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THE CONTROL OF DEVELOPMENT AROUND HAZARDOUS
INSTALLATIONS IN A MAJOR METROPOLITAN
PLANNING AUTHORITY

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1. Introduction

Events from time to time provide telling evidence and reminders of the existence of hazardous installations. Most prominent here in the U.K. is the case of Flixborough (Department of Employment 1975) - prompting major review and revision of the approach to hazard management in the U.K. by the Health and Safety Executive, the key regulatory authority (Health and Safety Commission 1976, 1979; Barrell and Scott 1982) - and there have also been a number of more minor incidents (for example at Braehead, HSE 1979b; Barking, HSE 1980; Stalybridge, HSE 1982; and Salford, Hytner 1983, HSE 1983). The seriousness of off-site hazard potential from such installations is obviously closely related to nearby population distributions and to the nature of activity and land use in the vicinity; ceteris parabus open fields provide a more suitable adjacent land-use than high rise flats, schools or hospitals. This elementary observation justifies careful consideration about the siting of new hazardous installations and about the development of land in the vicinity of existing such installations. Consideration of the extent to which siting restrictions and restrictions on neighbouring land use might figure among reasonably practicable safety measures adds issues of safety to the myriad of other competing pressures on land.

The purpose of this paper is to examine how aspects of safety have been incorporated into land development control decisions associated with non-nuclear hazardous installations in a major metropolitan planning authority area in the U.K. (For reasons of confidentiality the authority will not be named in this paper). The area examined is not one of obvious major hazards, having no large petrochemical complexes. However within its mixed industrial base there will inevitably be use and storage of hazardous substances. Thus although safety issues do not dominate planning in this area, it nevertheless provides scope for examining how aspects of safety have been incorporated into land development decisions, and a useful complement to work based on other more obviously hazardous

areas which have been more widely publicised and within which planning experience is greater. (Notably Canvey Island, HSE 1978, 1981; Lagadec 1982).

The extent to which the area examined is representative of others in the U.K. will only emerge after much further research. The results reported below are thus part of a wider study involving similar in-depth analysis of other areas. See Walker (1983) for a summary of evidence from other areas. This case by case approach is designed to complement the existing literature on land-use development decisions associated with potentially hazardous installations, the latter being more piecemeal (Brough and Payne (1981), Johnson (1982, Forte (1981), Macgill (1983a)), offering a wider national coverage but either in less depth or detail (Wood and Lawrence (1981), Barrell (1981), Health and Safety Commission, (1976, 1979)), dealing with procedural issues only (Hankey (1980), Macgill and Snowball (1983b)) or pitched at a more abstract level (see Macgill and Snowball (1983a) for a recent review, Griffiths (1981), Royal Society (1981), Goodman and Rowe (1979).

2. General issues in planning for hazardous installations

Four key questions provide a framing of the work presented below:

- (i) How are hazardous installations identified?
- (ii) How are areas at risk identified?
- (iii) On what criteria should possible development restrictions be considered?
- (iv) Who should decide on development restrictions?

It is rather easier to pose them than to answer such questions. Indeed, not only may different individuals and organisations (developers, planners, councillors and politicians, Health and Safety Inspectorate, private risk consultants, advisers and members of the public) invoke different criteria and considerations in answering the questions, but there is also likely to be a gradual evolution over time in any given web of responses, reflecting progressions of maturity, experience, knowledge and of the priority of safety on individual and societal agenda. The 'official' response will be indicated here: this has undergone marked

change over the past decade.

(i) Installations are officially identified as being hazardous as a consequence of handling, at any one time, quantities of dangerous materials in excess of certain stipulated amounts. There have been two categories of official hazardous installations, so-called major hazard installations and so-called notifiable installations. The major hazard categorisation defined in circular 1/72 (Department of the Environment 1972) operated until the end of 1982 when it was replaced by the notifiable categorisation as defined in circular 26/82 (Department of the Environment 1982). Installations in the notifiable category hold considerably smaller quantities than those in the former major hazard categorisation, for example, in the case of Chlorine, a toxic gas, the major hazard and notifiable quantities are 25 tonnes and 10 tonnes respectively.¹ There were approximately 500 major hazard installations in the U.K. and current estimates of the number of notifiable installations lie between 2,500 and 3,000 (Pape 1983).

Planning authorities are expected and will soon be required under forthcoming legislation to consult the Health and Safety Executive on any planning development involving a notifiable installation. (Stat. Inst. No. 1615, 1983).

(ii) The two categorisations of hazardous installations have also had respective areas at risk defined around them. Since 1972 planning authorities have been able to consult the HSE on any developments of a significant size within these areas. The basis for consultation was, however, vague.

¹Any attempt to specify threshold values on a continuous scale (in this case of hazard potential) although often a pragmatic necessity is open to inquiry as to its degree of arbitrariness. Questions that may be raised (though not pursued in the present paper) include (a) the extent of differences in the hazard potential of specified quantities of different materials (b) the degree of consensus in scientific knowledge about gas cloud behaviour and dispersion in 'uncontrolled' atmospheric conditions (c) the exclusion of some materials from those officially specified (d) the issue of hazard being a function of location as much as of quantity of material held; thus installations handling below notifiable quantities may, due to their location in densely peopled areas, have a greater hazard potential than many handling notifiable quantities. There is also the factor that operators may fail to notify the authorities of the substances they held. Floyd (1983) argues that the "Yellow Pages" may provide a more reliable guide than official notifiable lists of the whereabouts of hazardous activity.

Circular 1/72 only noted that "...it is ... important for local planning authorities to seek advice

before permitting development nearby (hazardous industry) so as not to introduce into an area which may be at risk development which caters for numbers of people". Neither "nearby" nor the "number of people" which would make development significant enough to be sent to the HSE were defined. It was not until 1978 that the HSE introduced a 2km radius consultation zone for planning purposes around all major hazard sites.¹ The 2km radius defined quite a significant parcel of land - virtually the whole of a town in the case of certain installations - and although the significance of development within the 2km still remained undefined it can be seen that safety considerations potentially affected the planning and development of large land areas. Since 1978 some authorities have obtained more detailed guidance on the scale and type of development which the HSE wished to be consulted on, often alongside a reduction in the size of consultation zone. These trends appear to have been continued into new notifiable installation categorisation: planning authorities are now beginning to receive a detailed definition of "significant surrounding development" divided into types of development (residential, industrial, offices, shops and others) and its size defined by population increase or floorspace. Consultation zones for notifiable installations now vary according to material stored and its quantity but would seem to be all within 2km and often within 1km.

These recently established zones are inevitably superimposed on a legacy of past development for which no restriction has been considered. Thus the pre-existing situation of development around hazardous installations draws attention to the differing basis on which present practice rests, notably the relative stringency of present practice as against the relative slackness of the past. There is likely to be precedent for a wide range of decisions, though they are not precedents which are necessarily good ones to follow.

¹ Again the pragmatic expedient of having a threshold distance is open to comment (a) installations excluded from the 'major hazard' categorisation (and therefore from the consultation system) may be very significant in terms of off-site hazard potential, depending on their location (b) hazard potential does not typically cover a uniform circular extent (c) the spatial extent of hazard potential diminishes gradually; not at some 2 km line (d) the intensification of hazard at an existing installation may increase risk to surrounding development, for which there is as yet no statutory intervention mechanisms.

(iii) Some kind of cost-benefit trade-off is inevitably involved in deciding on development approval or restriction: the costs of development foregone (jobs, income, compensation to the deprived developer) vs the benefits of reduced risk. Despite strong arguments for the theoretical ideal (Pearce 1981) it is unlikely to be possible to make the full trade-off explicitly, and it is thus more usually embedded implicitly in some value judgement. Buffer zones are stipulated around some installations within which no further development is allowed at all; the value of development thereby foregone is difficult to estimate. Within a consultation zone more generally, it may be a clear cut decision to refuse a school or a block of flats, but gradual infilling may generate quite significant "unseen" population concentrations. Unresolved (unresolvable) philosophical and practical issues arise if explicit account is taken of the relative risks of other societal activities whether directly related (as in the case of the transport of hazardous materials to and from such installations) or unrelated to the immediate concern of hazardous installations. (see Fischhoff et al 1981, Kates 1978, Proceeding of the Royal Society 1981).

It is to be noted that the reduction of risk posed by a given installation can be used to achieve the same overall level of off-site risk as restricting surrounding development. However, different statutory instruments are involved in this case (The Health and Safety at Work Act as distinct from the Town and Country Planning Act); the relative usage and effectiveness of each is as yet unknown.

(iv) The consultation zones define areas within which local authorities should seek the advice of the Health and Safety Executive (on a voluntary basis) on all planning applications for "significant" development. Thus these are zones of overlapping concern between local planning authorities and the HSE. The Advisory Committee on Major Hazards (HSC 1979) has set out basic HSE policy in stating that land-use development decisions associated with hazardous installations should be a matter for planning authorities, since safety cannot be divorced from other planning considerations. Thus the HSE's role is advisory (not mandatory), some form of expert risk consultation to local authorities being relevant because the latter's knowledge about the behaviour of hazardous materials

cannot necessarily be expected to be sufficient for informed decision making. There are indications however, that the consultation relationship between planning authorities and the HSE has fallen short of what it might be, concern being expressed by the former about delay, brevity of advice and lack of detail (Wood and Lawrence 1980, Association of District Councils 1979). Such aspects have prompted some local authorities, notably those with large petrochemical complexes, to retain private consultants in order to obtain more specific expert comment (Payne 1981, Ramsay, Evans and English 1982, Consodine 1983). Within such authorities also, there is likely to be a considerable build-up of internal expertise. This cannot be assumed to be widespread across all local authorities, however.

Some of the concerns of local authorities alluded to above have been accommodated in a re-organization of the HSE (Barrell 1981) though the success with which it can handle the new notifiable categorisation has yet to be seen; others, however, relate to the deeper nature of the topic of risk, and the inherent difficulties in "institutionalising" it.

Although the role of the HSE continues to be advisory, there may, in extreme cases, be penalties if local authorities do not follow the advice given (regarding their position in the event of an accident) or even if they do (regarding large compensation payments arising from development restrictions).

Consideration of the question of "who should decide" should not be confined to local authorities and planning authorities: the population at risk, on behalf of whom the decision is taken, may have views which do not find representation at the "official" level, and within such a population there may additionally be marked divergence of views. The scope for "public" debate on issues of planning for hazardous installations is, however, severely limited by the lack of public knowledge (a lack maintained by statutory dictate) of their existence. Imminent EEC directives stipulate more publicity of such installations. This and other aspects of public involvement are considered in Macgill (1983b).

3. Policy and Planning: case study area

Key stages in the evolution of national hazard control policy and their juxtaposition with the development of major hazards in the study area are given in table 1. It can be seen that at the time of study in the second half of 1982 there were 6 major hazard installations of concern in the planning authority area. During 1983 a number of additional notifiable installations have been added to this list but as yet the authority's experience in dealing with these installations has been limited and study has therefore been restricted to the pre-1983 major-hazard grouping.

In table 2 a brief sketch of the development histories of the six major hazard zones are summarised. It can be seen that the consultation zones were superimposed on a legacy of sometimes substantial past development, and that the installations in zones 2 to 5 had themselves been in existence for some time before being considered as hazards from 1972 onwards. Zones 1 and 2 were selected for detailed study as they are located within relatively developed and developing areas and therefore have more of interest in terms of planning applications (but see below for zone 3).

Evidence was collected within these two zones, via a survey of planning applications, first, in order to examine the extent to which the planning authority had consulted with the HSE, the way in which criteria for consultation had been defined, and the procedural and administrative problems experienced. These factors are assessed in section 4 below. Second, evidence was collected in order to ascertain how if at all, characteristics of risk and hazard have affected the outcome of planning decisions in this area. This evidence is assessed in section 5.

4. Assessment of Consultation Procedure

4.1 General Findings

In Table 3 key information obtained from an examination of all planning applications of a "significant" ¹ size within a 1km radius

¹"Significant" is defined as all residential applications larger than 2 dwellings, all industry and warehousing except for minor extensions and alterations, all community facilities such as schools, hospitals, nurseries, churches and social centres and major retail developments such as super-markets and D.I.Y. superstores. Applications dealing with reserved matters only are not included.

TABLE 1. POLICY EVOLUTION

Date	National Policy	Major Hazards	Local Policy
1972	Circular 1/72	1 m.hazard established since 1940	Review of development plan
		1 overlapping zone	No clear local policy on HSE consultation
1974	Local Government reorganisation	2 more hazards gained through boundary changes	
1975	Advisory Committee on Major Hazards formed		
1976			County Fire Service/HSE review of potentially hazardous premises
1977		1 new hazard site	
1978	2 km radius consultation zone advice		2 km radius zones states consultation policy "housing e.g. over 1 acre all large industrial and sensitive developments"
1980			Structure plan approved includes hazard policies
April 1982			4 zones reduced to 1 km. New rigorous consultation criteria
Study undertaken Oct. 1982		1 more overlapping zone	
1983	"Notification" regulations		Promised site specific consultation criteria

TABLE 2. DEVELOPMENT HISTORY AND SITE DETAILS

Date hazard established (or granted planning permission)	Nature of hazard	State of zone 1955	State of zone 1972	Pop ⁿ 1961	Pop ⁿ 1981 (approx)
1 December 1977	LPG	Half of zone outside city boundary. Largely undeveloped and rural but planned light industrial estate, residential development and district centre	Established central industrial estate. First 2 phases of residential development completed; housing and school on western edge of site. 3rd phase of housing estate planned	3,500	9,500
2 1950's	Highly reactive chemicals	Hazard surrounded on 2 sides by housing (beyond small open space) school nearby and developing industrial sector towards railway	Largely developed. Core of housing with 2 sectors of industry on outer edges. Infilling and redevelopment continuing	9,000	10,000
3 Pre 1972	LPG	Outside city boundary pre-1974. Gas works remotely sited by railway. Ribbon residential development and scattered industry in North	Small housing estate encroaches into zone in North. No development within 500 m radius	1,100	2,000
4 Pre 1972	LPG	Brickworks remotely sited. Few houses on outer edge of zone	Development restricted by green belt. Industrial estate planned for Northern area	150	160
5 Pre 1972	Unknown	Both installations in adjoining authority area. Overlapping zones unpopulated apart from small village and mine in North	No additional significant development within zones (local plan does not mention hazard but development of area ruled out on drainage and mining subsidence grounds)	120	110
6 1982	Unknown			150	140

TABLE 3. SUMMARY OF CONSULTATION AND ACTION ON SURROUNDING DEVELOPMENT

	No. of "significant" planning applications	No. of consultations with HSE	Date	Description	Details of consultations	No. of applications refused on hazard grounds	Population increase granted planning permission (approx.)	Development in zone up to October 1982
Zone 1 (1978-82)	31	6	1978	Erection of factory (outline)	500 m	None	2,000	Residential-3rd phase large scale development-600 dwellings.
			1978	2nd phase of factory	500 m			Industrial-warehousing in close vicinity, large factory development.
			1979	Alteration and extension to works	450 m			Other-community facilities, nursery, pub, community centre, church, day centre.
			1980	Tanks and treatment plant	500 m			
			1981	5 warehouse units	50 m			
			1982	3 shop units	800 m			
Zone 2 (1972-82)	25	6	1974	Bromine tanks to factory	1000 m	None	800	Residential-infilling and sheltered housing-total of 280 dwellings.
			1978	Storage shed	850 m			Industrial-extensive warehousing and light industrial development
			1978	Filling building and tanks (south)	850 m			Other-DIY retail warehouse, community centre extension.
			1981	21 dwellings	750 m			
			1981	Outline residential development	800 m			
			1982	2t LPG store	450 m			
Zone 3	500 m radius - residential installation.	residential exclusion zone established around Industrial development allowed on approval				None	Not known	No development within 500 m. Housing developments 500-lkm planned or going ahead.

of the two major hazard installations is presented.¹ The radius was restricted to 1 rather than 2km because preliminary analysis indicated that consideration of hazard is limited in practice to a much smaller radius than 2km.

Out of 31 significant applications in zone 1 (between January 1978-October 1982) 6 were sent to the HSE for consultation, with 4 of these involving the use of hazardous substances themselves. None of the applications for residential development would seem to have been consulted on (there was uncertainty on the part of the writers about 2 relatively minor applications) although the population increase granted permission in these applications amounted to approximately 2,000 people. Other developments not consulted on included a day nursery, church hall, community centre and public house all approximately 750 m from the major hazard site. Similarly in zone 2 of a total of 25 significant applications (between 1972-October 1982) only 6 were sent to the HSE and again 4 of these involved the use of hazardous substances, the further 2 both for relatively small scale residential development. Other residential development granted permission but not consulted on involved a population increase of approximately 800; a D.I.Y. retail warehouse and community centre extension within 500 m of the major hazard site were also not sent to the HSE for consultation.

Immediately apparent from this general review of evidence is the low level of consultation with the HSE and the lack of any clear selection criteria in terms of size or distance from hazard. Consultation has not been greater on developments which were closer to the hazard site or involved a greater population increase both of which might have been expected. If however the date of applications is considered a clearer picture emerges. It can be seen that there were no consultations on non-hazardous surrounding developments before 1981 the four applications found all being 1981 or 1982. For surrounding hazardous development consultations are spread over the ten year period examined but it is not always clear on what grounds consultation took place; proximity to the major hazard, its own use of hazardous materials or a combination of these factors. Earlier consultations would not seem to have explicitly considered the proximity of hazard sites.

¹Subject to accuracy of planning records.

The greater level of consultation in recent years would suggest a development of hazard policy and/or consultation procedure within the planning department and this was indeed kind to have occurred with a break-point usefully dividing analysis into pre-1982 and 1982- onward periods.

4.2 Policy and procedure before 1982

No strict departmental criteria for consultation were defined during this period. Even when the 2 km rule and guidelines on "significant" were adopted in 1978 these do not seem to have been enforced or monitored. The consultation decision was thus left to the discretion of the individual planning officer. It is difficult to assess why there was so little consultation with the HSE on surrounding development. Contributory factors would seem to have included the following:

(i) Given the vagueness of circular 1/72 there was little for individual planning officers to base their consultation decisions on. Development involving hazardous materials by its very nature may have suggested consultation to the caseworker, but to know whether development "nearby" counted as being "significant" was far from straightforward in the absence of any guidelines and given the limited experience of officers in hazard and risk issues. In this position reliance would seem to have been partly placed on the Environmental Health Department, with their greater expertise, to "prompt" the planning department to consult the HSE. Alternatively the reaction would seem to have been to not consult at all (as also noted in a related context by Johnson 1982).

(ii) Even when in 1978 the 2 km rule and broad internal guidelines were established the organisational arrangements within the department did not enforce this. It was "easy to forget HSE consultation amongst a pile a foot high of internal procedures" especially when new planners were brought into the department and rapidly educated in departmental practices. The relevance and necessity of HSE consultation does not seem to have ranked highly amongst "administrative priorities".

(iii) The brevity of written HSE advice (noted elsewhere also: Wood and Lawrence 1980, Metropolitan Planning Officers Society 1980) limited its usefulness for the planning officers: (responses consisting of only "no comment" provoked the reaction "why bother consulting at all").

(iv) HSE response to the planning authority in fact never advised against developments proceeding and even if it had, it would apparently not necessarily have affected the final application decision, particularly where there were existing planning permissions or development precedents.

(v) On several occasions planners in the authority expressed dissatisfaction with the length of time it took the HSE to respond to consultation on development applications (again a deficiency reported elsewhere: Wood and Lawrence 1980, Walsh 1979, Hankey 1980, Association of District Councils 1979) with increasing pressure on planning departments to process applications quickly and efficiently, this would seem to have further discouraged HSE consultation.

After examining a sample of 20 consultations over the period 1976-82 response times were found to range from 6 to 93 days with an average of 24.7. These figures compare to the "21 days minimum" expected HSE response time mentioned in circular 1/72 and the 8 week period statutorily prescribed for the determination of planning applications.

On selected occasions it would seem that the length of HSE response time has delayed applications. The major hazard application in zone 1 took $5\frac{1}{2}$ months to decide with the HSE taking $3\frac{1}{2}$ months to respond to a request for advice - explained as being caused by the application going from the local HSE office "up to headquarters" in London. This is a common factor with some of the other longer response times with the local area office on occasions warning of a possible delay in replying.

In general however response times have not been excessive: clearly, shorter response times facilitate the job of the planning officer, and improve relations between departments. There would seem to have been a gradual amelioration over the last few years with response times of 14, 15 and 17 days on applications in 1982. In terms of planners' own assessment of the situation, it may be that it is the difficult, larger and more complex applications that are remembered and it is these that required more work (and therefore a longer response time) by the HSE.

With the exception of the last-mentioned qualification, some combination of the above factors would seem to have created a general and self-reinforcing feeling of disillusionment amongst the planners. The scarcity of HSE consultation meant that safety issues were rarely considered to be of importance, that planners had little dealing with the HSE and that the consultation procedure could be easily forgotten. Relations generally between departments left something to be desired, the HSE being seen as distant, uncommunicative and unwilling to talk "off the record".¹ Such factors have little to do with hazard itself (other than being indicative of the low importance given to safety generally) and it would seem that decisions on whether to gain "expert advice" were not being made on an "expert" basis at all.

Notwithstanding the above remarks it is difficult to identify a specific set of applications on which consultation should strictly have taken place, because of the vagueness of circular 1/72. The housing development and concomittent allowed total population increase in zone 1 of approximately 2,050 people would however surely constitute a significant population increase and fall into circular 1/72's only example of development worthy of consultation namely "housing estates". Before arguing that the planning authority seems to have been negligent in not consulting on this development it must be appreciated that (a) it was very unlikely that any of this development would have been halted with longstanding planning of precedents in operation, and (b) the major hazard was introduced in the knowledge that the housing estate was expected to be built. Whether consultation should be expected in such circumstances is arguable. Without gaining HSE advice the strength of any possible safety objections cannot be gauged, and possible changes in circumstances at the hazard source or changes in hazard assessment and policy within the HSE are necessarily ignored.

The general inadequacies of the consultation system were further revealed in the course of collecting the case study evidence for this authority: an application in 1980 was found, by chance, which involved the use of major hazard levels of materials but which had not been consulted on by the planning authority. This is a clear mistake and

¹ Since this paper is based predominantly on information provided by the planning department it may consequently give a "one sided" view of planning department/HSE relations.

ommission by the planning authority who are expected to consult on all major hazard developments. At least part of the reason why such a mistake could occur during the pre-1982 period was the absence of any enforcement of monitoring of procedures. This perhaps re-enforces the view that the low level of consultation generally was more the result of the deficiencies and failures of the consultation system rather than being reasoned decisions of planning officers.

In 1981 the inadequacies of the consultation procedure came fully to light when the HSE complained in the strongest terms to the local authority about not being consulted on hazardous development at a site within 2 km of the major hazard in zone 2. A pointed exchange of correspondence between the HSE and the local authority instigated a complete overhaul of the consultation system (see below).

In summary, then, from the viewpoint of an "ideal" procedural system which (a) clearly defines criteria for consultation; (b) is consistent rigorous and monitored, and (c) in which applications are selected at an early stage in the application processing procedure (as briefly described by Hankey 1980) the state of affairs before 1982 would appear to have left much to be desired.

4.3 April 1982 onwards

Following the difficulties over non-consultation mentioned in the penultimate paragraph above, the planning department, in co-operation with the Environmental Health Department, attempted to formulate their own more precise set of consultation criteria. Considering their own attempt at this to be unsatisfactory, the HSE were approached on the matter and, although initially unwilling, the latter eventually produced more explicit guidelines in April 1982.

To put these into practice, the planning department also adopted new internal procedures for selecting significant applications.

In examining all planning applications for the authority during the period July to September 1982 a total of seven applications were found to have been sent to the HSE under the new procedure. All applications that came within the consultation criteria were referred to HSE as required. The relevant applications had been identified at an early stage of processing within the planning department by a single officer who checked all applications against the 1 km zones and detailed criteria.

Applications in zones 1 and 2 show the contrast between the position before and after April 1982. In zone 1 a detailed application for 3 shop units was sent to the HSE although an earlier outline application and surrounding community facilities and housing estates had not been. Similarly in zone 2 an application to install a small butane tank on the site of a DIY retail warehouse was referred to the HSE although the original application for the retail warehouse (involving large numbers of people during the day) had not been consulted on.

The system of consultation by the authority was therefore much improved, with even more detailed criteria now received from the HSE in relation to the new notifiable sites. However it would appear that some problems remained:

- (i) The consultation criteria cannot satisfactorily handle the accumulation of small developments over time, in total becoming the equivalent of a large and therefore significant development.
- (ii) The need for consultation on the various different forms of application - reserved matters, change of use, repeat, renewal - remains a matter for individual discretion.
- (iii) A tighter consultation system will not necessarily change the nature or content of the HSE advice, nor will it ease any of the constraints acting upon planners when dealing with safety issues (to be expanded upon below). It may even serve to intensify problems at a later stage.

(iv) The new consultation system ensures that the planners act "properly" in consulting the HSE over developments with hazard implications. This will now protect the department (against legal suits of negligence) in the event of an accident at one of the major hazard plants. However the inadequacies of the previous system, may still leave the planning authority open for claims of negligence in respect to applications decided before 1982.

4.4 Evaluation

The procedure of consultation with the HSE forms the base of all subsequent action on hazard grounds. If HSE consultation does not take place, it is unlikely that any action will be taken, although the role of Environmental Health and Fire Departments and their own consultation procedures and subsequent advice may be important in some cases. In addition a somewhat deficient consultation procedure (as existed pre-1982 in this authority) will result in turn in expert advice being given inconsistently and potentially incompletely. This interaction between procedure and action can be seen to have been acting in two ways, with a lack of action (or perceived possible action) on hazard grounds in turn influencing the perceived importance and usefulness of HSE consultation.

The experience of this authority with HSE consultation must however be viewed in relation to the developing organisational structure of the HSE and the general gradual increase in knowledge and expertise in relation to hazardous industry. The vagueness of circular 1/72 was reflected by the vagueness of the authority's consultation procedure and practice leading to almost complete inaction in relation to surrounding development. However circular 1/72 was introduced as a preliminary step only almost as a basis

for experimentation and the gathering of information, so it may not be suitable to overtly criticise, but it would seem, from the experience of this authority (and others) to have been unacceptable to expect either for planning authorities to define consultation criteria for themselves or for the HSE to take on a potentially heavy workload when it was initially (and maybe still) ill-equipped to do so. The length of time it has taken for matters to improve is also clearly open to criticism.

5. Assessment of planning practice (action and policy)

5.1 Introduction

The consultation procedure provides an important component of the institutional backcloth against which planning decisions for hazardous installations are taken, the gaining of HSE advice being the crucial factor in considering safety. The outcomes of these decisions for the six major hazard zones in the study area were summarised in Tables 2 and 3. Decisions themselves relate either to forward planning or development control, and in the following two subsections, these two areas of decision making are assessed in turn. Important constraints that emerge to restrict and condition the scope for planning action are then reviewed.

5.2 Forward planning

The incorporation of hazard policies into forward plans has been until recently a neglected area of HSE involvement in the planning process (Metropolitan Planning Officers Society 1980, Payne 1981, Association of District Councils 1979). However the case study authority has directly incorporated hazard policies into a spatial context through the inclusion of a cordon sanitaire around the major hazard site in zone 3, in a local plan produced in 1980. The HSE were consulted during the preparation of the local plan and their reply recommended the inclusion of a 500 m radius zone around the major hazard site within which no residential development is allowed, and industrial development should be the subject of further HSE consultation. This recommendation could be readily included in the local plan firstly because there was no existing development of any significance within 500 m of the major hazard, and secondly because provisional searches for residential development land had already previously excluded the area immediately around the hazard site on the grounds

of access and drainage. Consequently the major hazard is now "protected" from encroachment by residential development by a firm and enforceable restriction zone. In this case the "existing state" of the zone considerably eased the rationalisation of land use and hazard, the area being relatively undeveloped. This was also the case for a fourth major hazard (zone 4) which was located in the green belt and therefore "naturally" protected by long standing development constraint policies. This use of hazard zones in forward plans has been an increasing feature of late in several district authorities (for example, Preseli District Council 1980). Where they can be applied with the minimum of "side effects", as in the case above, they perhaps provide a ready made solution to the control of development around hazardous installations. However, for zones 1 and 2 (as with perhaps the majority of other hazardous installations in the UK) cordons sanitaire would clearly be of little use with considerable existing development and strong precedent for continued development.

5.3 Development control

Three different forms of control may be used, each to varying degrees.

(i) Planning conditions - the granting of planning permission with attached conditions can be used to regulate the development or use of land under the control of the applicant provided that the condition is reasonably related to the permitted development. The use of this provision in the present case study area has been restricted to development involving hazardous materials themselves, covering such matters as maximum storage capacities and compliance with codes of practice and it is here where the roles of Environmental Health and Fire Offices are especially important. Conditions on surrounding non-hazardous development in relation to hazard have not been used and there would also seem to have been no marginal risk reduction measures taken on surrounding development such as re-orientation of building, strengthening of walls and so on.

In one particular respect the use of conditions may have been expected. In their second report the Advisory Committee on Major Hazards (1979) suggested that a standard condition could be imposed "prohibiting without specific consent the introduction of notifiable hazards at a later date on all planning permissions of an industrial nature (HSC 1979) to ensure that the hazard implications of new developments could be realised and controlled by planning authorities". Such a condition could perhaps be of most use to this case study

authority in relation to surrounding warehouse/industrial development to prevent the additional storage of hazardous materials in close juxtaposition to existing major hazards. An examination of a large number of warehouse and industrial applications, particularly in zone 2, revealed no such conditions being applied. However many of these applicants had filled in the section on use of hazardous materials with "not known at present"; this precluded any consideration of hazard during the application decision process.

Although such conditions have been used by other departments it was considered by the case study authority that there would be legal problems in their application and the problem of enforcement could severely limit their usefulness.

(ii) Revocation and discontinuance - circular 1/72 and the reports of the Advisory Committee on Major Hazards state that it may be necessary for planning authorities to consider using their powers of revocation and discontinuance to change the existing pattern of land use in relation to hazard. The case study authority has never used or realistically considered using these powers. For example, the existing relation of the major hazard to surrounding development and population in zone 2 is far from ideal being determined 20 or 30 years before hazardous industry was generally considered as such. However, the costs (economic, social and political) of discontinuing planning permissions of major hazard or surrounding development are clearly considered to outweigh the benefits of reduced risk (see also below). This attitude towards relocation is in accordance with environmental policies in the structure plan for the area approved in 1980. Policy No.7 states that "the relocation of non-conforming uses will be supported only where there are overriding health, safety or environmental problems with due regard to the economic impact on the use concerned of any such relocation".

Although the Draft written statement had included a policy stating relocation as one of the methods by which the juxtaposition of hazardous industry and incompatible activities would be avoided,

any mention of relocation had been dropped by the time the structure plan had been approved, perhaps reflecting the increasingly unrealistic potential for any such moves as economies tightened.

(iii) Refusal of planning permission - there have been no refusals of planning permission on hazard grounds within the authority. In terms of surrounding development this means that there has been no limiting of population increase of direct impact on physical development in the vicinity of major hazards. In zones 1 and 2 the population increase involved amounted to totals of approximately 2000 and 800 people respectively (estimated population involved in planning applications granted since hazard recognised or introduced).

Two reasons for the lack of intervention on hazard grounds in surrounding development must be the low level of consultation already examined and the fact that, even when consulted, HSE have never recommended refusal. If a response of "no adverse comment" is received the application is determined with no real inclusion of hazard or risk in the balancing of planning considerations that follows. In this way the HSE's advice has the role of approval, in effect dismissing the relevance of safety to the application.

The more complex situations are those where the HSE recommend neither acceptance nor refusal of planning permission but present each side of the case and leave the weighing up to the local authority. This can be seen most clearly in the introduction of the major hazard installation in zone 1 and the consequent potential impact on the surrounding area of the

planning decision.

In this case the HSE advice include the remarks that "a guarantee of absolute safety continuously and in all respects is not possible ..." and that despite the precautions taken " ... some small element of risk must remain and no doubt you will wish to bear this in mind in considering this application". This advice proved difficult for the planning authority to assimilate.

The authority has never had to face the sort of confrontation and conflict which HSE advice recommending refusal can create (as in the well documented cases at Thornton Cleveleys : Planning June 1982) and Carless Chemicals in Middlesbrough : ENDS July 1981)*.

5.4 Constraints on action

There would appear to be strong constraints on what planning can do in order to take account of hazard. From discussion with planning officers, an examination of those planning decisions which involved substantial hazard issues, and a consideration of what action could in retrospect have been taken in zones 1 and 2 the following important constraints emerged:

(i) The existing situation - hazard has only been an "official" planning consideration since 1972. In all planning the "existing" state of affairs has to be faced and to a certain extent accepted but in relation to hazard this constraint is strengthened by the relatively late arrival of this "material consideration". The historical land use patterns in zones 1 and 2 were far from ideal in relation to hazard with locational forces creating the juxtaposition of industry and housing. Ironically, in zone 1, planning policy has created the very pattern of non-confirming uses it now seeks to control and improve, with a policy in the 1950's and 60's seeking to reduce the length of journeys to work through locating light industry close to the housing from which it draws its workforce.

* However there must be the question of whether the low level of consultation with the HSE over surrounding development - including those involving a relatively large population increase - has avoided "unfavourable" HSE advice and potential conflict with its attendant publicity problems.

The problem of existing land use patterns is of course, realised by anyone seriously involved with land use and hazard management issues. The HSE have recognised that although the existing situation may be "somewhat unsatisfactory" (Barrell 1981), action should still be taken to stop deterioration. They have accordingly adopted a policy on "intervening development" stating that "the existence of intervening development should not in any way affect the advice that it (the HSE) gives about the possible effects of that activity on proposed developments which may appear to be less at risk than the existing ones" (HSE 1979).

Although a reasonable policy from the point of view of the HSE (Barrell and Scott 1982), it may be more difficult for planners and members (and particularly for the latter) to ignore the "logical" inconsistencies and "double standards" which are involved when faced with a far from ideal existing state of affairs.

On several occasions the view was expressed that it would be very difficult to refuse development proposals on hazard grounds which were within an area already built up and with substantial housing between the development site and the major hazard - a situation which could have occurred on several occasions in both zones 1 and 2. In a zone already substantially developed the marginal improvements to safety through limitations on population increase that could be made may be seen to be outweighed by the adverse effects of refusing development on hazard grounds which could include publicity and local protest by those people who unavoidably remain at risk.

(ii) Past planning policy and precedents - beyond the existing land use pattern when the hazard potential of the installation is first realised, there is also the question of existing development plans, planning proposals and planning permissions. The impact of these factors can best be seen in zone 1. When the hazard was introduced in late 1977 the first 2 phases of surrounding large scale housing development was complete and a third had recently had its Master Plan internally approved. Thus future residential development, completing a long run project, had a very strong precedent and this included not only the housing but also the community facilities (nursery, shops, pub, church and community centre) to serve the new estates. In addition two future housing areas had already received

outline permission earlier in 1977, as had a distributor road to serve the whole estate. To have halted this whole co-ordinated development process would have been an enormous step in terms of past policy, economic implications and publicity.

(iii) Compensation - behind the two factors already discussed lies the economic constraint of compensation (again a limitation recognised by many others). Revocation of existing planning permission requires compensation, as does discontinuance undertaken to change the existing land use pattern, the potential costs involved being considerable. The case study authority has never had to pay compensation on hazard grounds itself but the economic implications of taking any significant action to change or influence land use around the hazards are seen as a strong constraint - especially in the current economic climate. It is envisaged that if in the future stronger action to change the major hazard or surrounding development is required then the most effective step would be to "buy out" the relatively small major hazard installations, notably at zones 1 and 2, and locate them in less densely populated areas outside the main urban core. The local authority is currently liable for any compensation claims resulting from action taken on hazard grounds and at present this looks unlikely to change.

(iv) Other planning considerations - issues other than safety (employment, housing, local community facilities and so on) are almost inevitably involved in planning decisions. In a less concrete sense such factors as disturbance to the community, publicity, avoidance of conflict and relations with industry could also arise. It is for the officers and members to balance such considerations against safety implications in reaching a decision, and in practice it would seem that other considerations are often stronger than safety. This point has already been borne out by the discussion above

(a) that in many instances the balancing of issues involved has not been explicitly addressed, the "no adverse comment" reply from the HSE precluding any later consideration of safety issues; (b) that in general the planning committee would "take a lot of convincing" before planning permissions were refused on hazard grounds especially if the possibility of lost employment were involved; and (c) that a basic policy of the structure plan is that

"... (the environment) must for the time being be a secondary factor in the allocation of scarce discretionary resources". In addition this contains a succession of policies against the revoking or discontinuance of planning permission on the grounds of non-conformity and a general "sympathetic approach" towards the planning control of industrial development. As a more specific illustration an application in zone 1 including the development of an extensive site for a new factory using a large number of different chemicals (albeit in less than major hazard quantities) created substantial local protest on several grounds including that of safety, proximity to housing (and the fact that the site had been designated as open space). However the employment potential was felt to outweigh these grounds of opposition and the applicant was granted permission.

5.5 Evaluation

From the above material it can be seen that in zones 1 and 2 the impact of the major hazard on surrounding development has been negligible, whilst in zone 3 the existing pattern of land use has allowed forward planning to protect the future juxtaposition of hazard and residential development. This generally low level of impact contrasts with fears expressed, when the consultation zone system was introduced, over blight and sterilisation of land within the imposed zones. The non-statutory basis of consultation, the rarity of HSE objection to development proposals, the constraints identified that may operate against rehousing surrounding development, and the low priority of "environmental matters" in the current economic climate, all serve to lessen the impact of hazard on land use planning. The action which any individual planning authority may take will therefore clearly be dependent on its own policy decisions and assessment of the importance of hazard relative to other factors but is open for debate whether constraints should be loosened and more importance given to safety at a national level, to permit and encourage stronger action to be taken by planning authorities. The Advisory Committee on Major Hazards has stated that "the overall objective should always

be to reduce the number of people at risk and in the case of people who unavoidably remain at risk, to reduce the likelihood and extent of harm if loss of containment or control occurs" (Health and Safety Commission 1979). The extent to which such an objective may have to be constrained in reality, as experienced by this authority, may not have been fully realised by the Committee, their view of planning control of hazards appearing somewhat simplistic relative to the messiness of practical reality.

6. Conclusions

Although much of the above has been concerned with procedure, problems and constraints, the underlying factor has been the importance of safety in its own right and relative to other factors delayed procedure, compensation, housing provision, and so on. In most cases the balances and assessments that are made are far from explicit and therefore difficult to trace. However, it would appear nonetheless that the last decade has seen a gradual but slow search for maturity in accounting for hazard issues in planning decisions, from the first (and even then belated) recognition of risk as an issue to be reckoned with in planning terms (planners given a role, but little guidance on how to use it) to the most recent set of guidelines in 1982, with the period in between being one of "feeling the way". These factors have been alluded to in general terms elsewhere in the literature, and above have been illustrated much more specifically in the light of experience of a particular planning authority. Procedures would appear to be improving but the tremendous legacy of the past and various other current forces continually shaping the patterns of land use still inevitably often frustrate attempts at logical and consistent practice on safety. Moreover it is abundantly clear that in the hazard field, as in other areas of administrative control of life, what appears in codes of practice, guidance notes and on the statute books and what actually happens in practice are simply not the same. Within the present case study authority, incompatible land use would seem to be as much the rule as the exception. Moreover significant increases in populations have evidently been allowed to occur within the HSE-specified zones around hazardous facilities. One interpretation of this state of affairs is that practicable opportunities to reduce populations "at risk" have not been exploited.

However another line of interpretation would be to suggest that the consultation zones were always much too big in terms of damage potential of even the most serious credible accidents. In other words, large zones were crudely specified mainly as an administrative expedient, more accurate specification being impossible because the risk assessments on which such specification would have to rest simply do not exist for the majority of hazardous sites in this country. If this line of interpretation is more accurate than the first then it is a telling reflection on the size of the management (if not the substantive hazard) problem posed by "hazardous" facilities, the catching up of which was even then stimulated only by Flixborough. Although the inefficient, ineffective, and cumbersome administrative effort that goes with this "administrative" interpretation may be a lesser evil than the prospect of substantive hazard potential, the administrative interpretation above may brush too lightly over deeper issues, for although not in the same league as Canvey or other large petrochemical complexes, the potential hazard consequences from the type of hazardous installations considered in this paper compare unfavourably with those associated with the considerably lesser quantities of materials involved in recent incidents such as those at Salford, Stalybridge, Wallingford, Harrow, Killingholm, Wolverhampton (as noted earlier in this paper).

Problems do tend to move faster than administrative pursuits, moreover the control of quantities below what are currently notifiable levels, and the existence of a possibly unknown number of "cowboy" operators still have the frustrating capacity to fly through and round (respectively) any administrative net. Thus the difficulties of dealing with safety in a land use context will continue to provide source for critical debate, occasional emotive outcry and will warrant continual examination and review.

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