Disaster Prevention in Urban Environments

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Abstract: Disasters always have very undesirable consequences, especially when they occur in urban environments. This paper discusses some problems with regard to disaster prevention policy in the Netherlands. This policy was put to the test in May 2000, when a devastating fireworks accident in the Dutch town Enschede took place, destroying a significant part of the built environment of this town, with an investigation by an independent evaluation committee painfully highlighting the failure of the local and national authorities' preventative policies. The Enschede disaster stimulated many new activities at various levels of government with regard to the need to improve disaster prevention and control. However, recent studies reveal that the lessons of Enschede have yet to be put into practice. This raises questions about the usefulness of a 'command-and-control' prevention approach. Alternative approaches are discussed and a comparison is made with the implementation of a Strategic Environmental Assessment (SEA).

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1. Introduction

The issue of disaster prevention and control is currently attracting increasing attention, reflected in the rising number of publications now available on this subject (e.g. Miller and Fricker, 1994; Milne, 2000). Most studies analyse the preparation for, response to, and recovery from accidents with community-wide implications, such as so-called *natural disasters*, like flooding and earthquakes, and *man-made disasters*, for instance caused by fire or construction errors. Until recently, these types of disasters were often described as civil disturbances caused by unintentional human failure (e.g. see Quarantelli, 2000). Especially after September 11, 2001 we have, more than ever, become aware of the fact that 'man-made' disasters can also be the result of purposeful terrorist actions. Terrorist disasters differ from other disasters because in conflict situations one or more of the involved parties are consciously aiming at a continuation of the crisis. Despite the different types of disasters, they have one thing in common: all relevant disasters imply the loss of human life and/or important ecological values, economic damage, and social distortion while often also destroying important parts of the built environment.

All too often, disasters occur without warning. Because our built environment of interrelated activities is much more complex today than ever before, each failure that is not adequately recognised and dealt with in advance may in principle become a disaster. Actual disasters have stimulated the systematic investigation of disaster prevention and control, particularly in relation to building directives and urban planning (e.g. Kartez and Kelley, 1987; Godschalk et al., 1999, Greiving, 2002). Many local governments today have some kind of emergency plan that serves primarily to give a proper response to crisis situations (Erickson, 1999). Disaster prevention is mostly organized along the lines of governmental directives and permits. For instance, after the explosion in 1976 in a chemical factory in the Italian town of Seveso the European Union introduced the Seveso Directive (1984) and the Seveso II Directive (1996) on the control of major industrial hazards (e.g. Porter and Wettig, 1999). This includes land use regulations (see also Christou et al., 1999), the making of safety reports and the inspection of installations. The notion of 'hazard' is used here for phenomenon or activities that may cause a disaster. However, how adequate are these regulative systems of hazard control in practice?

In the next section some conceptual notions and components of disaster prevention will be discussed. In addition, in section 3 the development of disaster prevention policy in the Netherlands is outlined. It was put to the test in May 2000, when a devastating fireworks accident occurred in Enschede, when a series of explosions generated by the fireworks destroyed a significant part of this town. This is briefly outlined in section 4. As usual, in the aftermath of the disaster an official evaluation committee was appointed to investigate the cause and the various responsibilities of the parties involved. The principal conclusions of this committee are discussed in section 5, with the committee's conclusions highlighting the failure of the local and national authorities' preventative policies. The Enschede disaster did receive significant national and international public attention, stimulating many new activities at various levels of government as regards the improvement of disaster prevention and control. However, recent studies have revealed that, in The Netherlands at least, lessons of Enschede have not yet been adequately put into practice. This issue is further elaborated in section 6, raising questions about the validity of a 'command-

and-control', rule-based prevention approach, something that is discussed in the closing section 7.

2. Disasters: Some conceptual notions

A disaster is defined here as a community-wide crisis. The linkage with 'community' suggests that the severity of a disaster is not just measured in terms of the number of deaths occurring. For a local community like Enschede the explosion that killed 22 people was probably equal to, or more shocking than, the Turkish earthquake in 1999 that killed 40,000 people or the almost 3,200 people that were killed by the Twin Towers destruction in New York. As such, each disaster is unique in its emotional impact. Different labels denote the protection of societies against, and their response to, disasters. While 'civil protection' and 'civil defence' are the terms mostly used in Europe, in many other countries around the world the organized efforts to cope with collective threats are called 'disaster planning' or – if focussing on crisis control – 'disaster management' (e.g. see Kartez and Kelley, 1987; Kaplan, 1996; Quarantelli, 2000). Obviously disasters are not 'planned', they just occur.[i] But the *circumstances* under which disasters may occur can be subject to planning as regards preventive measures, and crisis control.

Generally speaking there are three ways of coping with a disaster (cf. Quarantelli, 2000). In early historical times, and in some countries even today, disasters were primarily seen as the outcome of supernatural forces. They were seen as '*Acts of God'*, with the implication that nothing could be done about their occurrence. With the development of secularism and simultaneously the development of science, disasters were increasingly seen as '*Acts of Nature'*. A greater understanding of what was supposedly involved encouraged a more active approach towards disasters. Although the natural hazard itself could not be directly controlled, measures nevertheless could be taken to reduce the negative impacts of the disaster, such as engineering solutions to building dikes against flooding and earthquake-proof buildings. In the late 20th century the view shifted again, with disasters now being seen as resulting from '*Acts of Society'*. The current view in most western countries is that disasters result directly and indirectly from the actions, intended or otherwise, of human beings. If people are living in unprotected flood plains, in non-earthquake proof buildings, or next to fireworks factories, they are creating the necessary conditions for a potential disaster. Following this reasoning *a disaster is a social event* both created by, and manifested by, dysfunctional human and group behaviours. It is usually seen as a governmental duty to create the conditions for the minimisation, as far as possible, of the occurrence and impacts of disasters. This is called disaster prevention.

Disaster prevention can be subdivided into mitigation and preparedness, whereas disaster control focuses on response and recovery.[ii] *Mitigation* includes the policies and actions undertaken at a time before an actual disaster situation occurs, thus including policies aimed at preventing or reducing a disaster's impact if and when it takes place. Examples here are land use regulations, building codes, engineering solutions, education and training, etc. *Preparedness* has to do with the steps and measures planned for, and undertaken when, the probability of a disaster in a particular locality is immediate. Examples are the reservation of space for rescue work, the communication of warnings and the preparation of strategies for evacuating people from a disaster area. *Response* refers to actions taken during and immediately

after the period when the disaster occurs. Examples of this are, measures to deal with acute problems that arise during the crisis such as communications issues and the necessary collaboration between the emergency services such as the fire brigade and hospitals. Finally, *recovery* deals with activities carried out after the crisis caused by the disaster is over. Examples of such activities include, rebuilding dwellings, repairing embankments, dykes and other infrastructures. In the main, urban planning evidently has a role to play in mitigation and – after the disaster – in the recovery of the area concerned. However, in terms of preparedness urban planning can also be of importance, particularly with regard to the need to take into account vulnerable areas and activities.

Disaster prevention suggests planning and managing a 'command-and-control' system. This is in contrast to disaster control, which certainly should not focus on strict rules and regulations according to Kartez (1984) and Kartez & Kelley (1987). They conclude from field research that there is a basic need to plan for *flexibility and improvisation* in times of crisis. According to Dynes (1994) disaster control has to be based on coordination and cooperation instead rather than on a 'command-and-control' system. Many authors assert that disaster prevention and control necessitate a holistic or *overall perspective*. For example, Quarantelli (1992) holds out a plea for a *generic* rather than an *agent specific* approach to disasters. Evidently, there are different perspectives on how to interpret this.

Disaster prevention implies dealing with *risk*. Roughly three different epistemological perspectives to the study of risk can be distinguished (e.g. see also Krimsky and Golding, 1992; Lupton, 1999):

- An '*engineering'* perspective: Risk is an objective hazard, threat or danger that exists and can be measured independently of social and cultural processes.
- A *'sociological'* perspective: Risk is an objective hazard, threat or danger that is inevitably mediated through social and cultural processes and can never be known in isolation from these processes.
- A '*postmodern'* perspective: Nothing is a risk in itself – what we understand to be a 'risk' is a product of historically, socially and politically contingent ways of seeing.

The 'engineering' perspective is perhaps most well known in planning practice. Risk is seen as the probability of an occurrence of a hazard 'multiplied by' the size of the damage it may cause. Obviously, this interpretation includes many degrees of freedom (for a discussion see Freudenberg, 1988). The 'sociological' perspective provides a critique on the rationality of the engineering approach by showing that risk is an inseparable part of society, to be denoted by Beck (1992) as 'risk society'. According to Beck (1992, 21) '*Risk may be defined as a systematic way of dealing with hazards and insecurities induced and introduced by modernization itself'*. Hence, risk is no longer seen as a characteristic of, but is rather an approach to the study of social behaviour. The 'postmodern' perspective amplifies this view: nothing is a risk unless it is recognised as such and agreed upon in discourse. Of course, this may result in many different outcomes for what seem to be similar 'physical' situations (see also Renn, 1992).

One important way to minimize – perceived and/or measured – risk from hazards is to plan and develop communities with those dangers in mind. This is a general principle in safety policy and it has become an important element in the Seveso II directive of the European Union (notably in article 12 of this directive; see also Christou et al., 1999).

3. Disaster prevention in The Netherlands

For centuries the Netherlands struggled against flooding. Water protection is therefore a well-developed field of policy in which a significant amount of public money has been invested. However, in other fields there is no such tradition. A Nuisance Act has existed since the 19th Century, allowing municipalities to act against risky industrial activities, but this was not well defined. In the 1960s a Nuclear Energy Act came in force with a view to controlling radiation. However 'modern' disaster prevention policy started more or less with the LPG Integral Memorandum (1984). This national report stated essentially three elements as the basis for Dutch external safety policy:

1. The use of quantitative risk assessment for determining risks.
2. The adoption of two risk interpretations: *individual risk* and *societal risk.*
3. Acceptability criteria for both the individual risk and the societal risk.

The individual risk interpretation reflects the protection of each individual against hazards; it does not distinguish between the sizes of accidents that may occur.

Societal risk also reflects the amount of potential deaths due to a disaster.

The use of acceptability criteria in the Netherlands was changed somewhat in 1993, due to discussions between the Minister for the Environment and the Parliament. The most important element of this change being that the criterion for the tolerability of societal risk was given a less strict character, in that the authorities could now tolerate exceeding the societal risk criterion if sufficient arguments (e.g. economic) can be given for the specific situation involved. 'In return' the political gesture was made to abandon the concept of negligible risk (see Figure 1). A distinction is made here between new and existing situations, since existing situations cannot always be brought to the safety level for a new situation. Generally speaking, this implies a more 'understanding' attitude on the part of the government towards establishments that had already existed for many years on a particular site.

This development coincides with attempts in Dutch environmental planning to develop more integrated approaches that enable a balanced judgement of different kind of pollutants, including risk to occur. A well-documented example here being the development of integrated environmental zoning (e.g. see De Roo, 1997, 2003; Miller and De Roo, 1996; Voogd, 1994). Clearly, 'integration' has been a keyword in Dutch policymaking in the 1990s. In 1993, the Environmental Management Act came into force. Previous to this piece of legislation, each type of environmental protection, be it relating to water, air, soil, noise, etc., needed a separate permit. The 1993 Act however stipulated that a single integrated Environmental Permit, also covering safety measures for preventing major accidents, was to replace the previous arrangements. For activities included in the European Seveso Directive, an external safety report is to be submitted together with the environmental permit application. This is imposed by the Decree on Major Hazards (*Besluit Risico's Zware ongevallen*) of 1992. For

other hazardous activities, the same criteria and procedures apply, but a safety report is not required. For facts and figures about the implementation of the Seveso Directive in the Netherlands see Bottelberghs (2000). According to Bottelberghs, a civil servant in the Dutch Ministry of the Environment:

> 'Dutch external safety policy is based on the risk management approach, involving quantitative assessment of risks and evaluation against quantitative tolerability criteria. The experience in harmonizing the policies for the various activities involving dangerous substances is very positive from a viewpoint of efficiency and transparency.' (Bottelberghs, 2000, p.83).

Obviously, he wrote his article before May 13th 2000.

4. The Enschede SE-Fireworks disaster

4.1 The disaster

On Saturday afternoon, May 13th 2000 a severe accident at a fireworks factory took place in the Dutch town of Enschede (150,000 inhabitants) destroying an entire neighbourhood. The disaster generally referred to as the *Enschede SE-Fireworks-Disaster*, after the fireworks firm 'SE Fireworks'. It changed the lives of more than two thousand people living in the disaster area, roughly encompassing two square kilometres of the city (see Figure 2).

The incident began with a small fire at the site of the SE-Fireworks Company that resulted in a series of explosions ending in a devastating mass explosion. The first fireworks explosions attracted a large audience onto the streets of the city. This was later to cause some additional deaths among the most curious people standing close to the site of the fire, but at the same time it saved the lives of people who otherwise would have been crushed by the demolished buildings of the final explosion. In total 22 people died, more than 960 were injured and more than 600 houses, 40 shops and 60 small-scale-factories were demolished: burned out or simply blown away by the great explosion. The cost of the damage was estimated to be more than half-a-billion euros.

The people living within the disaster area were not allowed to return to their houses for more than two weeks. Evidently, the disaster had an enormous influence on a great number of people, both the people who lived in the area and those who worked there, as well as on those who simply knew people 'over there' or just liked the area because of its 'informal' characteristics.

Disaster control was very satisfactory. Fire brigades and ambulances from all over the region assisted, even coming from nearby Germany, while aid was well coordinated from the Enschede town hall. However, the Enschede disaster showed that in some fields 'disaster preparedness' remained inadequate. The most important are of concern here being that the fire brigade of Enschede had no proper information about the site or the products made by the company, SE Fireworks, which resulted in tactical errors taking place that were to lead to the unnecessary deaths of fire workers and other people.

4.2 Causes

As was later to come to light, an interesting fact here was that the environmental permit of SE Fireworks was reconsidered and renewed by the municipality shortly before the disaster on 19th July 1999. Evidently, the company itself was certainly not illegal. When it was set up on this site in 1977 it had a permit for just 18,450 kilos of (light) fireworks (De Lugt, 2000). Due to the fact that so-called 'event fireworks' became a booming business in the 1980s however the company had expanded significantly since then. Additional permits to accompany this growth were given in 1979 and 1997. The permit for 1999 allowed the company to store in total 158,250-kilos of fireworks. The municipality made this public in the usual manner, *viz.* by an announcement in a free local paper including the rules for making formal objections. Only one person responded and his appeal was – not unusually in administrative circles - welcomed but rejected.

Soon after the disaster the national government, together with the Province of Overijssel and the municipality of Enschede, undertook to set up an independent investigation. They appointed the so-called Oosting Committee, named after its chairman Marten Oosting, the former national ombudsman. This committee had to point out who is, or was, responsible: the company (SE-Firework), the local-government of Enschede or the national government. The final report of this committee published in February 2001 showed that all three were responsible and that in particular, disaster mitigation failed.

The committee did notice that more fireworks were stored on the site of SE Fireworks than it had obtained permits for. Moreover, the majority of these fireworks were of a much heavier class than was allowed by the environmental permits in force. This created a very large safety risk. In the area where the fire started no fireworks were permitted to be present when no work was being performed, i.e. when the company was closed, as was the case on Saturday May 13, 2000. The committee also determined that two sea containers with fireworks had been added without a permit and that these containers were also wrongly positioned, nearly closed off and difficult to access. In addition, the committee detected that the terrain had not been kept sufficiently clean to prevent the fire from spreading. The Oosting Committee therefore concluded that if the permit had been properly observed, the fire could not have occurred, or at least if it had, such an escalation as subsequently occurred, could not have taken place. The weight of the fireworks in storage would presumably not have mattered in such a case. SE Fireworks moreover did not meet its legal obligations in a number of other respects. For example, the company operated without delivery and occupation permits in the second half of the 1990s. The mandatory risk inventory and risk evaluation did not meet the necessary requirements either. See figure 3.

The municipality of Enschede also however made mistakes and, according to the Oosting committee, failed in its duties in a number of regards. The same is also true for the environmental permit advisory office of the Royal Armed Forces Materials Directorate (DMKL) of the Ministry of Defence, the legal advisor to the municipality on the technical aspects of fireworks. The other national legal advisor, the Environmental Hygiene Inspection of the Ministry of the Environment, was also criticized. According to the committee they all failed to adequately fulfil their role as supervisors. Not only did they inspect the company insufficiently, but the

municipality also refrained from taking any effective action against violations of the environmental permit in force that they detected.

The committee also criticized the municipal administration for its inadequate urban planning and for its absent monitoring of new developments. The company enlarged without building permits. The 1986 local land use plan, and afterwards also the 1996 Enschede North land use plan did not allow the company to expand. A shortcoming that proved crucial in this context according to the committee was the lack of coordination between the municipal environmental department and the planning and building department. It also appears that the transportation inspection of the Ministry of Transport and Public Works allowed the company to function for some years without a valid delivery permit and occupation permit. This phenomenon is known in the literature as the 'problem of interplay'. Interplay between or among institutions may take the form of functional interdependencies or arise as a consequence of the politics of institutional design and management. The problem of interplay is a consequence of the existence of a multitude of actors and may result in a lack of coordination between sectors and a lack of coordination between spatial scale levels (see Young, 2002).

The government's shortcomings stretch further than granting permits to and supervising SE Fireworks. The Oosting Committee's investigation shows that the unreliability of the fireworks classifications should be raised as an essential explanation for the seriousness of the fireworks disaster. According to the committee, all ministries involved must be blamed for the fact that the government had not learned any lessons from an earlier explosion in 1991 at a fireworks factory in the town Culemborg. Investigation into the cause of that explosion pointed out, among other things, the problems with the classification of fireworks, and resulted in a reconsideration of the usual safety distances. However, this did not lead to further action.

Almost one year after the Enschede disaster a person was arrested for starting the fire at the SE Fireworks site. He was a known pyromaniac. Although he pleaded not guilty, in August 2002 the court of justice pronounced him guilty of starting the fire that ultimately caused the disaster. However, this judgment was reversed on appeal due to the lack of convincing evidence.

5. Disaster prevention after Enschede

The Enschede disaster stimulated a public debate on disaster prevention and the need for the effective enforcement of fire and safety regulations. Many municipalities and provinces began to centrally register sites holding hazardous substances and announced initiatives to intensify the inspection of hazardous sites. The need for municipal disaster control plans was expressed and discussions started with regard to the position of fireworks depots and other potentially dangerous sites near living areas. There has also been a review of the roles and responsibilities of the various competent authorities and advisory bodies involved in issuing environmental permits. The responsibility of private persons on the one hand, and competent authorities on the other, for the consequences of situations involving risks is one of the key issues.

The public debate has however not yet run its course. Local governments announced after the Enschede disaster that companies, particularly those operating from

industrial sites and handling hazardous substances, can expect more inspections and stricter enforcement by the competent authorities. The national government moreover also decided upon a new Decree covering new rules on the import, storage, production and trading of fireworks. This Decree also stipulates that the distance between residential and recreational areas on the one hand, and fireworks depots on the other, should be at least 800 metres. Such a safety zone should provide considerable protection. In July 2002 the preliminary decision was made to concentrate fireworks storage at only two remote sites – one in the North and one in the South of the country.

Unfortunately, the political promises of local authorities are not always followed in practice. All Dutch authorities already displayed this through their actions after the 1991 explosion in a fireworks factory in Culemborg. Expert reports on this accident were completely neglected. The Enschede disaster has however certainly had more of an impact. However, two recent studies reveal that most municipalities in the Netherlands still do not have a proper integrated maintenance and permit enforcing organisation (NCP, 2002; AEF, 2002).

	Fire			*Building*			*Environment*		
Size of municipalities	Granting permits	Supervising permits	Total	Granting Permits	Supervising permits	Total	Granting permits	Supervising Permits	Total
> 70.000	0.41	0.22	0.63	1.03	1.48	2.51	0,63	0.87	1.49
20.000–70.000	0.39	0.16	0.55	1.12	0.73	1.85	0.63	0.68	1.31

Table 1: Average number of persons per 10,000 inhabitants for granting and enforcement of fire, building and environmental permits in small and larger Dutch municipalities (source: AEF, 2002).

Table 1, based on a representative sample of Dutch municipalities, illustrates that the amount of personnel for the supervision or enforcement of permits is still modest, especially in the field of fire and environmental permits**.** This is remarkable because the number of granted permits per year would only be a fraction of the total amount of permits that are valid in a municipality.

	Fire		*Building*		*Environment*	
Size of municipalities	Granting permits	Supervising permits	Granting permits	Supervising permits	Granting permits	Supervising permits
> 70.000	9.34	32.74	101.12	153.89	12.05	39.91
20.000 – 70.000	16.09	70.71	114.80	92.56	12.10	61.29

Table 2: Average annual production (i.e. number of permits and control visits) per 10,000 inhabitants for granting and enforcement of fire, building and environmental permits in small and larger Dutch municipalities (source: AEF, 2002).

This is again illustrated in Table 2, which shows the average annual 'production' of permits and control visits. Of particular note here is the fact that small municipalities grant significantly more permits – especially fire permits – than do larger municipalities. In addition, small municipalities are more active in supervising fire and environmental permits. This observation is however difficult to explain, as larger municipalities have more personnel, as Table 1 shows.

6. Discussion

Disaster prevention requires new thinking to expand our understanding of what may create a disaster and thus to help bolster possible defence measures. Preventing disasters in the first place basically means better understanding how such disasters occur. This paper illustrates that this is not just an academic exercise, but also an administrative learning process. For urban planners it implies that more attention needs to be given to risk-oriented planning, based on knowledge of the vulnerabilities faced in any particular situation. This suggests the need for an accurate management system to guarantee that all of the stakeholders involved obey the rules, but how realistic is this? As has been shown in this paper, these conditions are seldom met in practice, at least in the Netherlands. This seems rather paradoxical, as this country is traditionally known for its strong rule-observance tradition (e.g. see Faludi and Van der Valk, 1994).

The Enschede disaster clearly highlights the failure of the 'command-and-control' disaster prevention system in the Netherlands and in particular its inadequate rule-enforcing component. Moreover it also raises the question of whether government has not retreated too far from the private domain. Two institutional changes in the 1980s provide an explanation for this situation in respect of the public sector, *viz.* the process of decentralisation and the rise of 'managerialism'.

At least two types of *decentralisation* can be distinguished (cf. Kettl 2000). The first concerns the transfer of tasks and policy-making discretions from the level of national government to lower governments such as the provinces and municipalities. The second type concerns the organisation itself, i.e. the transfer of discretions and tasks to the lowest possible levels of the organisation in order to increase efficiency and effectiveness. The first process started in the Netherlands in the 1980s. It was presented as an avenue towards democratisation and efficiency and included a large package of operations, including privatisation, deregulation and de-concentration designed to reduce the 'size' of national government in terms of tasks and personnel. All Dutch cabinets have embraced this type of decentralisation in the last two decades, as it was in line with fashionable neo-liberal perspectives on slimming down the volume of the public sector. In particular it assigned municipalities more tasks and discretions, however this was done without sufficient accompanying resources. The second type of decentralisation, i.e. the transfer of discretions and tasks to the lowest possible levels of the organisation in order to improve the management and empower the managers, coincides with the introduction and adoption of business management ideas and concepts by public administrators. This concept entered into the Dutch public service vocabulary in the second half of the 1980s. Obviously, this is also an international phenomenon (e.g. see Osborne and Gaebler, 1992; Ashworth and Voogd, 1995). The provincial and municipal authorities in particular welcomed this new 'managerialism', mainly as a fierce reaction against the traditional stultifying 'bureaucratism' of daily administrative practice.

Subsequent Dutch national governments have however perhaps assumed too naively that the decentralisation of tasks and responsibilities, by definition, would enhance the quality and reliability of local government. However, decentralisation and the resultant withdrawal of public controls in the first place, and the emergence of managerialism in the conduct of public affairs in the second place can be denoted as the fundamental causes of the Enschede and Volendam disasters. The disasters clearly

demonstrate that both processes have generated and stimulated an administrative culture of *'laissez faire'* and of transferring responsibilities to 'others' when things go wrong, a process often labelled as 'blame avoidance' (e.g. Bovens, 1998).

Disasters always happen 'elsewhere'. The responsible authorities, including private sector companies, seem generally inclined to think that they have better control over their environment than 'elsewhere'. This is probably an important psychological reason for explaining the 'careless' attitude of many authorities. An interesting example of this attitude can be witnessed by the British Health & Safety Executive (HSE) claiming in the summer of 2000 that a disaster as had occurred in Enschede "would not happen in the UK as separation distances between such factories and homes are set at 185 metres" (Civil Protection, 2000, 1). Apart from questioning this separation distance, given the size of the Enschede disaster area, the problem of the deliberate mislabelling of fireworks from a higher into a lower category was apparently not recognised, nor was it considered to be important in the UK by the spokesperson for the HSE. Evidently, the claim by HSE can only be explained as the rhetoric of a governmental agency that wants to set a country's mind at rest by claiming that disasters can be avoided by a simple distance rule.

How far then should a government go in preventing disasters? In Table 3, three main approaches are presented that can be distinguished in current discussions on disaster prevention. These approaches differ in their emphasis on the two components of prevention, *viz.* mitigation and preparedness.

	Mitigation	**Preparedness**
Collective approach	Command-and-control	Command-and-control
Acquiescent approach	Information-based	Command-and-control
Liberal approach	Information-based	Information-based

Table 3: Three approaches to disaster prevention.

In essence two extreme approaches to disaster mitigation may be distinguished: a collective approach focusing on rule enforcement by strict governmental control; and a 'liberal' approach focusing on differences of judgement and individual responsibility. In addition, a 'middle way' is now also attracting growing popularity. Such an approach is termed here 'the acquiescent approach'. This approach acknowledges that disasters are inevitable in our 'risk society' and thus that most attention should be paid to our preparedness for such disasters.

Given the current imperfections and attitudes discussed previously, a *collective approach* can only be successful if a change of culture takes place, maintaining security at a permanently high level on the political and administrative agenda (e.g. see also Greiving, 2002). This would not be easy; indeed it may be impossible, given human nature and the continuing dominance of economic factors. Obviously, there will always remain a debate on the seriousness of the risk that is combated by rules and the costs involved. The outcome of such a debate remains however uncertain, and concerns a risk in itself since it may amplify or – given the economic interests involved – cushion the risk of the activity under consideration. As objective as it wishes to appear, expert constructions of risks are often highly arbitrary and hence questionable. Moreover, risks are subject to different perceptions which are simply

different ways of dealing with life and culture.

The other extreme is the adoption of a *liberal approach* that acknowledges the existence of different perceptions of risk. Provided that there is free and honest information available on risks, a policy could be followed to make people choose their own acceptable level of risk. For example, rather than forbidding people to live in the vicinity of a river flood basin, one could provide full information on the risk of flooding, leaving people with a choice to live there or elsewhere on higher ground. A liberal approach can only be morally justified if full public information is available on such risks. But risk assessments in urban plans may inspire personalised fear and incrimination that may go far beyond what can be judged to be reasonable from a rational comparative point of view. In other words, risk may become a threat in itself, affecting the well-being and land prices of the area surrounding the source of risk. Consequently, it may very well be that with a liberal approach, socially deprived groups in particular will suffer as they generally do not enjoy the easy alternative of being able to go elsewhere or – no less important – because on average they have less means and skills to collect, digest and appreciate available information on risks. In this light it is not exceptional that almost nobody reacted when in Enschede draft permits for the fireworks company were published for public reaction.

A 'middle way' such as is provided by the *acquiescent approach*, being an amalgamation of both extremes, thus seems most appropriate. The social costs of a collective approach are very high if for all possible events a 'reduced-risk' rule-enforcement system – if practically possible – should be implemented. The social costs of a liberal approach may seem much smaller, but this is misleading. Obviously, if a disaster occurs there will be intense political pressure to help those in distress and no government in a democratic society could afford to be so heartless as to say, 'it's your own fault!' In other words, a liberal approach would potentially cost society a significant amount of money. Indeed, it is likely that such an approach could cost more money than a collective approach, as more risky situations would exist should a liberal approach be followed, with the consequence being that there would be a higher probability of such disasters actually occurring.

Theoretically then, the best way to keep people and property safe is to keep them out of the potential danger zones. Consequently, land-use planning is seen as one of the best forms of mitigation (see also Greiving, 2002). In order to prevent large-scale industrial incident becoming major accidents with potentially large numbers of victims, persons outside an establishment can be protected, at least in general, by maintaining a safe distance between hazardous activities and populated areas. For any hazardous activity, adopting a zone from which vulnerable objects are excluded must ensure an acceptable risk level. Examples of such objects are:

- Hospitals, medical facilities and emergency treatment areas.
- Structures containing sufficient quantities of toxic or explosive substances.
- Structures whose primary occupancy is public assembly.
- Buildings for schools or day-care centres.
- Jails and detention facilities.

- Other buildings or areas frequented by the public, such as dwellings and offices.

However, in a densely populated country like the Netherlands there are often many claims on the available space. Safety zoning is not always seen as the best way to proceed given the amount of space that is involved. Besides, there are several hazardous activities; a nuclear power plant being a well-known example, for which a safety zone is meaningless. An *acquiescent approach* focussing on preparedness then seems to be a more realistic prevention policy – not so much from an emotional point of view but simply from a rational one. Most industrial disasters thus far have caused a limited number of fatalities, 'limited' at least in comparison to the annual number of people killed by drug abuse, smoking or traffic accidents. Therefore, It does not seem very logical to emphasize the risks of such disasters occurring more than is necessary compared to other potential sources of fatalities.

Obviously, disaster prevention – as with any other form of restrictive planning – always implies some form of incursion on the domain of private liberties. In the long run moreover this issue may be as problematic as the problems that it is intended to solve. As there is no preventive approach that can claim pure legitimacy in the face of all other approaches, disaster prevention should always be the result of social and political discourses. The role of government as the guardian of the quality of information in these discourses is therefore crucial, but not undisputed. It is clear from the Enschede and other disasters that safety can easily lose out when economic interests are at stake. Probably the only way to strengthen safety considerations in public decisions is to take more seriously the public availability of a proper information base that can feed different stakeholders in the debate. Risk mapping should no doubt be a crucial part of this information base. Hazard-related risk assessment and management should be an essential component of the Strategic Environmental Assessment (SEA) (e.g. see Spindler, 1992). The EU Directive on SEA (2001/42/EC) that came into force in 2001 offers a useful approach to better integrating risk assessment, land use planning and environmental analysis. This directive is currently implemented in national legislations (see also Arts, 2004; Risse et al., 2003). The reader is referred to Greiving (2004) for an elaborate discussion on the SEA directive and risk analysis.

Endnotes

[i] Very unfortunate exceptions to this rule are disasters caused by terrorist actions. These threats are currently limited in scope and frequency, but are emerging as potentially significant issues for future security (Ashworth, 1991; Cordesman, 2001).

[ii] The terms 'disaster management' or 'emergency management' are usually limited to the stages of preparedness and response, whereas the notion 'disaster planning' is often reserved for all four phases (e.g. see Myers, 1999; Quarantelli, 2000a).

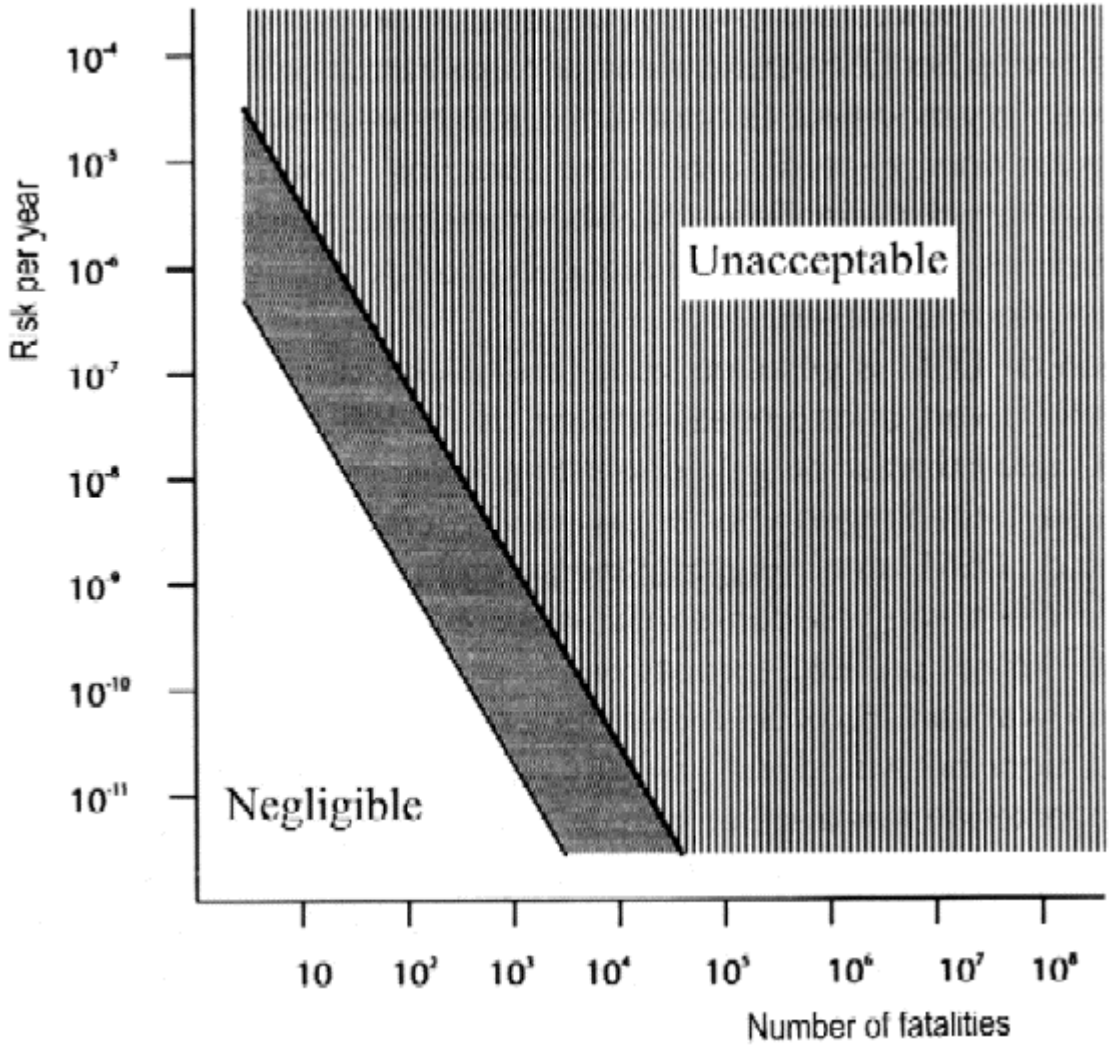
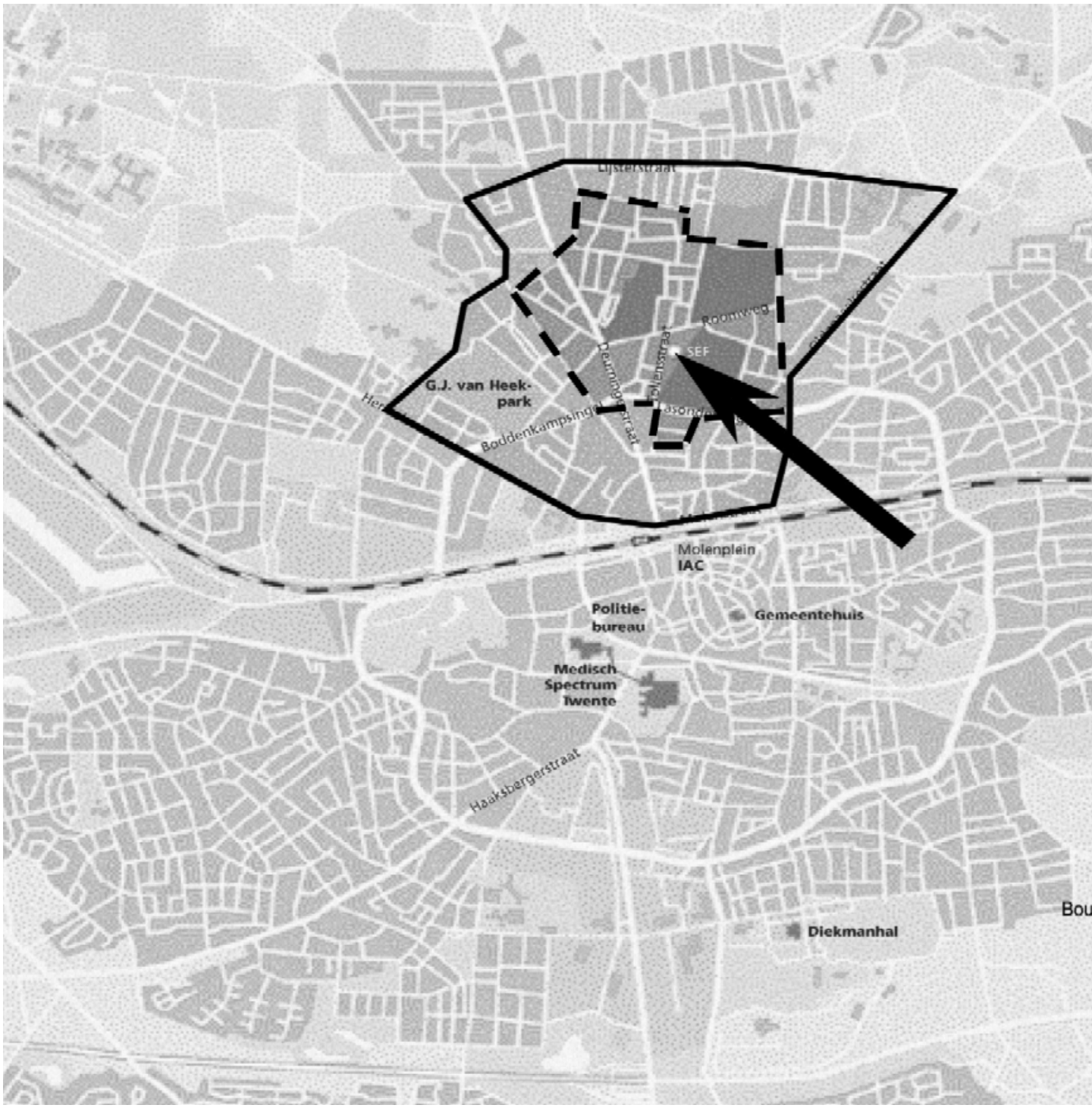


Figure 1: Acceptability criteria for societal risk as approved in 1988 by the Dutch parliament
Source: Tweede Kamer nr. 21137, 1988-1989.

Figure 2: Location of the Disaster Area in Enschede
Figure 3: Part of the disaster area three days after (source: De Lugt, 2000)



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