Risk Assessment

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Abstract

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1. INTRODUCTION

Risk management is a topic which solicitated rising interest and subsequently gained significance during the last years. This interest is based on two basic social values which each individual would like to have for granted - safety and security. We are demanding security for our independence, for our rights, for our freedom of action, for the environment issues, for business activities, for our property, but above all for our physical intactness - briefly safety and security for everything influencing our life. Risk management deals with handling the risks and dangers threatening our safety and security and the measures which would ensure safety and optimize security.

The planning of mastering extraordinary situations requires risk analysis in order to avoid preparing in the wrong way or with the wrong equipment. All personnel responsible for management and organization of disaster relief have to be aware of the scenarios, respectively the risks, they may face.

Dangers arise from certain menaces. The word “menace” spontaneously associates with the attack of the individual by any unlawful act or to the field of military strategy, based upon the menace by enemy forces. However, looking at the wide-ranging safety issues whose quality level should be assessed as high as possible by risk management, one will immediately recognize that also menaces threatening individuals or collectives show a great variety. They range from the wobbling kitchen chair to natural phenomenons, accidents caused by our civilization (mainly by handling technology), economic break-downs, unemployment, unknown side-effects of gene technology, criminal acts, to the break-down of political systems and outbreak of war.

The emphasis of risk management should be directed towards the probability of appearance of a menace, or even better towards true risks. In reality, those who are menaced define priorities in a different way. The choice of measures for instant acting depends on the kind of danger, the subjective feeling and also the acceptance to take certain risks.

Examples:

- There is no doubt that the threat by military actions had been judged to decrease during the last years. However, overviewing the world situation in the immediate past, the probability didn’t experience an appreciable reduction. Yugoslavia demonstrated it again in a drastic way. Iraq, Iran, the Gulf war and the Palestine problem are only some further key-words.
- Civil field studies from the U.S. explain the subjective judgment which deviates from reality. The following events caused the below listed numbers of deaths per 1 million persons and year:
- man-made-disasters 2,2
- natural disasters (worldwide) 10
- Daily accidents (traffic, works, sports etc.) 580

The risk to be killed by a man-made-disaster is about 260 times less then that to be killed by a daily accident. Nevertheless, people primarily seem to be threatened by man-made disasters. If priorities in risk assessment had to be defined one would rather concentrate in protection from dangers of daily life and neglect preparedness for disasters. Nevertheless, civilians expect to receive adequate medical help no matter what the size of the accident/disaster is. This has to do with risk acceptance and risk aversion.

Also not to be underestimated is the global role of the media and its continuous flow of information which daily reaches our living rooms thanks to quick and modern means of communication. And there is the fact that certain regions are fortunately very rarely visited by a major accident or by a disaster which unfortunately leads to the fatal and often practiced argumentation “Never here!” or “Not to us!” This point of view occupies not only the mind of civilians but can very often be heard even from the responsible authorities.

The following numbers take us back to reality:

-The Guidelines from the National Swedish Board of Health and Welfare from 1993 published the following results for the period from 1971 to1985:

- every year an average of 150 disasters occur leading to more than 20 casualties
- during this period 1,5 million people died
- natural disasters are causing 94 % of the deaths although they account only for 35 % of the recorded disasters
- disasters caused by human activities during the period of 1971 and 1985 broke down as follows:
- 461 fire disasters with 7400 deaths
- 396 air disasters with 21`000 deaths
- 335 ship disaster with 15`000 death
- 400 other mane-made disasters with 46`000 deaths

- Please consider further that, based upon the yearly statistics of the Swiss Reinsurance Company, a clearly increasing tendency towards severe disasters was noticed:

The number of recorded events increased between 1970 and 1996 from 100 to 340.

The continuous flood of information in a media world fatigued by disasters is lividly illustrated by this summary reports of only one daily newspaper - Neue Zürcher Zeitung - from July 28, 1997 until Sept. 14, 1997:

2. TERMS REFERRING TO RISK ASSESSMENT

2.1 RISK

Risk is the product of the probability of having a damage and the possible extent of their damage.

Various risks can be compared only to a certain degree. On the other hand, the extent of damage can be easily depicted in definite values (financial damage, number of deaths etc.). Important for the assessment of measures is the ratio of the numbers and not absolute figures.

2.2 RISK ANALYSIS

Risk analysis is an expert and objective study of dangers and their effects aiming at a value-free description of the extent and frequency of damages. It tries to answer to the question “How great is the probability that something might happen ?”

2.3 RISK ACCEPTANCE

There is no absolute security and there won’t be any in the future. It will not be possible to reduce the risk to zero. A focal point is the question about the accepted risk. Self determination and personal advantage are influencing the acceptance of the risk. If you are driving a car you are accepting a far bigger responsibilty or risk than by traveling by train, where you depend on the reliability of others. If you are parachuting or hiking you are accepting a far bigger risk than if you happen to live close to an explosives production facility. Consequently the degree of acceptance of a risk varies depending on the different kinds of events and it has to be hevely assessed every time. This assessment becomes a matter of personal estimation and there won’t be a right or wrong. The answer to the question “What do I allow to happen ?” influences the measures and the financial involvement necessary to decrease the risk.

2.4 RISK AVERSION

Risk as a result of rare events with extensive damages will be judged in another way than risks of exactly the same size but consisting of a great number of small-sized events. One accident with 10 victims is recognized to be more severe than 10 accidents with one victim each. A dramatic example can be found in the study of traffic accidents. 700 deaths in traffic accidents on Swiss roads in only one year will be

accepted and immediately forgotten by the public. However, 100 deaths in a railway accident would lead to a public outcry and the demand for sanctions against the railway management.

These different risk assessments are called “risk aversion” and are used in risk studies.

2.5 FELLED RISK

Felled risk is the product calculated from the frequency of the event, the extent of damage to be expected, the risk acceptance and the risk aversion.

3. THE ADVANTAGE OF RISK ASSESSMENT

3.1 GENERAL

The scientifically correct investigation of risks is quite a demanding task. In the first place it should serve the possible prevention of disasters, that means risk reduction, and in the second place it should also assess the necessary investments at the right place. A variety of studies have been published in regard to this topic.

To know the risks is a prerequisite for adequate and systematic planning of rescue operations with a large amount of patients. These aspects are often ignored and therefore too often simple chance will be involved. The consequences for the patients can be disastrous .

But the emphasis of these risk considerations is not just on the level of prevention. In the center of interest are as well

- the kind of events
- the possible extent of damage, referring to patients,
- the special problems to be expected and
- the extent to which the community may be able to manage the respective event at its level.

The frequency of the event does not necessarely have the same importance as the assessment of suitable prevention measures. The public is expecting that medical help works in an adequate way no matter if the event happens every ten or every hundred years. To concentrate measures upon the quite improbable case of a satellite crash into a sold-out football stadium would be quite unreasonable. On the other hand, one has to consider that preparations for many kinds of events are the same or at least similar ones. But there are relevant differences and that’s why the special problems are of significance. A train crash in an open field provides completely other conditions for the rescue operation than rescue in a long tunnel. Agaain, other special precautions would be necessary for contaminated patients in a chemical accident.

For risk considerations one has to differentiate between risks for which the place and time of the event is unknown and those in a defined time period and at a limited place, i.e.big events such as open-air-concerts.

3.2 EVENTS WITHOUT LIMITATION OF PLACE AND TIME

Events where place and time can not be limited can be divided into natural disasters and man-made disasters. We are excluding war as it happens under completely other conditions. However, terrorism and attacks by fanatics must not be neglected as they can cause a disaster everywhere - remember Oklahoma, where nobody expected such an event.

The successful preparation for a mass accident is only possible after having assessed the risks. Today this takes place at a national level in several countries. Every level which is to offer medical help has to undertake such risk considerations. This is necessary in order to judge in an objective way when an organization will be overcharged and the next higher level will have to go into operation. As a result, one would be able to estimate necessary resources in a realistic way. Thereafter, one may recognize that almost all kinds of events can occur almost everywhere. Of course - if there is no volcano no volcanic eruption will appear. A ship accident is only to be expected on water. But chemical accidents do not concentrate only on the sites of respective enterprises. They may happen everywhere and unexpected because of the numerous transports of dangerous goods. The risk sources of radioactive radiation are not primarily nuclear power stations, but foremost unpredictable risks of illegal smuggling of radioactive material in normal cars and without sufficient protection. Or what is going to happen when a truck with fuel rod crashed instead of nine meters - which shall be resisted by the transport container - thirty meters over a bridge ? Or who ever thought, that in a railway station of an Austrian city an orderly packed radioactive compound could just fall down on a rail where it was run over ? And all these discotheques at the countryside, far away from any powerful emergency service, where hundreds of young people have fun and where a small fire may have awful consequences ? These and more are results of risk considerations, which often provide disillusioning findings.

In Switzerland possible major events with a great number of

patients were compiled in a pragmatic way and possible effects were assessed:

Figure 1

Event	Persons involved	Deaths to be expected	Patients to be expected	Potential injuries	Medical help
Mass collision	50 - 200	0 - 10	10 - 50	multiple injuries, ev. burns	ev. several First Aid Stations, shock treatment
Railway accident	20×10^2	0 - 50	10 - 100	multiple injuries	ev. several First Aid Stations, shock treatment
Airplane crash near airport	100 - 350	50 - 350	30 - 150	multiple injuries, ev. burns, smoke intoxication	ev. several First Aid Stations, shock treatment, O2-inhalation
Big fire	50×10^2	10 - 100	up to $\times 10^2$	smoke intoxication, multiple injuries, ev. burns, panic	O2-inhalation, shock treatment
Chemical accident with explosion, fire	up to $\times 10^2$	0 - 50	up to $\times 10^2$	burns, chemical injury, crush injuries, smoke intoxication, multiple injuries	ev. several First Aid Stations, shock treatment, O2-inhalation
Collapse of house, building, stadium	up to $\times 10^2$	up to 50	10 - 100	crush injuries, multiple injuries	ev. several First Aid Stations, shock treatment
Earthquake	up to $\times 10^3$	up to $\times 10^2$	up to $\times 10^2$	crush injuries, multiple injuries, large damage area, destroyed infrastructure, danger of epidemics, time consuming searches	several First Aid Stations
Epidemics	up to $\times 10^3$	up to $\times 10^2$	up to $\times 10^3$	profuse vomiting, diarrhea, fever	analysis, isolation, desinfection, antibiotics, shock treatment, information
Large scale radiation accident	up to $\times 10^3$	ev. many	first few then masses	radiation syndrome (depending on dose)	contact station (analysis, sorting), shock treatment

Similar assessments are suggested to be performed by the authorities at different levels of charge.

3.3 BIG EVENTS (OPEN-AIR-CONCERTS, SPORT ETC.)

Big events are underrated concerning risks and overestimated concerning the available rescue organization. These false estimations are summing up and cause awful consequences if a major accident occurs. A complicating factor is that the organizers mostly do choose not to believe in risks. The air-show-disaster of Ramstein on 28th August 1988 is an example. These mistakes should never be repeated again.

Also big events considered quite harmless may be inflicted by a mass accident some day. A concert of the famous local band “Zillertaler Schürzenjäger” in Austria almost became a disaster. 80 000 visitors were sitting or standing on a slope being a natural grand-stand. Later it began to rain and the ground began to slide. Fortunately, only a few persons were injured. Some time ago, a loudspeaker tower broke down during a Deep Purple open-air concert. On September 4th, 1997 at least 33 persons died and 77 were severely injured during an election campaign event in Paraguay. Strong winds and heavy rain led to the break-down of part of the roof over the visitors in the football stadium. At the moment of the accident about 4000 people were in the stadium.

Who ever thought about such possibilities in these cases ?

Therefore, serious and careful risk assessment will be inevitable for every big event. The goal is

- to recognize all dangers and their consequences,
- to direct all necessary safety and security measures, taking also into consideration the responsibility for medical help,
- to be prepared for the expected number of patients by a reasonable expenditure,
- to also be ready for an eventual immediate major accident.

Let’s talk about risks at open-air-concerts which show a dangerous development. Some organizers dictate their own security measures, wishing to perform transportion of patients within the arena by themselves. They also reject the division into safety sectors. They are threatening not to execute the concert should their demands not be fulfilled, hiding out behind an enormous fan community and the power of money. There is nothing to say against security services evacuating hyperventilating girls. But the measures for a bigger accident and the safety and security measures have to be determined by the authorities and the EMS. This has to be done at an early stage of preparations and first requires a clear risk assessment.

3.4 ASSESSMENT OF THE OPERATION LEVEL

It will have to be determined what the necessary resources for medical help are and which level of the national organization will primarily be capable to master an event of a certain dimension. This organization and above all its human resources will be factors of importance.

4. CONCLUSIONS

These short and summarily explanations to the wide-ranging field “risk assessment” clearly show that

- menaces in the civil field are manifold and are always present
- also - or especially - in the field of medical help a great number of measures which are not fulfilled in many cases are necessary ,

- in general, there is quite a big backlog demand for the case of extraordinary situations,
- this is a task of immediate interest as there are still many gaps which may cause severe consequences
- the public has become sensitized by recent events and thus it increasingly demands more safety and security.

The authorities which want to adapt their preparedness to an operational level have to become aware of the different risks in different regions. To rely only on feelings will lead to false conclusions. Everybody responsible has to assess systematically the risks in the respective areas.

However, it is alarming how many authorities and responsible persons of public services are underestimating the risks while they are massively overestimating their own possibilities and simply ignore impending threats. Often indispensable or justifiable measures are denied because of financial reasons based on a cost-and-profit calculation. It is not enough to become aware of menace but it is also necessary to analyze them in a responsible way and to act accordingly. Therefore risks assessments are not only a task for special and rare cases but they are a prerequisite for the successful preparation of medical help for major accidents and disasters.

The permanent preceding technical development not only brings progress but also additional risks. Affluence has undermined too long the quality of our environment. The modernization of our living space, manifold services and automations have created a consumer society with a dangerous high degree of dependence. Soon our children won’t even know a hammer. All these facts make it more difficult to handle extraordinary situations. The responsibility of authorities and of those responsible for rescue organizations must correspond to these demands to minimize risks, to guarantee an optimum of safety and security and to give the operations a chance to succeed. It is not enough to become aware of this task. Responsibility also means to act accordingly by caring for risk assessment - a task of immediate importance.

References

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