

Report

Workshop Safety Chain

The Netherlands, Rotterdam, 8 and 9 November 1999

Contents

1	<i>Programme</i>	5
2	<i>Introduction</i>	7
3	<i>National Safety Policy in Norway</i>	9
4	<i>National Safety Policy in Italy</i>	13
5	<i>National Safety Policy in The Netherlands</i>	17
6	<i>Workshops</i>	23
	Workshop I: The underground structures to cross waterways	23
	Workshop II: The planning of flood prone river areas	26
	Workshop III: The planning of transport of hazardous goods through residential areas	29
	Parallel Workshop: Underground shopping center “Koopgoot”	32
7	<i>Concluding remarks</i>	41
8	<i>Attachment</i>	43
	List of participants	

1 Programme

Opening speech

Chairman Peter van Lochem, director of The Netherlands Institute for Fire Services and Disaster Management (NIBRA).

Introduction

Ernst Schulte, Administrator - European Commission DG XI, Environment, Nuclear Safety and Civil Protection.

Presentation on the national safety policy by Norway:

Roger Steen, Advisor - Department of Planning and Supervision, Norwegian Directorate for Civil Defense and Emergency Planning.

Presentation on the national safety policy by Italy:

Giuseppe Romano, Engineer - Chief of the Pisa County Fire Department, National Fire Corp. Ministry of the Interior.

Presentation on the national safety policy by The Netherlands:

Huib Bal, Head of the Safety Policy Division - Directorate for Crisis Management and Fire Services, Ministry of the Interior and Kingdom Relations.

Workshop I: The underground structures to cross waterways

Chairman:

Jos Verweij, project leader of "Safety Concept for Underground Structures", Ministry of the Interior and Kingdom Relations, The Netherlands.

Secretary:

Ms. Pauline Joosten-Evenaar, Safety Policy Department, Ministry of the Interior and Kingdom Relations, The Netherlands.

Workshop II: The planning in flood prone river areas

Chairwoman:

Ms. Ann Kristin Henriksen, Senior Executive Officer, Directorate for Civil Defense and Emergency Planning, Norway.

Secretary:

Odd Kirkeby, Adviser, Directorate for Civil Defense and Emergency Planning, Norway.

Workshop III: The planning of the transport of hazardous goods through residential areas

Chairman:

Peter Kaas-Claesson, Major - Emergency Management Agency, Ministry of the Interior, Denmark.

Secretary:

Peter Christensen, M. Sc. Chem. Eng., Emergency Management Agency, Ministry of the Interior, Denmark.

Discussion about one scenario in three parallel workshops

Integral approach of safety aspects concerning the Underground Shopping Center “Koopgoot” in the city center of Rotterdam.

Chairpersons:

- 1 Ms. Annemarie van Daalen - Head of Prevention Division, Fire Services of Rotterdam, The Netherlands.**
- 2 Giuseppe Romano, Engineer - Chief of the Pisa County Fire Department, Italy.**
- 3 Dick Fundter - Senior Advisor, Ministry of the Interior and Kingdom Relations, The Netherlands.**

2 Introduction

Opening speech by P. van Lochem

Mr. P. van Lochem welcomed the participants from the various EU countries to the Safety Chain Workshop. This workshop could not have taken place without tremendous support from both the EU in Brussels and a special core group which organized the workshop.

The workshop was held in the context of the Community Action Programme. The main objective was to compare and discuss the participating countries' different safety policy approaches.

During the workshop the participants talked about a safety chain. But is it a safety *chain* or a safety *wheel*? A wheel has no beginning and no end. Perhaps it would be more accurate to speak of specific chain management. Chain management can be divided into three subjects:

- 1 The coordination structures (centralized versus decentralized, dominant versus neutral),
- 2 The number of participants,
- 3 Long-term versus short-term agreements.

The coordination processes and ICT support are important aspects. One could conclude that it is preferable to speak of chain management.

In the Netherlands, *pro-action* is often used to designate density and the complexity of infrastructure.

You need *prevention* in a community oriented to policy and services.

Preparation: innovation in means, training and exercises.

Repression: interagency and innovation.

Follow-up: impact; mitigation and feedback.

The best system is an integrated emergency management system within which one can develop the four systems: prevention and mitigation, preparation and planning, response and intervention and finally, recovery.

Introduction by E. Schulte

Participation of the involved European countries underlines the importance of the "safety chain": Such chains constitute a necessary protection tool in so many fields. Some weak points remain concerning the safety of citizens within the European Union. There is still much to do.

Each Member State has its own rules and regulations designed to protect its citizens from technological and natural disasters. In addition, the Treaty of Amsterdam does not prescribe how Member States must arrange their civil protection organizations at the Union level. This is often seen as an advantage, although improvements are still being made in the field of cross-border cooperation between Member States.

Major disasters have occurred within the Union during the last 50 years. This reality is frightening in view of the joint human and technical potential for civil protection. It is a fact that the European Union regularly suffers from major disasters, including floods. The Union has had to face earthquakes, landslides and forest fires, in particular in the southern regions. Fire safety must still be improved everywhere. Aircraft, railway and other transport accidents are likely to increase in the future. Therefore, one has to bear in mind the lessons learnt from such major accidents and disasters, in particular when planning new infrastructure or constructions.

The Safety Chain Workshop will contribute to improving this situation because each participant brings his or her own experience to the forum. The workshop's objective is completely in line with the Community Action Programme in the field of civil protection which aims at protecting the citizen, the environment and property. In the Action Programme, particular emphasis has been placed on prevention, besides other major projects. Workshops, especially this one, will contribute to an important cross-fertilization because of the existing interactions. This workshop is subsidized by the EU. In the short term the Council has to make a decision about the Action Programme for the next 5 years (1.5 million euro per year).

3 National safety policy in Norway

Experiences with risk and vulnerability analyses in Norwegian municipalities - and how they follow up these analyses

Introduction

Since the early 1990s, DCDEP has worked hard to assist the different administrative levels in Norway in executing risk and vulnerability analyses. The municipalities are the DCDEP's prime targets, but it is also very satisfying to see that ministries and private enterprises are using its method for risk and vulnerability analysis. The introduction of this method has been part of a strategy to reduce society's vulnerability.

This effort has been necessary: Through national policies and local planning, society becomes more and more vulnerable and we are often unaware of the consequences of our actions. Our modern life depends on open roads, bridges, tunnels, electricity and of course computers - we cannot do much when the network breaks down, due to some mysterious virus in the hard drive or the much feared millennium bug. Only good planning and hard work in the field of security, safety and preparedness allow us to build a more resilient society.

Goals of the risk and vulnerability analysis project are as follows:

- to reduce society's vulnerability to accidents, crises and catastrophes,
- to create a safer and more resilient society,
- to prevent crises and catastrophes,
- to be prepared at all times, not only after a crisis has occurred.

The Directorate's aim is to influence the authorities, especially the municipalities, to achieve these goals.

Risk and vulnerability analyses as a method

The Scandinavian countries have for several years used a model for risk and vulnerability analyses, both to survey the degree to which the supplies of goods and services are vulnerable to interruptions and to identify hazards and reduce vulnerability. An analysis' results will give the user a good overview of where preventive measures should be implemented and where to build up damage-reducing measures.

The tools of risk and vulnerability analyses are to be used before a crisis occurs. This method assesses the kinds of accidents, crises and catastrophes likely to occur in the municipality as a geographical unit.

The model can function as a superstructure to point out the risks inherent in specific events such as, for instance, fires, disruptions in electricity and water supplies, epidemics, interruptions in infrastructure, tunnel accidents, avalanches and landslides. It is used as a superstructure so that the same method and analytical tools are applied to the various professions and sectors, thus promoting a general coordination of civil emergency planning.

The experience with risk and vulnerability analyses so far reveals the importance of establishing interdisciplinary work groups set up to examine possible causes of accidents and crises, discuss probabilities, consequences and different methods of crisis management and prevention.

These kinds of work groups will have better chances of identifying risk, due to their differing experiences and backgrounds.

Expectations for risk and vulnerability analyses in the municipalities

- Make a systematic assessment of possible risks and increase consciousness about the vulnerability of local societies.
- Create an overview of the resources, clarify responsibility and adjust the system in order to increase coordination and cooperation in civil emergency planning.
- Create a basis for assigning priority to different measures:
 - proposals for cost-effective preventive measures
 - implementation of effective damage-limiting measures (crisis measures)

It is important to find a balance between preventive measures and emergency preparedness.

Results

In Norway nearly 90% of the municipalities have executed risk and vulnerability analyses. These analyses are not only descriptions of reality; instead the work is being updated and continued in proposals to implement measures designed to increase municipal resilience and preparedness.

Asplan Viak Consulting Company has been commissioned to evaluate the effects of the efforts, to estimate the quality and tempo of the analyses and to identify areas where new measures should be developed. The following questions were asked:

- Is this work important to the municipalities?
- Which areas could be improved?

Representatives of political and administrative leaders from approximately 100 municipalities were interviewed. Research showed that the risk and vulnerability analysis project was a major factor in increasing awareness concerning particularly vulnerable areas within the municipality.

Both politicians and administrators agreed that the work benefited municipalities' ability to prevent and handle accidents, crises and natural catastrophes.

Research showed further that 75% of the municipalities familiar with risk and vulnerability analyses felt that these analyses positively impacted coordination between different municipal departments. Broad and interdisciplinary participation were important factors for success. The creation of a good planning system is essential.

In a similar survey in Sweden, more than 60% of the municipalities said that some serious hazards existed in their own municipality of which they were unaware before execution of the risk and vulnerability analysis.

Furthermore, the analyses were viewed as important tools for organization and the division of responsibilities; they also positively impacted the ordinary organizational development in the municipalities. The risk and vulnerability analyses project often led to the immediate solution of unsolved problems. The municipalities therefore also felt that their ability to manage crises had improved.

The implementation of risk and vulnerability analyses demonstrates the willingness to thoroughly examine the technical dimensions of society. Undesirable developments such as rising crime rates,

violence and drug abuse are seldom if ever considered. These factors could have been added to our own priorities and our analysis marketing. In any case, an assessment of these areas has potential.

Challenges

There are many ways or methods of increasing safety and security in society. Having said that, we do not doubt the suitability of risk and vulnerability analyses for increasing preparedness and for integrating demands for resilience, flexibility and endurance into ordinary municipal planning. We must try to reduce society's vulnerability through better planning on all levels of society - local, regional and central.

Cooperation between the various authorities is important. The authorities responsible for emergency planning, rescue services, police, civil defense, army, environmental protection, health services, administrative county planning, etc., should also be informed and aware of the need for identifying hazards and reducing vulnerability.

Risk and vulnerability analysis is a tool for (local, regional and national) planners. With the knowledge gained from these analyses, we can create a better, safer and more resilient society. Safety and preparedness considerations must be integrated into the ordinary peacetime planning process.

Motivation of leaderships and local planners in the municipalities

Despite the fact that we are experiencing a renaissance in local emergency planning, we continue to witness the low priority given by municipal leaderships and planners to civil emergency preparedness. To market the value of this work, we must increase the emphasis on informational measures. It is important to implement measures as a follow-up to analyses. In recent years our work has attracted much attention. Now, strenuous effort will be required to make the transition from goodwill to the implementation of concrete measures.

In Norway, DCDEP has published a collection of ideas and examples on executing and implementing risk and vulnerability analyses. It has also started a pilot project to see how Geographical Information Systems (GIS) can be used as a tool to create an overview of preparedness considerations in municipal planning. This tool has already gained a foothold in Norwegian area planning, especially in the environmental and agricultural sectors.

It has been frustrating to observe the absence of routines and decisions in connection with continuing and updating the risk and vulnerability analyses. The remedy is an increased focus on implementing a quality management system or internal audit in order to create good working conditions in the municipalities. Internal Audit is the term currently in use in Norway. In practice, Internal Audit is based on theories related to concepts of Quality Management.

The emphasis is to establish structured management of emergency planning such that a positive relationship between aims and objectives and results is achieved.

The first priority is to establish aims and objectives for emergency planning, with aims being the general principles and objectives being the concrete actions to be transformed into plans. Some aims and objectives have been determined by superior authorities. Other aims and objectives, however, must reflect what the municipalities themselves want to achieve.

Secondly, who does what must be decided: Areas of responsibility must be established (internally in the municipalities and between authorities). Someone must be responsible for carrying out each objective.

Thirdly, the municipality must establish an organization and procedures capable of transforming objectives into concrete measures and producing results (e.g. material emergency plans). This is how Emergency and Crisis Management Planning is developed and - most importantly - kept alive via constant attention and updating.

The key is to look at the planning process as a whole. DCDEP wishes to evaluate whether it is working as expected. The purpose is not to check whether single elements of the system comply with a detailed preparedness handbook. The internal audit system must be organized such that it motivates the municipalities to improve their preparedness.

Concluding remarks

To sum up, the main challenges of the future are:

- To make municipalities, politicians and planners more conscious of their responsibility for emergency preparedness, especially before things happen!
- To support successful municipalities which can serve as models for others.

The best ambassadors for our initiatives are representatives of successful municipalities. In this context I should like to mention the interesting potential in linking crisis management, emergency planning and safety and preparedness considerations to ordinary planning safety on the one hand, and efforts to prevent smaller accidents on the other (traffic accidents, accidents at home and at the workplace). In Norway municipalities now exist which are based on the risk and vulnerability analyses project, and WHO's programme for "Safe Communities".

Some counties have also based their local activities concerning environmental protection (Agenda 21) on the risk and vulnerability analyses project.

Our common goal must be to build safer and more resilient local societies - to safeguard lives, health, environment and welfare - through municipalities' ordinary planning processes. The realization of this goal requires long-term planning.

For further information: www.dsb.no

4 National Safety Policy in Italy

The Italian presentation was based on the safety aspects of emergencies related to technical or natural disasters. Aspects concerning the security of the population were not addressed in this presentation.

The Italian view of the safety chain comprises:

- Pro-action
- Prevention
- Preparation
- Repression
- Mitigation and
- After-Care

Two main “areas of concern” may be distinguished:

- The **pre-event** effects reduction: one can take measures in prevision, prevention and planning.
- The **post-event** effects reduction: this consists of rescuing people and animals. Furthermore, one can attain a complete stabilization and offer assistance where necessary.

In Italy the different policy staffs are:

- The policy staffs at national and local (regional) levels involved in protecting the civil population from physical danger involving natural and human-caused disasters. Within this local level one can make a distinction between the Italian government, the Ministry of the Interior, the National Civil Protection Agency, the regional governments (Civil Protection Offices), Provincial Civil Protection Services, the Prefectures and the Major.
- Policy Staff for emergency services.

In the planning one has to cooperate with the Civil Protection Agency, the Ministry of the Environment, local governments, the Prefectures and the Majors. On the operational level Italy has a National Fire Corps, and other local resources.

The national operational resources of the Civil Protection Service are:

- a The National Fire Corps as the main component of Civil Protection
- b The Army Forces
- c The Police Forces
- d The State Forest Corps
- e The National Technical Services
- f The National Scientific Research Groups
- g The Italian Red Cross
- h The National Health Services
- i The Volunteer Associations
- j The National Alpine Rescue Corps

In 1992 an Italian State Law was enacted for *natural and anthropical disasters*; it addresses the following aspects: prevention & prevision, planning and mitigation of consequences.

The Italian Safety Policy on major *industrial hazards* has been defined as follows:

Until 1999, with the inception of the EU Directive “Seveso I” and since 1999 with the inception of EU Directive “Seveso II”.

The competencies and resources to combat major industrial hazards during the planning and administration stages are controlled by the Ministry of Environment and the Ministry of the Interior, as well as the regional governments and the National Fire Corps. On the technical and operational levels, the National Fire Corps, the Environmental Regional Agencies and the health and safety institute play important roles.

The National Fire Corps and other emergency agencies have time-related operational capabilities. Other Italian Civil Protection Resources (local, regional and national) should be mentioned as well.

A possible scheme of the different stages of the Civil Protection Activity's safety chain:

A primary feature of the National Fire Corps during major emergencies is that the National Fire Corps operates **not only** at this stage of the emergency. An example was given of a Regional Mobile Group deployed at the scene of an earthquake (Central Italy, 1997). Moreover, the National Fire Corps has organized Regional Mobile Groups (R.M.G.) in **each** Italian Region. This means that in less than 30 minutes each R.M.G. can be "on the road".

One of the strategic elements for the delivery of "good service" is the quality of interaction with citizens. This interaction relies on the quality of the front-line operators that, consequently, becomes crucial.

The Human Resource Management must be integrated as part of every Civil Protection Organization. It is therefore necessary to create a mentality oriented to "Customer Satisfaction".

The traditional management tools (for example, hierarchy, formal structures, orders, profiles) must be transformed into other tools that do not represent authoritarian characteristics. The tools - using persuasion and involvement - should lead to shared values and responsibilities, both aligned with the organizational mission, with full respect being paid to the Civil Protection Operators' needs, interests and aspirations. This vision assumes an essential role in the field of civil protection, particularly if the differences between all the operators, the incredible number of administrations and groups that show up at the emergency scene, and - often - the lack of a strong command structure are considered.

Customer Satisfaction

The customer satisfaction concept takes on special meaning when the services are delivered to customers during crisis situations. The civil protection services are primarily oriented to eliminating dangers or, at least, to containing losses. Delivery of these services takes place when the customer is in a particular psychological condition, in which he or she may be either physically or emotionally involved. Listening to the customer is a very important attitude which could positively effect the customer's expectations and perceptions of the service.

Citizens must be the "gravity center" around which the whole system revolves. All organizational behaviours and strategies must be oriented towards them. The quality of services must constantly be verified on the basis of clear indicators; it must be easily measurable, accountable and well defined before the emergency occurs. In this way it will be possible to instantly comprehend problems and re-align the system if it does not perform adequately.

The ability to deliver quality service is necessary but not sufficient in and of itself. One must consider **perception of the quality** by the customer; for example a service may have been performed technically very well, but may not have been perceived by the citizens as one would have predicted. The Italian strategy is not simply to "give things", but rather to deliver services.

Usually during major emergencies, there is a redistribution of tasks and resources that may change the everyday roles. Some temporary form of organization takes place during an emergency and people who have never met must work together for the first time: This could potentially lead to a crisis. The solution to this problem is to work together well before the emergency occurs. A good emergency planning process could help enormously.

Suggestions for the next possible steps:

- Spread and circulate the know-how from the “detentors” (emergency and civil protection structures) to those who need it (such as local authorities and citizens).
- Define a quality standard such as service charts or performance standards.
- Create an EU directive for natural disaster planning.
- Similarly to the Seveso II directive, it should be possible to draw up indications for national and international risk analyses and planning for natural disasters.

For further information: www.protezionecivile.it

Giuseppe Romano, Fire Chief, Pisa County Fire Department, Italian National Fire Corp.

vfcomp101@interbusiness.it

Gianmario Gnechi, Fire Officer, Bergamo County Fire Department, Italian National Fire Corp.

giagnec@tin.it

5 National safety policy in The Netherlands

At the national level, the Dutch Ministry of the Interior and Kingdom Relations is responsible for public administration and minority and urban policy. A growing responsibility, however, is coordinating national policy on public order and safety.

Introduction

Cooperation is the key: it is the basis of successful management on every societal level.

In The Netherlands, the lack of safety and security has become a major social issue and therefore, too, a major political issue. Feelings of insecurity are mentioned as the number one problem by inhabitants of many cities. It is this sense of insecurity among citizens that affects the quality of their lives as well as burdens the relationship between public administrations and citizens. These feelings of danger and insecurity not only encompass nuisance and crime, but are also related to fires, floods, industrial calamities and traffic accidents. I realize that we share this problem with most of our neighbouring countries.

Nowadays traditional service organizations such as the police, the judiciary and fire-fighting services cannot be held solely responsible for providing safety. Danger and insecurity are also caused by bad housing facilities, drugs and alcohol addiction, social deprivation, and many more such problems. In addition, a developing technological economy must respond appropriately to risks emerging from an expanding chemical industry, hazardous transports, etc. The government has to consider that the capacities of the national police organization, the judiciary and the fire-fighting services will never be sufficient to provide full safety coverage. After all, these organizations are not responsible for many of the prevailing problems and therefore cannot be expected to solve them. Other measures, initiated by all levels of government, are required to help find the necessary solutions.

To this end in 1993 the Ministry of the Interior and Kingdom Relations introduced in cooperation with several other ministries the 'Integrated Public Safety Policy'. This concept was designed and staged by the public sector to encourage many different organizations to work together as much as possible in promoting and realizing safety. The considerable changes in Dutch society over the past 20 years have been the main reason for assigning safety policy responsibility not only to the judiciary, police and fire-fighting services, but also to the public sector. Together with substantial wealth, individualism is increasing and the family is no longer the most important social unit as a cornerstone of the community. Though the population is still growing, both social and economic securities are diminishing.

On a local level, fewer people know their neighbours; many travel to their jobs and social control is lacking.

We must create a new situation involving all the relevant actors and, moreover, a situation where efforts are combined and initiatives are taken by the various governmental authorities, school managers, housing association boards, managers in trade and industry, members of social service groups and naturally the citizens, who remain individually responsible.

The Dutch Safety Chain

The basis of Integrated Safety Policy is *cooperation* especially aimed at pro-action and prevention. The participants' responsibilities are not limited to solving their own problems or extinguishing

their own fires, so to speak; they must also approach the responsibility for safety and security from a broader joint perspective.

To further illustrate this concept of broad cooperation in joint perspective we can represent the Integrated Safety Policy as a “chain”. This “safety chain” links together the different concerns for safety and security. The five main links of the chain are: pro-action - prevention - preparation - repression and after-care.

Pro-action measures involve the structural cause of risk, for instance by banning certain forms of industry in the vicinity of residential areas. This step is crucial. When a decision is reached, for example to start or to continue a hazardous activity, one needs information to carry out the following steps of the chain. It is essential that safety policy be part of the overall policy of public administration in every area of concern.

Prevention measures means trying to prevent accidents from happening and to limit, as much as possible, the effects in case of an accident. This step includes the design, engineering, maintenance and safety-management systems. In addition, urban physical planning should already include safety aspects, for instance by projecting the separation of pedestrians from other traffic.

Preparation encompasses the measures to be taken in case of an actual incident or emergency. These measures must be defined and organized beforehand and they have to be laid down in emergency plans. It is important to inform the public of these plans and see to it that they know exactly what to do in case of an accident.

Mitigation measures: dealing with real accidents and providing assistance during emergencies. This is traditionally a task of the police and fire-fighting services. These services should also be geared to the other links in the safety chain.

After-care aims at returning to a normal situation. It implies all measures required to repair, assist, support and continue life. Of course, as the saying goes in Holland: “Only after the calf has drowned is the well filled up”. In other words, learning from experience is most important.

Implementation of the Safety Chain

The Ministry of the Interior and Kingdom Relations together with the local authorities initiate, stimulate and coordinate implementation of the safety chain. The aim is for all participants to create a safe environment in unison and to take measures coherently. But, as we all know, a chain is only as strong as its weakest link, and this one is no exception. Therefore, everyone involved should give each aspect of safety sufficient attention to warrant minimal risk.

The overall level of safety is influenced by the measures taken in all steps (of the process) of the safety chain. For industrial activities this means that various policy areas contribute to the overall level of safety: land-use planning, safe labor conditions, external safety, risk communication and emergency planning.

Land-use planning, prevention, emergency planning and repression require different kinds of risk information. Let us have a look at the differences.

Land-use planning

The risk information we use in The Netherlands in the land-use planning process is calculated in terms of individual risks and collective risks. On the basis of these calculations and the standards for individual and collective risk, a decision is reached to grant permission to start or to continue a hazardous activity or allow new building to proceed in the vicinity of an industrial activity.

In individual and collective risk the emphasis is on “death” as a possible effect of an accident at a technical installation. The “annual fatality risk” has become a yardstick for measuring risks and a basis for making decisions.

One of the goals of land-use planning is to keep the collective risk below the standard of one occurrence in 100,000 years for an accident with 10 fatalities and below one occurrence in 10 million years for an incident with 100 fatalities.

Disaster relief planning

For disaster relief planning, the emphasis is on other dimensions of risk:

- In disaster relief planning the *risk* of a disaster is of less importance than dealing with the extent of the *effects* of accidents and the measures that can be taken to reduce effect distances.
- For emergency planning other effects besides fatalities are of importance: immediate and long-term injuries and large-scale and long-term effects on various functions. The number of people to be evacuated is also of vital importance in making emergency plans.
- In disaster relief planning, detailed scenarios are needed in order to set up and test emergency plans. The possible effects determine the measures that can be taken to mitigate the effects.

Presumably, it is more important that no effects are overlooked, than that we have an exact estimation of the quantity of the effects. Furthermore it is very important that in order to guarantee the desired level of safety, the subject of safety will be incorporated into the decision-making process during the initial planning stages. This will prevent subsequent problems in the design, construction and operational stages and can ultimately lead to time and cost savings. It is more efficient to integrate the desired level of safety at the start than to be obliged to introduce it at a later stage.

Instruments

To support the Dutch pro-active and preventive safety policy the following instruments have been developed:

Effect Indicator

The Effect Indicator is primarily intended for municipal administrators, whom it provides with a quick insight into the consequences of disasters and calamities: the nature of the effect, the number of victims and the nature of injuries. It does not provide detailed insight, but rather an indication.

There are two ways of using the Effect Indicator. Firstly, this manual enables administrators to take safety aspects into account at an early stage of the decision-making process: at the point when the question is still what the municipality wishes to build on a specific location, and even before the permit stage. It may be used pro-actively to assess whether new plans, for example relating to the establishment of a company near a residential area, could have consequences for safety. At a later stage, a more detailed analysis carried out on the basis of a risk policy will be needed.

Secondly, the Effect Indicator provides the opportunity to check whether a municipality is sufficiently prepared for the consequences of disasters and calamities.

The Effect Indicator is definitely not intended as a manual that can be consulted once a disaster happens.

Fire Safety Concept

In The Netherlands, fire safety regulations have been formulated in a variety of ways. They are incorporated into the law or various judicial documents such as orders in council, decrees, standards and directives. These judicial documents contain fire safety requirements. The fact that the various requirements come from a variety of sources, means that the required standard is not always achieved because coordination is insufficient or absent. As a result, the fire safety standards in specific situations can be contradictory, overlapping or absent altogether. To avoid this situation we have developed a framework for an integrated approach to fire protection: the Fire Safety Concept.

A Fire Safety Concept provides a framework based on the safety chain philosophy for protecting buildings or activities against fire. This concept contains broad descriptions of fire safety arrangements and facilities which can be classified as follows:

- 1 **Planning** (pro-action, preparation)
- 2 **Architecture** (prevention)
- 3 **System technology** (prevention)
- 4 **Fittings** (prevention)
- 5 **Internal organization and use** (prevention, preparation, after-care)
- 6 **Deployment of the fire services** (preparation, mitigation, after-care)

The purpose of a Fire Safety Concept is twofold:

- It can be used by the government for formulating fire safety regulations; and
- It provides interested parties – such as government, insurers, designers and users of buildings - with an understanding of the relationship between the required arrangements and facilities.

It should be emphasized here that the Fire Safety Concept is not a regulation. It is a review of areas which are essential for fire safety.

Underground safety

A person making use of an underground construction must be able to depend on adequate safety measures and provisions, just as for structures above ground. The safety of underground structures is an important issue to all of us, particularly because the answer to urban development and infrastructure problems is increasingly being sought in underground solutions.

In order to guarantee the desired level of safety in underground structures, the topic should be incorporated into the decision-making process during the initial planning stages. The brochure 'Safety in Underground Structures; The Guide to Decision-Making', is an aid for the methodical integration of safety aspects into the decision-making process and for their improvement if required - both during the planning and operational stages of construction.

By using the Guide you will ensure that:

- Safety issues are raised at each stage of the project
- All parties involved can participate in the decision-making process at the appropriate time and their own area of specialization
- Permit application procedures are expedited.

Flow charts are an essential part of the Guide both for decision-making and testing of decisions. The Guide is intended for anyone who is involved in the decision-making process of projects.

Safety Effect Report (VER)

For a number of years we have worked together with external research experts to develop the Safety Effect Report (VER). The concept is currently being tested in more than 10 pilots in different municipalities. The VER's aims are:

- Focus more attention on safety during the design stage and following stages
- An integral approach to safety including study of all relevant aspects of safety in the design stage
- Providing an easily accessible, voluntary instrument to increase interest for safety.

VER consists of a quick scan of the various risks, followed by making arrangements which should lead to offering relevant methods.

The pilots are related to the first two steps of the VER. One positive outcome is that in a number of municipalities safety was discussed with partners who would not normally have been involved at this early stage. This can be seen as an achievement in light of compartmentalization.

A negative outcome, however, is that the quick scan did not automatically result in making arrangements for the following stages of the decision-making process. The assumption that the awareness regarding the relevant aspects of danger would suffice to guarantee due attention, did not hold. In practice there appeared to be appreciation for the fact that the instrument is easily accessible. However, on the administrative level the VER has been met with limited enthusiasm. The question asked is: "What's in it for me?".

In practice, VER has already produced one important result, which justifies continuing on the set course. This result is the fact that the fire-fighting and police services are already involved in the design stage. Furthermore, the pilots clearly indicate that VER has not yet reached the stage for full implementation. Intensive flanking measures and policies will be necessary to also justify VER as a long-term instrument.

What next?

The instruments mentioned earlier deal mainly with how safety should be incorporated into the planning and design stages. They do not answer the question: "How safe is safe?" Recently, a few small steps were taken in The Netherlands towards a national policy in this field. One of many questions which came up during discussions was how safety provisions should be considered in view of the costs involved. We have agreed to first initiate a common project with regard to tunnel safety in which the frameworks for consideration will be formulated .

An integrated approach to safety should be adopted when designing such a framework. For instance, from the beginning measures for offering adequate help and for encouraging the ability of citizens to cope in case of emergencies must constitute an integral element of the various considerations concerning safety in tunnels; such measures cannot be seen as separate from the measures needed to prevent accidents and to safeguard the infrastructure. In line with this logic, the costs involved for all measures which are needed to raise the safety level in tunnels to a socially acceptable level comprise a part of the total budgetary considerations that precede decision-making on tunnels. These considerations include measures concerning the ability to cope and the functioning of emergency services.

If safety is considered from an integrated approach, the costs of safety also constitute an integral part of a tunnel project. Such an integrated approach to safety is one of the starting points for developing, as a joint effort, a socially acceptable safety level. As a result, planning for this safety level is no longer the exclusive domain of accountants; planning is now practical and a process that can be clearly explained and justified on the administrative level.

6 Workshops

Workshop I: The underground structures to cross waterways

Chairman workshop

J. Verweij, The Netherlands

Secretary

Ms. P. Joosten-Evenaar, The Netherlands

Participants

M. Graversen, Denmark

K. Möller, Denmark

S. Hammerstedt, Sweden

R. Steen, Norway

S. Heidenreich, Germany

J. Metso, Finland

Scenario

The Netherlands abound in water, with many rivers and canals. To build or expand the road infrastructure, these watercourses need to be crossed regularly. Formerly, this was done with ferryboats. Later, bridges and tunnels were built, with little thought for (fire) safety.

After the fire in 1979 in the Velsler tunnel near Amsterdam (in which 4 people died), safety issues became increasingly important. At present, the approach towards developing safety in The Netherlands follows a specified framework intended to optimize safety.

In 1996, following 60 years of discussion, the decision was made to build a tunnel between the municipalities of Terneuzen and Borsele in the southwest Netherlands. The tunnel will be situated 60 meters underneath the water surface of the Westerschelde. The length of the tunnel will be 6.6 kilometers. Cutting of the two tunnel pipes has begun in 1999. The tunnel will be finished in 2002. There will be no restrictions on the transport of hazardous goods. Approximately 12,000 cars will pass through the tunnel daily.

Development of the Westerschelde tunnel project comprises several stages, i.e. the orientation, planning, design, construction and operational stages. At each stage, the parties involved (initiators, operators, regulators, emergency services, insurers, etc. - depending on the relevant stage) are in close consultation with each other. During these consultations the important 'links' in the safety chain at that particular moment (pro-active action - prevention - preparation - repression - after-care) are discussed.

- Which safety elements are important to the authorities in the development process of a tunnel?
- What demands could the responsible authorities make with respect to, for instance, pro-action, prevention, repression, mitigation and after-care in each stage of the development process of a tunnel?
- Which tools could be useful for the authorities in this, or a similar, process?

Legislation

In The Netherlands, the Ministry of the Interior and Kingdom Relations is responsible for safety and security policy (Police and Fire brigade), and has therefore developed a guideline based on international studies for Underground Structures.

In Germany, however, the federal governments of 16 counties are responsible for protection by the fire brigade. The Ministry of Traffic plays an advising role but cannot enforce safety rules.

In practice, private organizations ultimately often decide whether a tunnel is built and what the level of safety will be. This is also the case in Denmark.

In Sweden, too, decisions for designing tunnels are taken on a local level. These decisions have a political nature and are made on the basis of a “guideline for constructors”. Safety is discussed at a later stage.

During the planning and construction phase, Norway evaluates the consequences of all options in which safety and security aspects are considered. In most cases the local authorities (municipalities) decide how a structure is to be built. If large risks exist, the central government can make use of a special law and slow down the planning of local authorities. Representatives of Norway prefer that the fire brigade enters the decision-making period at an earlier stage, if possible during the initiation phase.

According to Denmark safety is more than its connection with monetary values; let public perception determine what level of safety is acceptable.

In Finland there is no public need for underwater crossings. The country offers more space in relation to the number of inhabitants and there is less traffic (transportation). The constructed tunnels serve other purposes (emergency help in case of fire on another island, heating etc.). Design and techniques for infrastructure projects should be developed in the same way. The Rescue Services Act obliges the municipalities to supply a certain guarantee for safe escape from tunnels. The seriousness and nature of the problems in the event of an accident must be recognized. The question of what a responsible safety level is and who determines this level remains.

Safety rules are not kept up to date; newly developed techniques could already be applied to raise the existing safety level.

Emergency services also get stuck in traffic jams, not necessarily in tunnels (Paris).

Apart from applying the safety chain, one can improve the information for passengers: signs saying *maintain distance*, warnings saying *reduce speed*, *speed limit*. It is imperative that people be made aware of the danger in tunnels.

In both Finland and Sweden civil protection and fire brigade are integrated.

In Germany a second tunnel is being been constructed underneath the Elbe River and connected with the nearby original (old) tunnel.

Main goals for the fire brigade are: to avoid fire, to avoid accidents and victims of fire, to create the opportunity for fire-fighting in a tunnel.

To achieve this, diverse safety measures are considered: automatic fire alarm system, one direction traffic per tube (pro-active), every thousand meter a connection with the old tunnel, supervision per video, loudspeakers, sprinkler ventilation system, and holder to catch the water (after-care).

It would be useful to compare these measures to the safety measures taken for the Westerschelde tunnel in The Netherlands.

All parties agree that for all European countries a standard unity in safety aspects should be developed and applied. Safety measures should be evaluated and adjusted on a regular basis.

Workshop II: The planning for flood-prone river areas

Chairman workshop

O. Kirkeby, Norway

Secretary

Ms. A. K. Henriksen, Norway

Participants

L. B. Jorgensen, Denmark

U. Norgren, Sweden

B. Ward, United Kingdom

J. Förster, Germany

G. Romano, Italy

H. Bal, The Netherlands

Scenario

The Municipality of Kroken has approximately 10,000 inhabitants. The principal industry is the shipyard in the country town of Rokko, which employs the majority of the working population in the municipality. Rokko is a thriving community center with excellent service facilities as well as a junction for road and ferry connections in the region.

An expansion of the shipyard had created an increasing need for land use for housing purposes, and the municipality started planning accordingly. Areas close to existing housing and the town center were thought suitable for housing. This would strengthen the existing community, benefit the environment due to short journeys to and from workplaces, in addition to being the most inexpensive solution with regard to public services such as roads, water and sewage, refuse handling, etc. However, the Storelva river - which runs through the town center and can flood quickly - presented a problem. The local authorities asked for a risk analysis in connection with approval of the regulating scheme. Several aspects would have to be considered with regard to flood control of the area. The Risk Analysis was never presented, however, as the river had recently been dredged and it was assumed that it did not pose a threat.

Snow fell early the next winter and settled in deep drifts on the hills surrounding Rokko. The municipality was warned during the winter that if a long and cold spring persisted, the river could flood and be a hazard to the newly constructed housing areas. Ten to fifteen houses would be in immediate danger, as no funds had been left for flood control in this housing area. By the middle of May the flood was still not evident, but the responsible authorities considered evacuation plans for the area.

On June 1st, mild wet weather and copious amounts of rain caused the Storelva River to rise, threatening to flood the new housing estates. The local authorities considered the situation to be critical and summoned a crisis meeting.

- What instruments may a municipality have at its access, in order to cope with the consequences of such a situation?
- Which elements should have been present in the planning process?
- Which planning tools would have been useful to the planners in this or similar types of situations?

- What demands could the responsible authorities make with respect to, for instance, prevention, repression, mitigation, economic liability and after-care?

Results workshop

The work group did not have time to discuss all the problems in depth. Most of the discussion time was spent on the first two questions, and parts of the last question. The third question was only briefly touched upon.

- 1 *What instruments may a municipality have at its access, in order to cope with the consequences of such a situation?*

The delegates from the different countries in the work group each presented some elements they felt should have been present during the preparations for the possible crisis developing in the given scenario. The idea was to have the group elaborate on the reason for possible differences between the countries present. Yet there were no substantial differences in the use of different types of instruments. We considered the following instruments (not in order of priority):

- Focus on collecting information and a prognosis of the rising water level.
- Notify voluntary organizations about a possible crisis.
- Make plans for a possible evacuation.
- Alert organizations and responsible authorities that you may need to build barriers.
- Alert regional authorities.
- Make or carry into effect an informational strategy.
- Prepare for rest center management.

- 2 *Which elements should have been present in the planning process?*

The group touched upon how the planning processes are organized in the different countries, and discussed the usefulness of planning tools such as Risk Analysis/Assessments and digital planning through the use of Geographical Information Systems (GIS).

- Norway pointed out their legal basis for Regional Authorities to scrutinize local land use plans.
- Sweden stated that a newly implemented environmental act was a further check on elements that should be present in a land use planning process.
- Italy pointed out that the municipalities are responsible for development, and that the availability of data had not been sufficient until 4-5 years ago.

- 3 *Which planning tools would have been useful to the planners in this or similar types of situations?*

Resource databases, digital planning (GIS), and information plans were some of the tools briefly mentioned. Furthermore, the problem of who should bear the cost of establishing resource databases was discussed. It was pointed out that not all municipalities could afford to use such a tool.

- 4 *What demands could the responsible authorities make with respect to, for instance, prevention, repression, mitigation, economic liability and after-care?*

The question pertains to several different aspects of the safety chain. Due to lack of time the group discussed prevention and repression, as well as mitigation and economic liability (in one).

Prevention

The group pointed out that there may be a political dimension to the instruments which can contribute to preventing possibly hazardous situations, since the use of such instruments and the direction and level of prevention most likely will be debated politically. Some examples of concrete measures are:

- That the local authorities be involved in granting planning permissions and conditions. E.g. that special conditions should be met to protect the first floor of a house in a certain area.
- Change the circumstances of the river.
- Resist building close to the river.

Repression measures

- Build a sand volley.
- Make sure you have and are able to use an early warning system.
- You may purposefully flood different areas, and/or have some areas designated as such areas.
Note: This is a measure that is allowed in the UK and in most countries that were present in the group. This is not the case in Italy, where private ownership has a strong foundation and public administration may not intrude on this ownership.
- Handle special demands.
- Pre-allocate technical equipment etc.

Mitigation/Economic Liability

An aspect discussed was the fact that insurance against flooding was not possible in all the countries present. It was also pointed out that if a situation similar to the scenario were to arise, the municipality may have if not a legal responsibility, then a moral responsibility. In some countries the municipality may also be served with a regressive claim from the insurance companies if planning procedures have not complied with laws and regulations. In Italy, however, the person building the house does so at his/her own risk, and bears the economic consequences. The UK also offered an example of a municipality making seemingly sufficient plans, but based on inaccurate information. When an accident happened they were therefore sued successfully for regression on this basis.

The group then concluded that if you are going to do the planning, you better do it right.

Workshop III: Planning the transport of hazardous goods through residential areas

Chairman workshop

P. Kaas-Claesson, Denmark

Secretary

P. Christensen, Denmark

Participants

S. Bergström, Sweden

K. Koskela, Finland

O. Tsangarakou, Greece

S. Hogan, Ireland

N.I. Larsen, Norway

A. Sorticlos, Greece

R. van Loo, The Netherlands

G. Gnechi, Italy

Scenario

In some cases chemical sites have a large impact on how cities develop. Some times cities expand around chemical sites due to the fact that site workers want as little transport time as possible.

A specific chemical site is located in the middle of a large residential area. The site needs ammonia for production purposes. The ammonia is transported to the site by tank vehicles. To deliver the ammonia, the vehicle is bound to go through a large residential area with more than 1000 houses, a large elementary school and a public beach.

Ammonia is currently delivered as an ammonia solution with 25% ammonia in 30-ton tanks. However, it is also possible to have the ammonia delivered as anhydrous ammonia; the chemical site is interested in this form of transport for economic reasons.

An economic report on the two alternatives says that the chemical site would save five million Euro per year in transport expenses if it were to choose to transport anhydrous ammonia. This is caused by a reduction in transport expenses. For the time-being ammonia solution is delivered twice a day but if the anhydrous ammonia form were chosen only one transport every other day would be necessary.

The chemical site therefore asks the competent authorities for permission to bring the ammonia in anhydrous form. Furthermore, the chemical site is willing to fulfill a large number of possible demands from the authorities.

- 1 Which elements are important to the authorities in the decision-making process?
- 2 Which planning tools would be useful to the decision makers in this particular situation?
- 3 What demands could the competent authorities make with respect to, for instance, prevention, repression, mitigation and after-care?
- 4 If the chemical site were to receive permission to transport anhydrous ammonia, suppose that an accident were to occur: What are the legal and economic consequences and responsibilities?

Results Workshop

The Danish work group leader specified the different properties of the two substances described in the scenario. Anhydrous ammonia is classified as very dangerous and the substance is poisonous, corrosive as well as flammable. Ammonia solution containing 25% ammonia is classified as moderately dangerous and it is corrosive.

Anhydrous ammonia is transported in pressure tanks and in case of a leakage the substance evaporates rapidly as compared to the ammonia solution. Therefore, in case of an emergency, there is a larger risk that people in the area would be exposed to dangerous levels of ammonia in the air they breathe.

The main aspect of the scenario was to focus on the inhabitants and those involved in activities in the vicinity of the transport route.

The participants agreed that the following elements should be important to the authorities in the decision-making process:

- 1 Primarily, the project has to be thoroughly described. This includes a description of the residential area as well as a description of all aspects regarding the transport. Furthermore, an assessment of the economic consequences of the project will be of importance.
- 2 The decision-makers have to comply with national and international laws as well as standards. In addition, they have to make sure that all parties involved are heard.
- 3 Information regarding similar projects should be collected. This includes accident rates and consequences for such or similar transports. This should be followed up by a discussion as well as "brainstorming" about possible accident scenarios based on the information.
- 4 A discussion of how to reduce the consequences of an accident is necessary. This includes the emergency management element.

Then the work group discussed which planning tools would be useful in this situation.

- 1 A Geographical Information System (GIS) or other simulation system.
- 2 A risk assessment method, which – when used – describes and quantifies risks. Furthermore, it could be useful to make a risk profile of the various alternatives based on the risk assessment method. Cost-benefit analyses that includes economic and civil protection parameters.

Having described the issues important to the decision-making process, the competent authorities could make demands on, for instance, prevention, repression, mitigation and after-care. The work group discussed the following demands:

- 1 The chemical site shall at an early stage provide a report verifying that the transport is carried out in the most secure manner and that the risks are acceptable.
- 2 Special education, proper equipment and exercises for persons and rescue teams.
- 3 Forbid transports during rush hours and during periods when the school is populated by restricting transports to certain periods of time.
- 4 Speed must be reduced in the populated area.
- 5 Special accident emergency management including handling plans for accidents.

In case of an accident the legal and economic consequences depend on the specific accident. However, the authorities who have given permission for this transport will have a moral responsibility.

Following such an accident the chemical site will – although it may have fulfilled the authorities' demands - have an image problem.

In the work group there was a general discussion about the different words used in the safety chain. The common view was that it was important to define words such as pro-action, prevention, preparation, repression, mitigation and after-care. Work group members had opinions about words' meanings.

The general feeling was that a definition of the words in the different countries would provide a good base for future discussions. This could improve communication between the different interest groups and people.

Denmark works with the safety chain from a legal point of view: the Danish Law no. 1054 of December 23, 1992 on preparedness (Beredskabsloven) states that the Danish Emergency Management Agency's task is to prevent, reduce and mitigate injuries to persons, property and environment when accidents occur. Denmark recognizes the importance in taking all safety issues into account as early as possible in the decision-making process, in order to prevent, reduce and mitigate injuries to persons, etc. Denmark therefore emphasizes the importance of the pro-action step in the safety chain.

Parallel Workshop: Integral approach to safety and security aspects concerning the (partially) underground shopping center “Koopgoot” in the city center of Rotterdam

Scenario

Central theme: *The integral consideration of decisions in respect of the development of a (partially) underground shopping center in downtown Rotterdam.*

Rotterdam has the image of being a city with a no-nonsense attitude. The international seaport and the new city center with its many high-rise office buildings seem intent on illustrating this.

Rotterdam’s “shopping center” is divided into two by the Coolsingel, an important main road from South to North for cars, busses and trams. Below the Coolsingel runs the North-South line of the underground railway, with an underground station under the Beurs square (off the Coolsingel) that can be used as a pedestrian subway.

As a physical barrier between two shopping areas, the Coolsingel used to have a negative influence on shopping appeal. This made it more difficult to promote an improved image of the city in other areas than ‘Work and Business’. The pedestrian subway was hardly used because of people’s fear of crime.

Rotterdam sought a solution and ultimately found one in the form of a (partially) underground shopping center. This project realized a linking of the two shopping areas, while integrating the underground station. The so-called “Koopgoot” (buying gutter) is situated below the average water level of the Maas river.

Aspects that could have played a role in the decision-making process:

1 Safety and security

Various safety and security aspects played a role, such as fire safety effects, flooding, crime and burglaries. In such an underground shopping center, public safety tends to play a particularly important role. Visitors should be able to feel safe. This can be achieved by, among other things, clearly visible monitoring, in the form of video cameras and security staff. It is also important to construct sound, clearly-marked escape routes. After all, fire in an underground construction involves extra risks, because it is difficult for smoke to escape.

2 Image

Image is another important consideration in the decision-making process. The city of Rotterdam can benefit from a popular shopping center in the heart of the city. The existing shopping center is not exactly a “showpiece”. With the arrival of the new shopping center it will be possible to attract new visitors. The shopping center will also have more unusual, more exclusive shops attracting a different kind of visitor.

The design, the image and the above-mentioned safety and security aspects of the shopping center contribute towards a positive image for the heart of the city.

3 Surrounding area

As part of the integral consideration of decisions the area immediately surrounding the proposed shopping center also plays an important role. After all, if other organizations have been planned in the surrounding area (such as for example a school) this may influence aspects such as crime, image and thus the number of visitors.

4 Economy

The presence of a shopping center in the heart of the city naturally also boosts the economy.

Visitors will be traveling to and from the city center and will in most cases be spending money. It will be necessary to recover the costs of investing in a new shopping center and this aspect should therefore carry a lot of weight.

Items for discussion

- Should the above aspects (safety and security, image, surrounding area and economy) be discussed in the planning stage (spatial planning, zoning regulations)?
- If so, how?
- How does safety in this stage relate to the other three aspects mentioned?
- What can (still) be done, when the next stage has already been reached? I.e. when the plans are more or less completed and the design is being developed further.
- How does safety in this (advanced) stage relate to the other three aspects mentioned?
- Taking all these items into consideration, could another decision have been reached?

Chairman

D. Fundter

Secretary

Ms. J. Holthuis

The question in what stage the four aspects (safety and security, image, surrounding area and economy) should be discussed, was unanimously answered: in the earliest stage possible.

Safety

For argument's sake, the participants first focused exclusively on the safety aspect. The question whether and how safety relates to the other three aspects mentioned above was discussed. Each of the participants wrote down their main ideas and suggestions about safety with respect to this project. Because of the participants' different nationalities and backgrounds, the discussion bore fruit, and some refreshing ideas were brought up.

The Irish participant stated that the population is very important. For example, the number of people that will visit the shopping center, the types of people (highly educated people place other demands than less educated people). Another important factor is the movement of these people; how will they move in and out of the area?

Furthermore, one has to consider all the scenarios: what kinds of threats can be expected?

For example: fire, bomb threat, evacuation, crowd movements, etc. A final aspect mentioned by the Irish participant was the construction of the building. This includes alarm systems, monitoring, cameras, etc.

The participant from Norway also emphasized the importance of the population. He claimed that the population should be involved in the planning process. Not only will the population be the future customers - who need to feel safe in the shopping center - but they also live and work in the surrounding area. Norway seems to have a regulation concerning the involvement of the population. Planning and building a shopping center may not be initiated without doing some sort of social mapping; what kinds of people live and work in the surrounding area, what kinds of people will likely visit the shopping center?

The necessity of a risk and vulnerability analysis for the shopping center was also mentioned by the Norwegians. What are the scenarios, what can be expected, how many people will have to be evacuated, etc.

The Dutch participant stated that there have to be enough escape routes in a building.

Another important item: the center has to be open and large, to create a safe image. Finally, he stated that the scenarios should be drawn up together with the fire brigades. An important aspect of scenarios should be the question of how people behave in disaster situations.

The representative from Finland came up with the idea that safety may not be hindered by modern architecture. He gave an example from Finland, where a shopping center has walls of glass that mislead people about the escape routes. One should be aware of this.

Special attention should also be paid to provisions for disabled people, elderly people and others who cannot move as fast and as easily as others. The shopping center should be accessible to everyone.

Another interesting aspect discussed was the fact that Europe is becoming a multicultural society. This means that people from all kinds of nationalities will visit the shopping center.

Directions in case of disasters and escape routes should be logical and understandable to everyone, for instance, there should not be hundred signs to show the way out. People of other nationalities must also understand what to do in case of a disaster and where to leave the building. The building has to communicate in a non- verbal way to everyone. This is a challenge for the future.

Economy

When the focus turned towards the economic aspect, there seemed to be various considerations as far as this project was concerned. Most of these considerations create tension with the other aspects, such as safety. Guaranteeing a completely safe shopping center can only be done at extremely high cost. A balance between safety and economy must be found. This means that there will always be a certain level of danger. This is a consequence of the fact that each project is limited to its established budget.

The Dutch participant stated that the acceptable level of danger (and therefore the acceptable level of safety) has to be established by the local authorities together with the fire brigades. Scenarios and risk analyses are of the utmost importance in deciding the right level of safety. Safety has its price.

The Finnish representative mentioned the influence of insurance companies on the establishment of an acceptable safety level. The more safety is guaranteed by technical matters, the more willing the companies will be to provide (fire) insurance for the building.

The Swedish and Danish participants asked themselves and the other participants 'how safe is safe'? What is an acceptable level of safety? They invited the European Union to decide this in directives to its members.

They also brought up the connection of economy and image. In order to attract highly positioned, rich people who can influence the economy of the city in a positive way, a certain atmosphere has to be created in the shopping center. This means that among other things the shopping center should have a safe image. A safe image can be created by using certain materials (which might be more expensive), and other extra provisions, that might cost extra.

However, they also emphasized the importance of a good design; a good design will save money. For example, extra measures to prevent shoplifters from striking and escaping will pay themselves back.

Image

Finally, the workshop turned towards the image of the new shopping building. They discussed whether image should be a subject of importance in the planning stage of a project like this and how image relates to safety and economic aspects.

A shopping center with a good image attracts a certain kind of people. In order to attract well-to-do people who can boost the economy of the city, the shopping center should therefore be clean, neat and safe.

The Swedish and Danish participants emphasized that image is a psychological factor; people feel safe, but they do not necessarily have to be safe. It is a personal feeling that one must appeal to.

Conclusion

After having discussed all these items, some conclusions were:

- Safety should be an important issue right from the start of each project. A pro-active approach is very important.
- Communication is crucial. This includes not only communication with the population in the surrounding areas and with the future visitors of the building (social mapping), but also within the

building itself. A new building should communicate and be understandable to everyone. This means no difficult directions or hundred signs, but a logical building.

- Risk analysis also seems to be of great importance. The possible scenarios and the way people behave in disaster situations should be studied together with the fire brigade.

In the case of “the Koopgoot”, the participants tried to find a balance between the four above-mentioned aspects. It seems that the four aspects constantly influence each other. The aspect of safety should not be isolated in a big project like “the Koopgoot”. Safety turns out to not only be a technical problem; psychological and financial factors also figure prominently. People who are responsible for safety, such as the people present at this workshop, should realize that they need to cooperate with others in order to create a safe building.

The economic background and the budget for a certain project determines the level of safety that can be created. This level has to be acceptable to all the participants. In order to value this level scenarios and risk analyses should be made together with the fire brigades. The image of a future building is also an important factor in decision-making. All of these aspects should be discussed in the earliest stage possible. A pro-active approach is most important.

Chairman

G. Romano

Secretary

S. Meijer

The German representative did not consider image and economy a problem for the fire department. It is a problem for the shopping center! This thesis was not supported by the Swedish and Norwegian participants. The considerations made in the planning stage of a shopping center affect the level of safety in a later stage of the process. Image and economics should figure prominently at this stage.

The chairman suggested dividing the problem of influence in the planning into two levels. The first level is the level of politics; image and economics are key issues for politicians. If you want to change things on this level you have to play the political game. The second level is the technical level, in which the fire department of a community is involved. In Italy the fire department is independent of the community. This is one of the reasons why the fire department is not involved in urban planning, etc. The German representative reacted by stating that in his country the communities are obligated to ask the fire department for advice.

In Norway the fire department is asked for advice when the key decisions have already been made. However, the fire department has possibilities to withhold the use of a dwelling. Since the community realizes that the fire department has this power, they are often more willing to ask for advice at an earlier stage.

Italy stated that to get involved is mostly a matter of marketing. Safety is a product that you should put on the market, so it can be distributed in the conscience of decision makers. According to chairman Peter van Lochem, safety must be seen as a commercial product. Denmark confirmed this. For politicians image and economy are important. You should convince them that safety is linked to those issues.

The case of “the Koopgoot” raised the question of what the problem is. Is it unsafe? If you build this kind of constellation you should create more emergency escapes. So then again, what is the problem? Denmark led this discussion. The rest of the group confirmed this opinion. If the risks are higher than in a normal situation, one should take preventive measures to reduce the risks. As long as it is technically possible there are no problems. Problems only emerge when the fire department is not involved in earlier stages of the construction. In principle, the fire department should be asked to make a “go / no go” decision in the planning phase. The German participant gave an example of a dwelling that was to be built in front of a dike. The fire department stopped this plan by convincing the project developer that the risk of flooding was to be taken seriously.

In Norway, Germany and Denmark a dwelling is inspected by the fire department before it is used. If the building is safe enough it may be used, otherwise use is prohibited until additional safety measures are taken. The Greek participant asked the German if the use of the new dwelling is limited to a license period. In Germany only special types of buildings have to be examined at certain intervals.

Chairwoman

Ms. A. van Daalen

Secretary

A. Griffioen

The discussion began with participants' descriptions of when and how the fire brigades are involved in building projects.

The Danish representative pointed out that in Denmark the fire brigades become involved in most projects only if building plans are almost finished and need safety approval from the fire brigade. Their job is to examine the building plans. Furthermore, he pointed out that though risk assessments are carried out, this is done by the municipality and not by the fire brigade, except for projects involving risky objects such as chemical plants, for which the fire department acts as a consultant. Apart from this, because of Copenhagen's very old and beautiful center, one cannot build everything everywhere. The city planning department has to perform a risk assessment and the municipality has to prove that the attendance time for the fire-fighting and rescue services is adequate.

The Norwegian representative pointed out that municipalities in Norway do risk assessments before the final planning phase and that for large (risky) projects the law requires a risk assessment involving the fire department.

In the UK the fire department is also involved later in the design process, though there is a tendency to involve the fire departments during "the land zoning" stage, because of the historical growth patterns in most old cities. The cities have evolved around industrial areas, so nowadays a lot of 'heavy' industry is situated within the cities. The aspect of attendance time for those areas is very important for the rescue services and they are therefore involved in the land zoning phase at an early stage.

In Italy, fire safety is a 'state' issue and so the fire department of a region has to give its approval to the (fire) safety of a building before one can 'use' the building. The municipality decides on the land-use purpose of an area (industry, commerce, living, etc.), for which decision it uses a risk assessment.

The fire department is directly involved only for 'big' projects during the design process, including the planning.

In Italy, too, one can observe a growing tendency to carry out risk assessments and request more involvement from the fire departments.

The chairwoman asked: 'What happens when there turns out to be a real suppression problem?'

In relation to this issue, the Norwegian representative asked whether any international regulations or rules about maximum attendance times exist. The chairwoman answered that she did not know whether such international rules exist, but that The Netherlands do have such rules.

The Italian representative pointed out that in Italy one did not in the first place rely on active repression such as sprinklers, but rather primarily on passive repression. This means that the construction of the building must be solid and fire 'safe'.

The chairwoman asked: 'What if the municipality says, "we want this number of shops, this big, but active repressive measures such as sprinklers are too expensive?'"

In Italy one cannot open a building without fire department approval, so ultimately the fire department may prevent the building from being used. To avoid such an extreme measure, everyone works together to design a structure to everyone's satisfaction.

In Denmark, too, the fire department must approve a building before it can be used. In case of a disagreement about a real safety problem, the Danish Emergency Agency can conduct a safety exam.

The "Koopgoot" case was then examined in detail. The chairwoman made a rough sketch of the "Koopgoot" and explained how the building, its exits and safety measures are constructed.

Based on that sketch, the Italian representative said that in Italy one would try to prevent 'communication' between the different parts of the construction in case of a fire. He pointed out that in Italy the fire department would never have given its approval to a construction where the underground station, the underground shopping area and the surrounding shopping area were in direct contact with each other. In Italy this would have been halved by passive prevention aids such as fire doors. He also noted that he had seen shop signs hung beneath parts of the sprinkler system.

The representative of the U.K. asked whether it was possible to adjust the stairs at the ends of the "Koopgoot" so that fire trucks and ambulances could pass by them. The general opinion was that the distance between the underground part of the construction and the areas for accommodating fire trucks and ambulances was too big. Another important issue he mentioned was how to get in the underground station in case of an emergency and if there was a communication system to alert people in the shops. The chairwoman reacted that she did not know of the existence of such a system.

Now everybody was asked to use the hexagons to write down pro-active, preventive, preparative and suppressive points to consider, and put them on the white boards. The points were then grouped into a couple of common themes.

Pro-active:

Fire departments and other aid services should be more involved during the planning and decision-making 'moments' of building (and other) projects.

This means, for instance, that already during the spatial zoning and planning phase of a project one has to take aid service attendance times into account and do risk assessments supported by fire departments and other rescue services.

Preventive:

The preventive points can be categorized into a couple of themes:

- 'compartmentalization' (close entrance to subway, with fire doors and/or sprinkler shielding or limit the fire load - in which case one can build bigger compartments in Italy and The Netherlands).
- full blown automatic sprinkler systems and smoke detectors
- alarm and communication systems for evacuation(guidance) and suppression coordination
- ventilation systems for smoke and air
- systems such as dry risers and fire hydrants should be planned
- a system to stop the trains before they enter the underground station

When all these more 'technical' aids have been installed or provided for, one has to teach people how to handle them and how to react during an emergency:

Preparative:

This can be achieved by drawing up an evacuation plan for shopping area staff and customers and for the people in the subway station.

An evacuation plan is not sufficient: shop personnel also have to be trained in how to act during an evacuation.

The aid-services have to be trained for this special kind of structure regularly.

Another important point was that there should be a plan for decision-making about the ventilation (direction). The two tunnel disasters in 1999 in the Alps underscore the importance of such a plan.

Suppression:

For a worst-case scenario, the following suppression points were mentioned:

In the first place there should be a good (underground) communication system between the fire-fighting and other rescue services.

Secondly, there should be a joint command center; this room should be planned for during the preventive 'phase'.

Finally, there should be arrangements for triage points.

The opinion of the work group members was that all of the above-mentioned elements should either already have been done and be present, or should be carried out to make the "Koopgoot" 'safe'. The question of whether these elements have already been incorporated was left unanswered.

7 Concluding remarks

The workshop showed different approaches by the participating countries.

- Especially on the “left side” of the safety chain, pro-action and prevention, the laws and regulations in each country vary from each other.
- In the plenary lectures Italy emphasized the operational aspects towards the clients, the community on local level. Norway and The Netherlands on the other hand emphasized on policy aspects by using various instruments to study and implement the safety aspects.

But notwithstanding the different scenarios and input, the workshop showed similarities.

Recommendations by the participants:

- All aspects of the safety chain should be discussed in the earliest stage possible. A pro-active approach is most important!
- There is a need for more consciousness about risks and more priority to avoid risks. Furthermore, there is a need for more awareness on both governmental and local level.
- The suggestion was made that for European countries a standard unity in safety aspects could be developed and applied.
- Safety measures should be evaluated and adjusted on a regular basis.
- The common view was that it is important to clearly define words such as pro-action, prevention, preparation, repression, mitigation and after-care. This could facilitate and therefore improve future communication between the different interest groups and people.
- Last but not least, the integral approach of safety was a main issue. The importance of both social and physical aspects was stressed. In other words, the surrounding area of the object also plays an important role, both socially and physically, in the decision making process regarding safety aspects.

The workshop Safety Chain was very interesting and productive. The participants were given the opportunity to meet colleagues from other European countries and discuss their different approaches and suggestions on safety elements. Much information was exchanged about the various instruments used in the individual countries. The importance was stressed of communicating on these subjects on a regular basis.

8 List of participants

E. Schulte

**European Commission
Administrator
174, Boulevard du Triomphe
B-1160 Brussels
Belgium
Tel.: #32 2 296 0224
Fax: #32 2 299 0314
E-mail: ernst.schulte@dg11.cec.be**

P. Christensen M.Sc.

**Ministry of the Interior
Emergency Management Agency/Chem.Eng.
Datavej 16
DK-3460 Birkerød
Denmark
Tel.: #45 45 825 400
Fax: #45 45 826 565
E-mail: pec@brs.dk**

M. Graversen

**Copenhagen Fire Brigade
Divisional Officer
H.C. Andersens Boulevard 23
DK-1553 Copenhagen V
Denmark
Tel.: #45 33 662 929
Fax: #45 33 664 931
E-mail: mads_graversen.112@ipost.kk.dk**

L.B. Jørgensen

**Emergency Management Agency
Fire Inspector
Blomstervenget 10
DK-7100 Velje
Denmark
Tel.: #45 75 832 035
Fax: #45 75 832 065
E-mail: lbj@beredskabsstyrelsen.dk**

P. Kaas-Claesson

**Ministry of the Interior
Emergency Management Agency/Major
Datavej 16
DK-3460 Birkerød
Denmark
Tel.: #45 45 825 400
Fax: #45 45 826 565
E-mail: pkc@brs.dk**

K. Møller

**Emergency Management Agency
Principal in the Development and Research Unit
Datavej 16
DK-3460 Birkerød
Denmark
Tel.: #45 45 825 400
Fax: #45 45 826 565
E-mail: krm@beredskabsstyrelsen.dk**

K.Koskela

**Rescue Department of Pietarsaari
Chief Fire Officer
Kristinankatu 2
FIN-68600 Pietarsaari
Finland
Tel.: #358 6 785 1802
Fax: #358 6 723 7056
E-mail: jukka.metso@sm.intermin.fi**

J. Metso

**Ministry of the Interior
Rescue Department - Chief Engineer
P.O.Box 257
FIN-00171 Helsinki
Finland
Tel.: #358 9 160 2985
Fax: #358 9 160 4672
E-mail: jukka.metso@sm.intermin.fi**

J. Förster

**Regierungspräsidium Dresden
Abteilungsleiter
Stauffenberg Allee 2
D-01099 Dresden
Germany
Tel.: #49 351 825 2000
Fax: #49 351 825 9200/801 4514**

S. Heidenreich

Fire Department Hamburg

Fire Officer

Westphalensweg 1

D-20099 Hamburg

Germany

Tel.: #49 40 428 512 001

Fax: #49 40 428 512009

S. Hogan

Department of the Environment & Local Government

Fire Adviser

Custom House

IRL-Dublin 1

Ireland

Tel.: #353 1 888 2374

Fax: #353 1 888 2888

E-mail: sean-hogan@environ.irlgov.ie

G. Gnecci

National Fire Corp (MOI)

Staff Officer of the Bergamo County Fire Department

Via Codussi no. 9

I-24100 Bergamo

Italy

Tel.: #39 035 463 001

Fax: #39 035 235 036

E-mail: gignecc@tin.it

G. Romano

National Fire Corp (MOI)

Engineer - Chief of the Pisa County Fire Department

Viale delle piagge no. 1

I-56124 Pisa

Italy

Tel.: #39 050 941 901

Fax: #39 050 941 940

E-mail: vfcompio@interbusiness.it

J.H. Bal

Ministry of the Interior and Kingdom Relations

Crisis Management and Fire Services Department

P.O.Box 20011 - H 1409

NL-2500 EA The Hague

The Netherlands

Tel.: #31 70 426 7542

Fax: #31 70 426 7713

E-mail: huib.bal@minbzk.nl

Ms. A. van Daalen

Fire Brigade Rotterdam
Head of Prevention Division
P.O.Box 10901
NL-3004 BB Rotterdam
The Netherlands
Tel.: #31 10 446 8261
Fax: #31 10 446 8299
E-mail: a.vandaalen@brandweer.rotterdam.nl

D.Q.P. Fundter

Ministry of the Interior and Kingdom Relations
Crisis Management and Fire Services Department
P.O.Box 20011 - H 1420
NL-2500 EA The Hague
The Netherlands
Tel.: #31 70 426 7323
Fax: #31 70 426 1444
E-mail: dick.fundter@minbzk.nl

Ms. M. van Gils

Ministry of the Interior and Kingdom Relations
Crisis Management and Fire Services Department
P.O.Box 20011 - H 1402
NL-2500 EA The Hague
The Netherlands
Tel.: #31 70 426 6418
Fax: #31 70 426 7713
E-mail: maddy.gils@minbzk.nl

A. Griffioen

Ministry of the Interior and Kingdom Relations
Crisis Management and Fire Services Department
P.O.Box 20011 - H 1419
NL-2500 EA The Hague
The Netherlands
Tel.: #31 70 426 7272
Fax: #31 70 426 7713
E-mail: andre.griffioen@minbzk.nl

G. Herkemij

Ministry of the Interior and Kingdom Relations
Director of the Crisis Management and
Fire Services Department
P.O.Box 20011 - H 1429
NL-2500 EA The Hague
The Netherlands
Tel.: #31 70 426 7394
Fax: #31 70 426 7424

Ms. J. Holthuis

Ministry of the Interior and Kingdom Relations
Crisis Management and Fire Services Department
P.O.Box 20011 - H 1418
NL-2500 EA The Hague
The Netherlands
Tel.: #31 70 426 7418
Fax: #31 70 426 7713
E-mail: joan.holthuis@minbzk.nl

Ms. P.M. Joosten-Evenaar

Ministry of the Interior and Kingdom Relations
Crisis Management and Fire Services Department
P.O.Box 20011 - H 1402
NL-2500 EA The Hague
The Netherlands
Tel.: #31 70 426 7681
Fax: #31 70 426 7713
E-mail: pauline.joosten@minbzk.nl

Ms. M.N.H. Kieboom

Ministry of the Interior and Kingdom Relations
Crisis Management and Fire Services Department
P.O.Box 20011 - H 1401
NL-2500 EA The Hague
The Netherlands
Tel.: #31 70 426 7417
Fax: #31 70 426 7713
E-mail: monique.kieboom@minbzk.nl

P.J.P.M. van Lochem

Netherlands Institute for Crisis Management and Fire Services
Director
Kemperbergerweg 783
NL-6816 RW Arnhem
The Netherlands
Tel.: #31 26 355 2457
Fax: #31 26 355 2406

R. van Loo

Ministry of Housing, Infrastructure and Environment
Policy maker
Rijnstraat 8
NL-2500 GX The Hague
The Netherlands
Tel.: #31 70 339 4724
Fax: #31 70 339 1314

S. Meijer

**Ministry of the Interior and Kingdom Relations
Crisis Management and Fire Services Department
P.O.Box 20011 - H 1405
NL-2500 EA The Hague
The Netherlands
Tel.: #31 70 426 6127
Fax: #31 70 426 7713
E-mail: sjirk.meijer@minbzk.nl**

mr. Ing, H.W. Meulendijks

**Regional Fire Brigade Utrecht
Head of the Public Safety Division
Briljantlaan 3E
NL-3523 CD Utrecht
The Netherlands
Tel.: #31 30 286 7807
Fax: #31 30 286 7859 (7807)**

ir. J.W. Scherjon

**Regional Fire Brigade Achterhoek
Regional Commander
P.O.Box 53
NL-7000 AB Doetinchem
The Netherlands
Tel.: #31 314 321 320
Fax: #31 314 364 078**

E.J. Verweij

**Ministry of the Interior and Kingdom Relations
Crisis Management and Fire Services Department
P.O.Box 20011 - H 1406
NL-2500 EA The Hague
The Netherlands
Tel.: #31 70 426 7260
Fax: #31 70 426 7713
E-mail: jos.verweij@minbzk.nl**

Ms. J.C.H. Visser

**Ministry of the Interior and Kingdom Relations
Crisis Management and Fire Services Department
P.O.Box 20011 - H 1418
NL-2500 EA The Hague
The Netherlands
Tel.: #31 70 426 1471
Fax: #31 70 426 7713
E-mail: jacotien.visser@minbzk.nl**

R. Vrolijk

**Ministry of the Interior and Kingdom Relations
Deputy Director of the Crisis Management and
Fire Services Department
P.O.Box 20011 - H 1432
NL-2500 EA The Hague
The Netherlands
Tel.: #31 70 426 7398
Fax: #31 70 426 7424
E-mail: rudi.vrolijk@minbzk.nl**

Ms. A.K. Henriksen

**Directorate for Civil Defence and Emergency Planning
Senior Executive Officer
P.O.Box 8136 Dep
N-0033 Oslo
Norway
Tel.: #47 22 358 572
Fax: #47 22 382 824
E-mail: ann-kristin.henriksen@dsb.dep.no**

O. Kirkeby

**Directorate for Civil Defence and Emergency Planning
Adviser
P.O.Box 8136 Dep
N-0033 Oslo
Norway
Tel.: #47 22 358 375
Fax: #47 22 382 675
E-mail: odd.kirkeby@dsb.dep.no**

N.I. Larsen

**Directorate for Civil Defence and Emergency Planning
Assistant Director
P.O.Box 8136 Dep
N-0033 Oslo
Norway
Tel.: #47 22 358 566
Fax: #47 22 382 675
E-mail: nils.ivar.larsen@dsb.dep.no**

R. Steen

**Directorate for Civil Defence and Emergency Planning
Adviser
P.O.Box 8136 Dep
N-0033 Oslo
Norway
Tel.: #47 22 358 587
Fax: #47 22 382 675
E-mail: roger.steen@dsb.dep.no**

S.G. Bergström

**Räddningscenter
Chief Fire Department
S-653 40 Karlstad
Sweden**

Tel.: #46 54 297001

Fax: #46 54 297016

E-mail: stefan.bergstrom@karlstad.se

S. Hammerstedt

**Swedish Association of Local Authorities
Chief Adviser Section for Energy Policy, Emergency Planning and Public Security
Hornsgatan 15
S-118 82 Stockholm
Sweden**

Tel.: #46 8 772 4192

Fax: #46 8 641 5185

E-mail: sven.hammarstedt@svekom.se

U.T. Norgren

**Swedish Rescue Services Agency
Deputy Head of Department
Karolinen
S-651 80 Karlstad
Sweden**

Tel.: #46 54 104130

Fax: #46 54 102889

E-mail: ulf.norgren@kdslv.se

B.D. Ward

**West Yorkshire Fire & Civil Defence Authority
Emergency Planning Manager
Emergency Planning Unit - Oakroyd Hall - Bradford Road
Bradford BD11 2DY
United Kingdom**

Tel.: #44 1274 655 760

Fax: #44 1274 655 769

E-mail: ward.brian@virgin.nett