

DISASTERS IN EUROPE: EXAMPLES, OPINIONS, AND INVESTIGATIONS

by

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Abstract

Disasters and accidents in Europe are analysed and discussed from three different angles: the statistical overview of disasters in Europe 1975 – 2000, three opinion surveys from France, Belgium and Norway during January 2002 till January 2003, and a survey among public authorities and companies concerning the value of accident investigation (April 2001 till January 2002). The main facts from all the three sources are presented in separate chapters. The findings are considered and commented with special focus on comparisons. At the end, four different challenges are presented and proposals described.

Disasters in Europe in recent years

Several disasters from natural events and technical breakdowns have during the recent years shocked Europe. The consequences have been many lost lives and severe material damage. Politicians, safety authorities, victims, mass media, and the public have asked questions about the causes; some have focused on the possibilities to prevent similar accidents. They all unite in the common belief that some disasters could have been prevented, and that the severe consequences arising from other disasters could have been reduced. These disasters have a very wide scope – they range from natural events, via technological accidents to comprehensive public health treats. Examples from the recent years of such disasters can be used to illustrate the risks in different fields:

Natural events:

Flooding in Germany, Austria and Hungary; avalanches in Switzerland and Austria; wildfires in France and Greece; earthquakes in different countries

Man-made disasters:

Disco fire in Gothenburg, Sweden; chemical explosion in Toulouse, France; firework explosion in The Netherlands; collisions and fires in road tunnels; rail accidents in Germany, England and Norway.

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New threats:

For example, disasters connected to civil space activity; accidents due to software programme failure; diseases caused by meat; attacks organised by different groups representing a new kind of international terrorism.

Disasters and great accidents represent significant losses for society as measured in lives lost, material damage, environmental disturbances, productivity consequences, confidence deterioration etc. It might not be true, but the overall impression based on the media coverage is that the frequency of great accidents in Europe through the latest 5 years has increased as well as their severity.

Unfortunately, the data available cannot describe the trends in all disasters in Europe. However, a statistical overview of natural disasters in Europe in the period 1975 – 2000 gives us the following comprehensive picture:

Table 1: Disaster Characteristics in Europe 1975 - 2000²

| Type | No of Disasters | | No of People Killed | No of Totally Affected People | Amount of Damage in US\$ |
|--------------------|-----------------|------------|---------------------|-------------------------------|--------------------------|
| Earthquake | 16 % | 135 | 46 % | 10 % | 19 % |
| Epidemic | 3 % | 25 | 3 % | 1 % | |
| Extreme temp. | 10 % | 81 | 20 % | 3 % | 1 % |
| Famine (natural) | 0% | 2 | | 12 % | |
| Flood | 26 % | 220 | 14 % | 22 % | 56 % |
| Drought | 3 % | 24 | | 22 % | 7 % |
| Volcano | 2 % | 16 | | | |
| Slide | 5 % | 44 | 6 % | | 1 % |
| Insect infestation | 0 % | 1 | | | |
| Wild fire | 8 % | 66 | 1 % | | 1 % |
| Wave/surge | 0 % | 1 | | | |
| Wind storm | 27 % | 225 | 10 % | 30 % | 15 % |
| TOTAL | | 840 | 18.050 | 26,96 mill. | 178.77 Bn US\$ |

The Data Book summarizes the situation in Europe in the following way: In Europe, 70 % of the total disasters are caused by natural events: windstorms (27 %), floods (26 %) and earthquakes (16 %), and it is also made distinctive in that they have more wild fires (8 %) occurred in Europe compared to the other areas. The number of people killed accounts for 46 % of earthquake and 20 % of extreme temperature such as cold wave. Windstorms (30 %), floods (22 %) and drought (22%) effect the largest number of people affected, and for economic damage, floods (56 %), cause the largest impact on Europe³.

The picture is heterogeneous with no type of disaster as predominant on all indicators: wind storms occurred most often (225) and affected most people (8,1 million), earthquake caused most fatalities (8.303), while floods had very severe economic consequences and costs about 100 Bn US\$.

² Based on facts from the 20th Century Asian Disasters Data Book, ch. 2 (August 2002)

³ Ibid.



Public opinion concerning risks: Examples from France, Belgium and Norway

Public opinion about risks are often different from the disasters and accidents which take place in Europe.

Three national opinion surveys from the last 1-2 years give us several facts. The survey in France was done by IRSN (Institut de Radioprotection et de Surete Nucleaire) in November 2002; a quite similar study was done in Belgium at the same time by SCK-CEN (Belgium Nuclear Research Centre)⁴. The Norwegian studies were done in January 2002, August 2002, and January 2003 by Agenda on behalf of the Norwegian Directorate for civilian defence⁵.

France and Belgium

| Some of the questions: | France (in %) | Belgium (in %) |
|---|--|--|
| „In France (resp. Belgium), among the present problems mentioned in the list, which one is the main source of concern to you? And the second one?“ | | |
| <ul style="list-style-type: none"> • Insecurity • Terrorism • Degradation of the environment • Addiction to drugs, alcohol, etc. • Misery and exclusion • Unemployment • Road traffic accidents • Nuclear risks | 40 22 11 21 22 27 20 12 | 33 34 19 30 15 14 14 13 |
| (Percentages cumulated, explaining why the sum is over 100 %) | | |
| Percentage of the population in France and Belgium answering ‘No’ to the question whether they think the truth has been told to them about..... | | |
| <ul style="list-style-type: none"> • Nuclear power plants • Chemical plants • Nuclear waste • Chemical waste • Chernobyl fallout | 56 61 63 63 75 | 60 57 63 61 65 |
| “Would French (resp. Belgian) authorities take necessary protective actions in the event of an accident in a nuclear plant in France (resp. Belgium)?“ | | |
| <ul style="list-style-type: none"> • Yes • No | 23 68 | 17 69 |

Norway

Since the same questions have been asked three times with a time span of 1 year, it is possible to see same the trends in the answers. The evaluations of the likelihood for natural disasters and terrorist attacks have been very stable over time, while the respondent’s evaluation of the possibility of transport accidents has dropped and the environment disturbances have increased.

The pattern is different from January 2002 to January 2003 concerning crisis awareness: a larger portion of the population thinks they will be affected by a natural disaster or

⁴ Benny Carle, Sylvia Charron, Alexandre Milochevitch and Frank Hardeman (2003): An Inquiry of the opinions of the French and Belgian Populations as regards Risks. Presented at the 24th ESReDA Seminar in Petten, May 12-13, 2003.

⁵ Agenda (2003): Nasjonalt beredskapsbarometer – resultater fra tre målinger. Internal report, not yet published.



environmental disturbances and a lesser portion (from 45 till 37 %) is concerned about transport accidents which still are the dominant type of accidents effecting people.

| Some of the questions: | Norway (in %) |
|--|--------------------------|
| Question concerning the most likely event out of 9 possibilities. Results for the five most frequent answers from the January 2003-survey: <ul style="list-style-type: none"> • Natural disasters • Great public transport accident • Great environmental disturbances • Terrorist attacks • Nuclear accident | 38 21 16 9 3 |
| Question concerning crisis conscience: thinks often or now and then that they might be affected by certain events (January 2003) <ul style="list-style-type: none"> • Natural disasters • Public transport accidents • Environmental disturbances • Terrorist attacks • Nuclear accident | 19 37 9 14 6 |

A European survey of accident investigations

Accident investigation is the most widely used method to clarify the basic, contributing and immediate causes of accidents as well as identifying the appropriate measures to prevent the occurrence of similar events in the future. The obligation to investigate can be mandated by law, or partly necessary by ethical or commercial reasons. From a legal point of view, the European Commission has during the recent years been advocating the need to investigate accidents⁶. One example is the SEVESO II directive on the control of major accident hazards involving dangerous substances; others are sectorial approaches in the transport field, especially concerning aviation, maritime and rail traffic.

On the national level, all EC and EEA countries have the obligation to implement such directives as the Seveso II directive in their national legislation. In addition, many European countries have separate and mandatory obligations upon public and private enterprises to both notify and investigate on their own serious accidents and incidents, especially in the working environment, but also in fields such as transport, process industry and energy production.

On a company level, some firms have established perhaps as part of a safety management system, a systematic reporting system for accident and incident, and a permanent or ad hoc investigation system as a follow up. The reasons may be many: a mandatory duty, ethical or reputation considerations, the need of confidence from their customers, image aspirations etc. However, little or no comprehensive research studies have been done to establish the extension of accident investigation and to measure the effectiveness of such investigation systems or procedures on a European level.

The European safety organisation ESReDA (European Safety, Reliability and Data Association) created a new and separate expert group in 2000 with studies and recommendations concerning accident investigation as the main objective. First of all, there was a need to clarify the use of accident investigation practices among public safety authorities and organisations involved in high risk activities. No extensive study had been

⁶ Sofia Marinho de Bastos (2003): The need for a European Union approach to accident investigations. Presented at the JRC-ESReDA Seminar in Petten, NL, May 12, 2003. Forthcoming in final proceedings.



done so far to map the total situation in Europe. The lack of adequate information about the situation in Europe was a clear drawback to be filled.

As a first step, the ESReDA AI group decided to use a questionnaire in order to gather as much systematic information of the state of the art as possible and to find out if there was a need for information about “good practices” in the field. 136 organisations were selected. The majority were authority or government bodies (92) and the rest mainly industrial firms or organisations, research centres, universities and consultancy firms. A few international organisations, such as OECD and Joint Aviation Authorities, were also included. The questionnaire was sent out in April 2001, a reminder in August 2001 and to some new respondents in January 2002 to include missing countries.

The questionnaire – and the main responses

The questionnaire was structured with 16 questions, partly with given response alternatives. The questionnaire covered several aspects, such as the definition of accident/incident used, the formal investigation structure, the internal decision-makers, the selection criteria used, the objectives, the scope, the procedures/instructions, and information about the standard method (see Appendix 1 to the report).

Altogether, 59 authorities, firms or organisations responded with a few from outside Europe. 49 answers are treated in the ESReDA report⁷, covering 15 countries in Europe. The largest number of answers came from Sweden (11), Norway (10), The Netherlands (6), Finland (5), and France (5). In other words, five countries count for 37 responses or for about 75 % of the total number of answers.

One important reservation is that neither the list of selected authorities, firms and organisations nor the responses can give us a true picture of the actual situation in Europe. Neither the selected target group nor the responses are representative, from several points of view: by country, by public safety authorities, by companies, by academic institutions etc. The information given in the answers must therefore be looked upon as a kind of snapshot, reflecting the situation as discovered and experienced by the 49 respondents.

The respondents were divided in three main categories:

- Authority (27)
- Company (15)
- Research (7) (Consultant/Research centre/University)

Some findings from the survey can be summarized in the following way:

The respondents were asked about the **primary objectives** of the **different levels** in the investigation organisation. Generally, the main objective of **the investigation team** (both in the public and private sector) was to collect facts and to find primary and underlying causes of an accident. Another objective was to prevent a similar accident from happening.

Authority or government bodies also mentioned some other objectives:

- To make recommendations (also mentioned by a research body)
- To find a need for development of legislation
- To find any breaches of law
- To learn from the accident
- To decide on information dissemination

When the question of primary objectives were directly connected to the accident investigations, the concentration on prevention of accidents or recommendation to reduce or

⁷ ESReDA (2003): Accident Investigation Practices – Results from a European Study. Forthcoming.



eliminate the identified threats were even more overwhelming (60 replies). But 23 replies mentioned "just fact-finding" as a primary objective.

The respondents were also asked if a formal investigation is carried out depending on the **probability** and/or the **consequences** of an accident. For about 33% of the responding organisations only the consequences or the consequences weighted by their probability (i.e. the accidental risks) determined whether or not an accident investigation is carried out. While authorities or government bodies concentrate more on consequences, companies tend to also include considerations on risk. About 26% of the responses (especially authorities, but partly also companies) responded that "all accidents" are investigated.

The organisations were also asked if a **formal permanently established organisation** is active in carrying out accident investigations within their field in their country. About 75% of the organisations replied that a formal permanent established organisation was active in carrying out accident investigations within their field in their country.

Next, the organisations were asked if it is **mandatory or voluntary to provide information to an accident investigation team**. For about 66% of organisations the provision of information for an accident investigation team is mandatory (the case of many organisations, and especially the case of most authorities (in some cases mandatory directly by law). Sometimes, in cases where the statement is considered very important and critical, questioning is carried out by bodies representing the law (the police, the court).

Respondents were asked to "*describe the procedures/instructions that are available for carrying out accident / incident investigations*". Several organisations (45%) mentioned that they use some kind of internal procedures, instructions or rules. Some of the organisations are referring to international procedures, such as:

International procedures:

- Annex 13 (Aircraft Accident & Incident Investigation) to International Civil Aviation Convention
- International Maritime Organisation (IMO): Resolution A.849 (20), Code for the Investigation of Marine Casualties and Incidents (27th of November 1997) and Resolution A.884 (21), Amendments to A.849 (20) (25th of November 1999)

The respondents were also asked to "*describe the standard **method** that is recommended for carrying out accident / incident investigations*". Examples are:

- TRIPOD method
- Human error analysis
- Cause-consequence analysis

11 organisations stated that they have a recommended method. However, the largest group explicitly answered that they had no standard method. It can be noted that 12 answers were difficult to interpret, and they were classified as "unclear". Among the 11 organisations with a recommended method, five selected Cause-consequence analysis. The rest of these organisations had all chosen different methods. These were Fault Tree Analysis, Human Error Analysis, Probability Risk Analysis, and Root Cause Analysis. In all, there were 14 names of different methods mentioned. Of these, eight of the methods were mentioned by only one respondent each.

A clear majority (69%) of the organisations referred to a standard procedure of some kind for making the investigations. The procedure issue had a much higher priority than the choice of methods. It was a large variation on the view on methods, both considering the use and the preferred type of method. There was no clear dominance for any specific method.



Some considerations and conclusions

The facts are not identical in several respects. Natural disaster statistics cover a 25 year period, while the opinion surveys in France, Belgium and Norway either cover one moment (November 2002) or a short span of time (January 2002 – January 2003). The ESReDA survey is from April 2001 – January 2002. The focus and findings represents different approaches. Nevertheless, some considerations can be done:

The statistics concerning natural disasters in Europe 1975 – 2000 reveal a topic of high importance due to the consequences: a relative large number of disasters (840), many fatalities (18.050), many people affected (26,96 mill) and a great amount of damage as measured by US\$ (178.77 Bn). The variations according to type of disasters and their consequences are very large. But compared with other types of accidents, e.g. road traffic accidents or even more school- and leisure time accidents), the numbers are quite low.

The peoples concerns of natural disasters in some countries (France, Belgium) are rather low. The likelihood is stipulated higher in Norway (38%) but with less crisis conscience (19%). The accident investigation procedure is often based on ad hoc-commissions, and natural disasters are seldom integrated in a multi-modal investigation approach (exceptions: Sweden, Finland, The Netherlands).

The fear of terrorism is more frequently expressed in the French and Belgian population (22 %, resp. 34 %) than in Norway (9%). A thesis might be that central Europe has been more exposed to terrorist attacks during the latest 10-20 years which is reflected in the attitude of the population.

Transport accidents cannot be compared directly, but findings from the different surveys indicate that the safety of private and public transport are of major concerns. While part of the population of France (20%) and Belgium (14%) see road traffic accidents as a main source of concern, the percentage concerning public transport accidents in Norway is 21%. A major part of the respondents from the transport field in the ESReDA survey was from the rail sector, indicating a positive attitude to use accident investigation as a preventive tool. In Norway, however, people who think they might be affected by a public transport accident is around 37 %.

Nuclear risk affects about 12-13 % of the population and France and Belgium but only 3% in Norway, reflecting the fact that Norway has no power plant and that the concern about the consequences from the Chernobyl disaster is fading. However, of technological risks presented in the surveys, the highest probability to cause a serious accident or disaster in Belgium November 2002 was nuclear power plants. Such plants got the highest rank with 53 % followed by dangerous transport (49%).

Concerning risk communication, there is a common scepticism both in France and Belgium about the true risks of nuclear and chemical plants and waste – a large majority of the population in both countries do not believe that they have been told the truth, varying between 56 % till 75 %.

The same sceptic pattern appears concerning the question of protective action taken by the national authorities in case of an accident in a nuclear plant in the country. A majority in both countries (68-69%) have no belief in their authorities in this respect.

The ESReDA survey about accident investigation reveals a positive attitude among several public authorities and companies in using such a tool to find causes and propose measures to prevent similar accidents in the future. However, the definitions, the structure, procedures, methods etc. varies quite a lot among the players. A more systematic and structured approach with well-defined procedures and methods should be developed.



Future consideration:

Based on the facts given concerning the frequencies and severities of disasters in Europe, the main pattern of risk perceptions in the population in some European countries and the replies from the respondents to the ESReDA questionnaire, some important challenges would be:

1. To develop, in close cooperation with key players at the European level and national levels, a **joint research programme** in Europe concerning different aspects of disasters, risk perceptions, accident investigations, emergency management, and prevention strategies, including several state of the art-studies as first phase task. The European Commission should be challenged to take the initiative and the lead in the process that should involve key practitioners, public servants, consultants and research persons. A separate strategy should be developed to disseminate the results from this broad research programme in order to improve the factual use of the results.
2. To collect, analyse, and put together examples of “**good practices**” from three different levels of organisation: international organisations (such as EC, ICAO, IMO, UIC, etc.), national ministries, directorates, inspectorates and public accident investigation commissions; and private companies, and publish the recommended guidelines.
3. To stimulate both legal bodies and operational bodies to enhance more **harmonised measures and tools** in their work with risk perceptions and risk communication as well as accident investigation and emergency management, including definitions, legal requirements (also requirements to objectivity, independence, competence etc), institutional bodies, methods and procedures, reporting systems and routines, standards etc.
4. **TIEMS** should contribute to enhance the abovementioned objectives by motivating and stimulating decision-makers in EU bodies, national authorities and companies to allocate resources for these tasks.

These approaches, among others, would contribute to a safer Europe tomorrow.

