

## IMPLICATIONS OF PEOPLE'S RISK PERCEPTION FOR CONCEPTUALIZING EMERGENCY PREPAREDNESS

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### **Keywords:**

Risk perception, disaster awareness, emergency preparedness, risk communication

### **Abstract:**

Almost all people have judgments and evaluations of hazards they (or their facilities or environment) are or might be exposed to. A psychometric study conducted in eight countries (in Europe, Asia, America) reveals that the perceived risk magnitude of hazards depends primarily on the assumed probability to die and supposed health impacts. However, emotional facets, such as fear associations, and attitudes, such as environmental concern and technology scepticism, also show significant influence on risk appraisals. These may induce an overestimation of a risk, while mind-sets like optimism bias may lead to naïve confidence in safety.

Beliefs about risk acceptance differ considerably for hazard types: Technology-induced risks from chemical industry, powerplants or radioactive waste storage are less tolerated than natural hazards like volcanoes, earthquakes, floods and forestfires. Furthermore, there are disparities between societal groups and professions - their ideological orientations vary and are differently linked to what they sense in newspapers, television and their social setting. In sum, people's risk appraisals are a complex result of hazard features, media information and personal philosophies.

How people think and feel about hazards is vital for conceptualizing the emergency preparedness of residents or employees at the workplace. This applies to their planning and acting before, during and after a disaster. A crucial socio-psychological process to enhance awareness and proactive measures is risk communication. It must reflect the nature of risk perception to be efficient, because emergency management programs aiming at people's agenda on the whole usually integrate technical and psychological means. A study about the disaster preparedness of residents exposed to the forestfire hazard demonstrated which information measures achieve educational and tutoring goals and which fall short, given the uniqueness of people's risk perception. This applies to website messages as well - their usefulness depends on matching the problem view and needs of those looking for information and advice.

Altogether the author's research demonstrates that reflecting psychological aspects of disasters is essential for designing emergency management procedures.

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**Introduction: The concept "risk perception".**

Almost all people have judgments and evaluations of hazards they (or their facilities or environment) are or might be exposed to. This includes working conditions, private activities, technological developments, residential settings, environmental hazards and global ecological changes.

In social-science risk research, sociologists and psychologists investigate how people think and feel about risks, which impacts on health and safety they assume, what their attitudes towards risk-taking are, and how information and education can change the interpretation of hazard states and conditions.

The core area, called "risk perception", has been a vivid field of both societal debate and scientific research for two decades now. The starting point was to establish "risk" as a subjective concept, not an objective entity; to include technical/physical and social/psychological aspects in risk criteria; and to accept opinions of "the public" (i.e., not just scientists) as the matter of interest. This approach was developed by B. Fischhoff, S. Lichtenstein and P. Slovic, the "Oregon Group".

Box 1:

THE CONTEXT OF RISK PERCEPTION					
<i>context:</i>	temporary	<b>risk cognition &amp; perception</b>	hazard	risk	personal
personal	permanent		appraisal	behavior	<i>emergency</i>
societal	future				<i>preparedness</i>
cultural	<i>hazards</i>				process

Risk perception is a pivotal ingredient for human behavior regarding hazards, as shown in *Box 1*. Main issues are the cognitive structure of risk ratings, subjective concepts underlying risk judgments, the determinants of perceived risk magnitude and risk acceptance, and differences between societal groups or countries and cultures (cf., e.g., Finucane & Holup 2006, Fischhoff et al. 1982, Fischhoff et al. 1997, Rohrman 2003a, Rohrman 2006, Rohrman & Renn 2000, Slovic 2000, Sjoeborg 1999). The multifold findings are essential for understanding risk behavior during emergencies and consequently for enhancing risk management.

**Empirical findings about people's awareness and appraisal of risks.**

In empirical risk perception studies, usually an array of hazards gets rated in regard to relevant risk and benefit facets. In *Box 2*, the main results from psychometric studies in 7 countries (cf. Rohrman 2000, 2006) are merged.

These data reveal that ratings of risk magnitude and beliefs about risk acceptance differ considerably for hazard types: Within residential and environmental conditions, technology-induced risks from chemical industry, powerplants or radioactive waste storage are less tolerated than natural hazards like volcanoes, earthquakes, floods and forestfires, even though fatality rates may indicate otherwise. Regarding private activities, judgments are most critical for smoking and unsafe sex, while the riskiness of car-driving is obviously underestimated, given the very high numbers of accidents. In general, viewpoints are more negative for involuntary than self-chosen (controllable) risk exposure.

Which factors are crucial for the perceived risk magnitude of hazards depends primarily on the assumed probability to die and supposed health impacts. However, a careful analysis of risk facets (in the research summarized in *Box 2*, up to 15 different aspects were judged by the respondents) shows that emotional issues, such as fear associations, lack of familiarity,

and attitudes, such as environmental concern and technology scepticism, also have significant influence on risk appraisals (cf. e.g., Finucane & Holup 2006, Rohrman 2000b). These may induce an overestimation of a risk, while mind-sets like optimism bias - beliefs to be clever, or not likely to get hit - may lead to naïve confidence in safety.

Furthermore, there are disparities between societal groups and professions - their ideological orientations vary and are differently linked to what they sense in newspapers, television and their social setting (cf., e.g., Rohrman 1994, 2000b, Sjoeborg 1999).

## Box 2:

<b>RISK RATINGS IN DIFFERENT COUNTRIES</b> <i>Projects Rohrman, CRC and CRH</i>														
<b>China / Japan / Singapore // Australia / Canada / Germany // Brazil</b>														
<i>Response scale: 0...10</i>														
<i>Risk aspect:      Perceived Risk Magnitude      Individual Risk Acceptance</i>														
<i>Country:</i>	<i>Chi</i>	<i>Jap</i>	<i>Sin</i>	<i>Aus</i>	<i>Can</i>	<i>Ger</i>	<i>Bra</i>	<i>Chi</i>	<i>Jap</i>	<i>Sin</i>	<i>Aus</i>	<i>Can</i>	<i>Ger</i>	<i>Bra</i>
<i>Sample: N=...</i>	270	196	153	203	141	235	160	270	196	153	203	141	235	160
<i>Hazard</i>														
Regular car driving	4.5	3.4	4.2	4.0	3.8	4.4	4.7	7.6	6.6	7.7	7.9	8.2	6.5	7.7
Long-term smoking	6.6	7.8	8.8	8.8	9.0	8.4	8.9	2.6	6.2	2.7	4.8	4.7	3.4	2.9
Unsafe sex	7.6	7.8	8.6	8.2	8.4	7.8	9.0	2.3	5.8	2.7	5.0	5.0	3.3	2.8
Overeating	4.9	6.5	7.3	6.5	6.5	7.2	8.0	3.9	6.1	4.2	5.7	5.7	4.2	3.8
Firefighting	5.1	5.9	6.4	6.0	6.2	5.0		5.8	6.8	5.6	7.0	7.4	7.5	
X-ray lab work	6.0	5.7	6.3	5.0	4.7	5.1	6.9	5.4	6.5	5.4	6.7	7.0	6.6	5.0
Underground miner	6.4	7.2	7.8	6.6	6.3	5.7	7.7	4.8	6.5	4.4	6.1	6.2	6.0	4.3
Mobile phone use		3.2			3.0	3.8	4.0		5.6	5.3		6.5		7.5
Gambling in casino	7.5	6.3	6.6	5.8	5.8	4.3	6.2	1.7	5.7	3.4	5.8	6.1	5.5	3.4
Earthquakes	5.7	6.8	7.8	6.8	5.7	6.2	7.0	4.3	6.4	3.8	6.2	7.2	5.0	4.2
Storms/hurricanes	6.2	6.9	7.9	6.6	6.0	6.7	7.3	4.0	6.2	3.6	6.2	6.8	4.8	4.0
Landslides							7.9							3.0
Floods	6.2	7.2	7.4	6.2	6.2	6.3	7.5	3.7	6.1	3.8	6.2	6.6	4.7	3.2
Fire areas	6.7	6.8	7.7	6.4	6.0	5.2		2.9	6.1	3.5	6.0	6.6	5.0	
Air pollution	7.1	7.4	7.9	6.2	5.9	6.7	7.2	2.5	5.8	2.9	5.0	5.6	3.6	3.9
Unhealthy climate	5.9		7.3	5.5				3.5		3.1	5.7			
Large airport	6.2	5.1	5.3	4.2	2.9	5.2	4.8	3.5	5.8	5.2	6.0	7.1	4.5	6.2
Coal power plant	5.8	4.9	6.7	5.3	4.9	5.0	4.5	3.4	5.9	4.0	5.4	5.6	4.6	5.7
Nuclear power plant	6.7	6.6	8.5	7.1	6.2	6.5	6.8	3.8	6.0	2.7	4.6	5.1	3.5	3.8
Chemical industry		6.1	7.7	6.2	5.7	6.1	6.5		5.6	3.6	5.2	5.4	3.8	4.2
<i>(Mean)</i>	6.0	6.4	7.2	6.2	5.8	5.9	6.9	3.9	6.0	4.1	5.9	6.2	5.0	4.3
<i>Hazards: m =..</i>	23	26	24	25	26	24	25	23	26	24	25	26	24	25

In sum, people's risk appraisals are a complex result of hazard features, media information and personal philosophies.

The manifold influences which steer the subjective evaluation of risks were merged into an integrative model (source: Rohrman 1998), which is shown in *Box 3*.

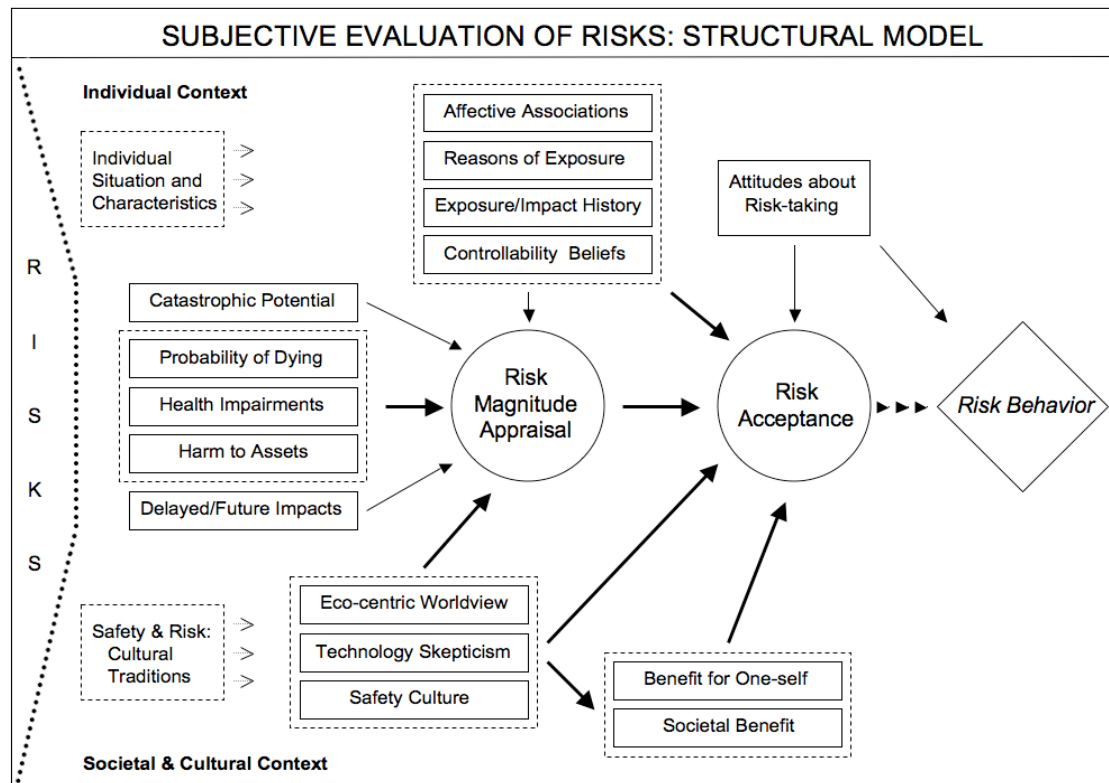
The model presents the effect of fifteen socio-psychological factors, including risk attitudes and individual or societal benefits which can counterbalance risk concerns. These judgmental

processes are embedded in a wider cultural and political context; therefore, societal groups differ in how they deal with hazards in emergency situations.

### The role of risk viewpoints in residents' preparedness.

Risk perceptions are interpretations of the world, based on experiences and/or beliefs. Given the multifaceted life which every human has to face, they can never be complete and valid in all regards. Thus the status of a resident's risk perception shapes whether s/he seeks additional information about a hazard, and where.

Box 3:



The risk of bushfires (forestfires) has been a long-standing instance for this, and the intense debate about human behavior during the horrendous fire disaster in Australia in February 2009 linked frequently to risk perception issues. Fire emergency management is as much a technical as a social task (Handmer & Dovers 2008, Paton et al. 2008).

If people look for information in order to improve their preparedness for accidents and disasters, they can use personal advice from friends, neighbours and experts in pertinent public institutions; and/or they will utilize media such as books, newspapers, radio & television, and internet facilities such as websites.

In all of these cases it is essential that the source provides the needed information, and that the offered information is understandable and usable. This is especially relevant for 'one-way' resources, like most media.

A series of studies about the disaster preparedness of residents exposed to the forestfire hazard (Rohrmann 2000c, 2003b, 2007) demonstrated which information measures achieve educational and tutoring goals and which fall short, given the uniqueness of people's risk perception.

This also applies to messages presented on websites. In one project it was investigated how fire authorities design their internet pages, and to what degree the presented information suits

customers. In *Box 4* the conclusions from a survey with citizens of different cultural background are outlined.

Several of the points listed in this table can be linked to the way the risk perception of residents is formed, i.e., whether it is based on solid knowledge or rather not, whether the assessment of the fire risk is insufficient and biased or valid, whether it is harmed by cultural constrictions, and whether there is willingness and patience to accept significant revisions and turnarounds of one's attitude.

The more the content and the language of disaster information in websites reflect this, the better is their prospect to enhance emergency management. In fact this applies to almost every information program which aims at preparing residents or employees at the workplace for risky situations, such as accident-focussed campaigns or procedures utilized when floods or hurricanes are threatening settlements.

Most people are not new to a hazard - they have already personal experiences or at least opinions in their mind. Information and propositions given to them do not create risk perception, they enrich and potentially modify it if accepted.

Box 4:

APPRAISAL OF WEBSITES OF FIRE AUTHORITIES CRITICISMS AND SUGGESTIONS	
<b><i>Perceived shortcomings:</i></b>	
◇ some information and instructions too 'texty'	
◇ information about present bushfires not as current as newspaper or TV reports	
◇ in parts difficult to understand for people with a 'non-english' background	{rp}
◇ explanation of technical terms occasionally hard to find and/or to understand	
◇ some summaries of key points too complex	{rp}
◇ inconvenient if information comes in 'pdf' format and needs a printer	
<b><i>Suggested improvements:</i></b>	
◇ reflecting the (restricted) awareness and knowledge of residents	{rp}
◇ using more maps/pictures/diagrams/charts to convey information	
◇ providing downloadable videos re fire risks and enhancing preparedness	{rp}
◇ including facilities for those with low vision	
◇ placing up-to-date information about current bushfires on frontpage	
◇ making core information usable for all website users, including those who have restricted download capabilities and can't print website texts	
◇ adding information aimed at children	
◇ enhancing accessibility for the wider Australian audience, by providing information in languages other than English	{rp}
<i>{rp} refers to issues (marked ◇) for which awareness of residents' <b>risk perception</b> is essential</i>	
<p><i>Source:</i> Study "Surveying bushfire events on websites - experience of people from different cultural backgrounds" - Rohrmann 2007</p>	

**Outlook: Applying risk perception research in emergency management.**

Augmenting and improving emergency preparedness is a complex task because this applies to planning and acting before, during and after a disaster. Many parts of disaster mitigation have -- in addition to technical, administrative and medical tasks -- psychological and sociological facets. In *Box 5*, for three segments, "consequences of disasters", "preventive actions" and "tasks during and after a disaster" it is indicated which issues refer to individuals or the community. Those issues which are possibly or certainly linked to people's risk perception are marked with {rp}.

This listing demonstrates the considerable relevance of risk perception features for realizing a helpful and effective course of action.

A vital socio-psychological process to enhance awareness and proactive measures is "risk communication" - an umbrella term for providing information necessary for most risk management pursuits (cf., e.g., Fischhoff et al 1997, Lundgren & McMakin 1998, Rohrman 2000a). Research on the efficiency of a risk communication venture has confirmed that it must reflect the nature of risk perception to attain its purpose, because emergency management programs aiming at people's agenda on the whole combine technical and psychological means.

Box 5:

DISASTER MITIGATION: SOCIO-PSYCHOLOGICAL ASPECTS			
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Substantial impact of <i>risk perception</i> processes {rp}			
<i>Relevant to: Individuals</i>			
<i>Community</i>			
<b><i>Consequences of disasters</i></b>			
> Death	I		
> Immediate health impairments	I		
> Traumatic reactions	I		{rp}
> Grief about disaster impacts	I		
> Loss/destruction of assets	I	C	
> Homelessness	I	C	
> Disruption/destruction of social order		C	{rp?}
<b><i>Preventive actions</i></b>			
> Education about risks for life/health/assets	I	C	{rp!}
> Development of disaster preparedness and cooperation		C	{rp}
> Establishing and evaluating warning systems		C	
> Informing the community about preventive actions		C	{rp}
> Improvement of technical protection measures	I	C	
> Personal preparation (home, car, food, etc.)	I		{rp!}
> Thinking ahead, discussion in family, training	I		{rp}
<b><i>Tasks during and after a disaster</i></b>			
> Warning the community about impending or acute danger		C	{rp?}
> Informing exposed people about necessary actions		C	
> Searching for confirmation of information	I		{rp}
> Technical measures against disaster impacts	I	C	
> Provision of information sources		C	
> Evacuation (regarding oneself and others)	I	C	{rp!}
> Care for the injured	I	C	
> Providing shelter for the homeless	I	C	

> Search for missing persons	I	C	
> Psychological rehabilitation	I		{rp}
> Reconstruction (physical, social)	I	C	

To sum up the presented considerations and findings about human risk perception - there is convincing evidence that socio-psychology expertise is indispensable for designing accident mitigation procedures and enhancing disaster preparedness. Risk communication ventures are an essential ingredient of such efforts - yet they can only achieve success if they reflect how people think and feel about hazards, and in which way their perception of an emergency is realistic or biased.

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Scientific education in Germany. Various positions as social scientist and lecturer at research institutions and universities. Then director of a social-scientific consultancy team and visiting lecturer in Austria, Switzerland, Australia, New Zealand and HongKong. Since 1993 with The University of Melbourne. Main study areas include: Applied social research, environmental psychology, and research methodology. Special substantive interests: Risk perception/ attitudes/communication/ management; impacts of environmental stressors (eg, noise, fires); hazard appraisal and disaster preparedness; residential choice and satisfaction; decision processes and decision-aiding technologies; teaching quality. Methodological interests: Response scales, survey methodology, evaluation research, and structural models. Conducted numerous empirical investigations; strong emphasis on interdisciplinary approaches and applicability of findings. Also work as consultant with governmental agencies, courts and companies, on federal or state level. In 2006 establishing the "TIEMS-Rohrmann Student Scholarship Fund". Publication of around 130 articles/reports/chapters/books.