types of complex pollution problems. The Commission has continued to argue for this multi-media inspectorate. It has also suggested that, as the British rating (local tax) system offers inadequate relief to residents suffering pollution burdens, compensation for the effects of environmental damage should be utilized in Britain:

> We recommend that the government should examine the appropriateness and feasibility of adapting UK law and administrative procedures to provide for some form of discretionary compensation or inducement to individuals or communities affected by... sites, such that the costs fall ultimately on those who generate the waste. (18)

Wood made numerous suggestions for improving planning control over pollution, including increased provision of information, clearer objectives and standards, increased powers under planning legislation, greater use of planning techniques, more effective consultation and more training to increase awareness about potential pollution problems amongst those involved in planning decisions.[19] Miller and Wood urged that a change of attitudes towards pollution was needed and argued for many of the same reforms (including mandatory consultations) together with the introduction of environmental impact assessment. They also argued that the developer should be obliged to demonstrate the need for the proposed pollution source. They recommended the use of standards, using the analogy of the recommendations of the International Commission on Radiological Protection, which had been accepted by the UK government:

> Central government has therefore endorsed a system of regulating radioactive pollution which includes quantitative standards and demonstrations of 'net benefit', yet equivalent controls have not been readily accepted in the case of inactive pollutants. (20)

This comparative study of the anticipatory control system in the United States enables a number of these previous recommendations to be extended and amplified. The latest change in local government in Britain is the abolition of the metropolitan county councils. This measure is likely to run counter to the best interests of air pollution control. From both the planning and the pollution control viewpoints the reintroduction of some form of sub-regional local government in the metropolitan areas may well prove necessary as the pollution problems of conurbations are not respectors of local authority boundaries. The significant environmental management achievements over the twelve years of the metropolitan counties' existence are too valuable to be dissipated.[21]

The developer is in a strong position in UK siting disputes. The payment of compensation to those directly affected by air pollution from a new major source, perhaps from permit fees charged by air pollution control agencies and/or by land use planning authorities, might reduce conflicts in certain cases and would be a desirable extension of the UK system. The likely damage could perhaps be assessed by the air pollution control agencies on the basis of proximity to the source and the nature of the emissions.

There is scope to improve the air pollution control system. While it is obvious that the UK should avoid the complexity of the US system, serious consideration needs to be given to increasing the force of air pollution guide values. This might be done by converting the current guide values to legally enforceable standards, by extending the coverage of ambient limits to pollutants such as oxides of nitrogen, or even by attaching far more weight to the significance of the existing guide values. The corrolary of requiring the use of offsets or prohibitions on new source development in areas exceeding the standards merits serious consideration. There are, of course, numerous difficulties to be overcome in applying a system of mandatory standards but the potential advantages are too great to be dismissed by clamorous references to the flexibility of the British system and by resort to taller chimneys. The anticipatory control powers of the environmental health officers of local authorities are woefully inadequate by comparison with those of the Industrial Air Pollution Inspectorate and there is a pressing need for legislation to grant local authorities equivalent powers over non-registered sources.

In equity, the public right to information ought to be increased to counteract the inevitable tendency of air pollution controls to be influenced by the relatively uncontested representations of developers. Such public information needs to be made available prior to the grant of permit and should preferably be supplemented by a third party right of appeal against the air pollution control agency's decision in certain circumstances. Appropriate circumstances might be when demanded by a given proportion of residents living within a specified distance of the proposed plant.

It is clearly desirable to increase the scope and utilisation of air pollution control agency enforcement powers and the amounts of penalties for non-compliance. This would serve to ensure that developers maintain the priority of pollution control once their permits have been received.

The Industrial Air Pollution Inspectorate, while it has undoubtedly been extremely cost-effective, may have become an anachronism in its present form. There is a strong case, well made by the Royal Commission on Environmental Pollution (above), for broadening the scope of the Inspectorate to cover major pollutants affecting all media. In parallel, serious consideration now needs to be given to the delegation of many of the Inspectorate's functions to local authorities to avoid the dupliction of effort, and conflict of objectives, that so often occurs at present. The new inspectorate would obviously need to retain oversight responsibilities and intervention rights (similar to those of the US Environmental Protection Agency) because the competence of local authorities would vary considerably in the initial stages of such a modified system.

Finally, because many of these reforms would be costly, it would seem sensible to introduce a system of construction and operating permit charges, as in the United States, to contribute to the costs of air pollution control. The precedent for construction charges has been set in the UK with planning application charges: the case for air pollution permit payments is much greater, as it can be justified by the 'polluter pays principle'. The fees would need to be sufficient to pay the compensation charges mentioned above, together with a proportion of the air pollution control agency's expenditure.

It is quite obvious from American experience that, even if air pollution control agencies gain comprehensive anticipatory powers over air pollution, the <u>land use planning</u> authority will be left to make the decision as to whether to permit the development or not. There is a need for changes in the land use planning system though it should be less necessary to append air pollution control conditions to planning permissions. The requirement would remain, however, for much greater provision of information to the public at the early stages of an application to locate a new source or to extend an existing source of air pollution. Similarly, public access to planning files and a right for interested members of the public to be heard at planning committee meetings (perhaps on the basis of a petitioned request) would be valuable in improving procedural equity. A parallel right of public appeal against planning decisions should be considered (perhaps on the basis of a request from a specified proportion of residents living within a certain distance of the proposed site). The agreement, in advance, of how long each participant at planning inquiries should have for both the presentation of his case and for the cross-examination of opposing witnesses might also prove a useful reform.

There is a strong case for amending the General Development Order[22] to make consultation by the planning authority with the air pollution control agencies mandatory when a proposed new or extended source is under consideration. Consultation over major pollution-sensitive developments in the proximity of existing major pollution sources should similarly become mandatory. There is also a need to tighten the order to prevent the intensification of use of premises, without the need for planning permission, which can lead to increased air pollution (as demonstrated by the case study concerning the Yorkshire chemical formulation plant). The same case study shows the need for an alteration to the Use Classes Order[23] to prevent change from an environmentally innocuous use of buildings or land to one which pollutes neighbouring areas, while avoiding a requirement for planning permission.

Wider use of the valuable anticipatory planning tool of environmental impact assessment (EIA) is required. While it is at present possible for a planning authority to ask a developer for a comprehensive statement of the pollution implications of a proposed development, the onus of preparing an EIA falls on the developer. In the interests of wider provision of information, to support and facilitate increased consultation and to ensure that environmental impacts are considered in detail in planning applications involving air pollution sources, a much greater use of formal environmental impact assessments is necessary than has hitherto been the practice in the UK. The government should therefore encourage implementation of the European directive for a broad, rather than a narrow, range of project types.

There is a strong case for increasing the strength and range of enforcement powers available to the land use planning agency. The most important reform to help redress the balance towards objectors would be the passing of a comprehensive freedom of information act. United States experience indicates that this could give pressure groups the opportunity to participate in a meaningful fashion in the siting of new sources of air pollution. This could ensure fuller consideration of the effects of air pollution and hence better anticipatory control. there is also a case for encouraging environmental presssure groups to focus on anticipatory controls over pollution sources by means of grants. Even with the introduction of these suggested reforms, economic factors may still tend to outweigh environmental factors, in British decision-making but the ramifications of decisions should become more explicit. It could be expected that local authorities, in particular, would be influenced to greater use of planning conditions or agreements increasingly aligned towards redressing this balance and to overcome these ramifications. This study indicates that such reforms are overdue and that deregulation of, and budget cuts in, the implementation of anticipatory controls over new air pollution sources are likely to prove counter productive.

Again, these recommendations in regard to the UK system raise matters which provide scope for further enquiry. In particular, the reconciliation of air quality standards with the 'best practicable means' concept of air pollution control, and the ramifications of the use of standards in terms of the prevention of new development in 'polluted areas', merit further research. The possibilities of levying compensation and of introducing an air pollution permit fee system also require further definition and investigation. The same is true of several of the suggestions to improve the land use planning system such as the basis on which a third party right of appeal might operate. The advantages, disadvantages and feasibility of financing pressure groups to enable them to pursue environmental issues (including air pollution) in the community interest would also repay enquiry based on an investigation of the difficulties encountered by such groups under present arrangements.

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