

An aerial photograph of Karlstad, Sweden, showing a large lake and a city built on a peninsula. The foreground shows a residential area with houses and a road, while the background shows the city and the lake.

FROM THE EVERYDAY
TO THE EXTRAORDINARY

SRA-EUROPE CONFERENCE
28 JUNE – 1 JULY 2009
KARLSTAD, SWEDEN

The SRA-Europe 2009 Conference is supported and co-hosted by the Swedish Civil Contingencies Agency (MSB), Karlstad University (KaU) and the Swedish National Defence College (SNDC).



The following organizations have also contributed sponsorship to the conference:

- The Municipality of Karlstad
- The County Administrative Board of Värmland
- The Journal of Risk Research

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THE SWEDISH CIVIL CONTINGENCIES AGENCY – MSB

■ On 1st January 2009, a new, consolidated authority commenced work, namely, the Swedish Civil Contingencies Agency (MSB). It replaced the former Swedish Emergency Management Agency (SEMA), the Swedish Rescue Services Agency (SRSA), and the Swedish National Board of Psychological Defence, who all ceased operations and closed down on 31st December 2008.

The MSB is responsible for matters related to civil protection, emergency management and civil defence. Within the field of civil protection, MSB works with public safety in the form of protection from incidents and accidents as well as larger emergencies and disasters. Emergency management is defined as a process to reduce loss of life and property and to protect life, property and the environment from all types of hazards and risks through a comprehensive, risk-based, emergency management programme of prevention, planning, preparedness, response and recovery. Civil security matters also concern public safety during wartime.

This responsibility applies to measures taken before, during, and after the occurrence of emergencies and disasters. In other words, the MSB's mandate spans the entire spectrum of threats and risks, from everyday accidents up to major disasters.

DIRECTION

The MSB shall advance and support societal preparedness for emergencies, crises and disasters and contribute to reducing the consequences of serious emergencies, crises and disasters when they occur. The MSB has an important role coordinating across and between various sector boundaries and areas of responsibility. This coordinating role is based on the principle of responsibility – in other words, the MSB will not take over the responsibility of other actors.

VALUES

The MSB is an open, competent and active authority focusing both on the individual and on society as a whole.

RESEARCH

One of MSB's tasks is to fund research. The goal is to generate research with applicable and useful results, appropriate for solving the challenges within our domain of interest and responsibility. This means that MSB supports research within all major disciplines: social sciences, natural sciences, technology etc. The approach is trans-disciplinary covering all societal sectors.

MSB spends around 10 million Euros in research support annually. Most of it is announced through open calls during the year.

The Research Management Section at the MSB coordinates, directs, orders and communicates results from the research financed by the agency.

MSB is one of the main sponsors of the SRA-E Annual Conference in Karlstad.

For more information about our agency and the research we fund, please join us at our information desk or contact Mr. Agne Sandberg, agne.sandberg@msbmyndigheten.se, member of the local organizing committee.

The MSB website: www.msbmyndigheten.se



Swedish Civil
Contingencies
Agency



WELCOME TO KARLSTAD UNIVERSITY

We are one of the youngest universities in Sweden. This makes us a little more modern; a little more adventurous. We see it as our role to challenge the established and investigate the unknown. It is our ambition to contribute to the development of knowledge both at the international, regional and individual level. With our openness, creativity and multidisciplinary we have already attained a significant level of academic achieve-

ment. Underpinning all our teaching and research is a close dialogue with private companies and public organisations. We can thus offer one of the more inspirational university environments in the country.

*“He who has begun, has half done.
Dare to be wise; begin!”*

We have taken the words of the poet Horace “Sapere aude” as our motto. They capture what we are and underline our curiosity and our courage to move from thought to action. The sun is the symbol for the University, representing as it does life, warmth and energy. It provides light and symbolises enlightenment and growth.

THE SWEDISH NATIONAL DEFENCE COLLEGE

■ The Swedish National Defence College was established as a national university college on January 1, 2008, with the right to issue academic degrees. This implies that the college can now offer civilian university study programmes to a greater extent than before.

The Swedish National Defence College (SNDC), (Försvarshögskolan in Swedish) has existed in its present form since 1997. The roots of the College can be traced back as far as the establishment of the Artillery College at Marieberg in Stockholm in the 19th century. Today's College marks the latest development in a long line of military educational tradition.

TASK

The task of the College is to contribute towards national and international security through research and development. Research is carried out in diverse, but inter-related subject areas and subsequently disseminated to other interested sectors of society both nationally and internationally.

The College trains and educates military and civilian personnel in leading positions, both nationally and internationally as part of the contribution to the management of crisis situations and security issues.

LEADERSHIP & MANAGEMENT

Within the SNDC, the Department of Leadership and Management (ILM) is orientated towards research on and education of professionals, who fill or will fill leadership positions in the armed forces, civil crisis management, and civil service. Its work is carried out in an interdisciplinary academic environment, encompassing the whole spectrum of leadership activities from combat or warfare to various forms of conflict prevention, crisis management, stabilizing operations, and the reconstruction of states.

EDUCATION & RESEARCH

The two primary areas of the department are education and research, with the aim to create the prerequisites for tomorrow's leadership tasks in an increasingly complex social and cultural environment. ILM is located in Stockholm and Karlstad.

The SNDC website: www.fhs.se/en



SOCIETY FOR RISK ANALYSIS (SRA) EUROPE

Student Scholarship Awards

Karlstad Conference Studentship Scholarships (each worth €500) have been awarded to:

- **Corinne Moser**

ETH Zürich, Natural and Social Science Interface.

Conference presentation (Parallel session, C3)

How do we perceive one million years? A qualitative investigation of time in risk perception of nuclear waste disposal

Corinne Moser, Michael Stauffacher, Pius Krütli, & Roland W. Scholz.

- **Nicholas Smith**

University College London

Conference presentation (Symposium S1, A5)

Using visual imagery to communicate global warming risk

Nicholas Smith.

Awards committee: Julie Barnett (Chair), Margôt Kuttschreuter, Lars Nyberg, Richard Shepherd.

■ WHAT IS THE SOCIETY FOR RISK ANALYSIS?

The Society for Risk Analysis (SRA), founded in 1981, represents the leading platform for interdisciplinary academic risk research. Its membership is multidisciplinary, interdisciplinary and international.

SRA provides an open forum for those who are interested in all aspects of risk analysis to share experiences, exchange ideas and to build co-operation in research and mutual support. It provides a fruitful opportunity for inter-generational and multinational exchange as well as for communication with stakeholders in industry, politics and society.

WHY A EUROPEAN SECTION?

The Society for Risk Analysis Europe (SRA-E) was founded in 1987 as a section of SRA international to develop a special focus on risk related issues in Europe. SRA-E aims to bring together European individuals and organisations with an academic interest in risk assessment, risk management and risk communication.

SRA-E emphasises the European dimension in the promotion of interdisciplinary approaches of risk analysis in science. Our activities are highly relevant to practical application in industry and governance. The Charter of SRA-E which sets out all the aims of the organisation can be found on our website at www.sraeurope.org.

To foster strong and healthy relations between SRA-Europe and SRA International there is a “Memorandum of Understanding” that describes key principles of good practice and support. This can also be found on the website. There are a number of other active regional organisations in North America, Japan, Latin America, Australia, New Zealand and Russia. Most recently SRA-E has been developing a Framework Agreement for Cooperation with the Risk Analysis Council of China Association for Disaster Prevention

WHAT ARE THE ACTIVITIES OF SRA-EUROPE?

The SRA-E encourages and facilitates the communication among experts in all risk domains via general conferences and target focus meetings. The annual conference of SRA-E offers

academics, researchers, students, policy makers, and industry representatives an opportunity to discuss 'state of the art' theory, research and policy relating to risk. We also discuss future directions and challenges in risk analysis and risk management. The annual conference takes place in various countries in Europe in order to enhance the access to SRA-E for members and risk interested people all over Europe. We are always keen to hear from SRA-E members that are interested in hosting the conference. Additional meetings and workshops focus on specific risk topics of SRA-E interest – building links with other associations or institutions helps to communicate, collaborate and develop new methodologies for risk analysis and risk management.

In the past we have addressed issues such as Natural Hazard, Risk Communication & Electromagnetic Fields, Risk Regulations & the Precautionary Principle etc. Further, SRA-Europe provides its members with risk related information with regard to activities & initiatives on scientific, political and industrial level. SRA-E offers also the platform for working groups on particular risk issues which need to be developed and enhanced.

HOW IS SRA-E ORGANIZED?

The functioning of SRA-E is ensured by an Executive Committee comprising eight members who are elected by the Society members. For certain tasks (e.g. conference host) co-opted members join the committee. A permanent secretariat is established to strengthen the liaison between members and the organization, secretariat@sraeurope.org.

WHY TO BECOME A MEMBER? WHAT ARE THE BENEFITS?

Membership of SRA-Europe carries automatic membership of the international Society for Risk Analysis, founded in 1981, with over 2000 members worldwide. SRA-Europe has around 300 members. Being a member of SRA-Europe offers multiple benefits. Members are part of the scientific community and can stay in touch with the latest news in research and practice in risk analysis. Members will also receive news of events and conferences worldwide. SRA-E helps members to become familiar with national and international policies on risk analysis.

Further SRA-E encourages members to network and exchange ideas with other professionals working on different areas of risk research. The quarterly Newsletter of SRA informs all members four times a year about what's going on in the Society. In addition, SRA-Europe regularly provides Europe specific risk related information to its members. All members receive the journal Risk Analysis as part of their membership privileges and also have the opportunity to subscribe at a reduced rate to the Journal of Risk Research, the official jour-

nal of SRA-E and SRA-Japan. You can become a member of SRA-Europe through the SRA website www.sra.org and by selecting the option to belong to the SRA Europe regional organisation.

HOW CAN MEMBERS BECOME ACTIVE IN THE SOCIETY?

SRA-E welcomes new ideas and initiatives from members. Active members are the basis of the Society and of its future. If you have views or suggestions for improving SRA-E then please do get in touch.

You could also become involved by standing for election to the SRA-E or helping us with organizing a conference. You can contact the Executive Committee members directly or through emailing the secretariat, secretariat@sraeurope.org.

SRA Europe Executive Committee

President: Roberto Bubbico

Past President: Olivier Salvi

Secretary: Julie Barnett

President-Elect: Ann Enander

Co-opted member: Margôt Kuttschreuter

Secretariat: Raffaella Cozza

Elections to the SRA-E Executive Committee have been held during the spring 2009 and new committee members will be announced at the Business Meeting Tuesday 30th June.

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WELCOME TO THE 18TH SRA-EUROPE ANNUAL MEETING

■ The first ideas about hosting an SRA-E Conference in Karlstad were hatched over dinner at a small restaurant by Lake Como in 2005. Moving from the wild idea to the actual event has taken time, hard work and enthusiasm from a great number of people and organizations.

The commitment of the local organizing committee, the support from the SRA-E executive council members, the good advice from the members of the technical program committee and other colleagues who have helped review the scientific submissions are all gratefully acknowledged. You will find some of these names in various parts of the programme, but not all. Many have worked behind the scenes to establish contacts, organize the programme and arrange practical details. Thank you all for your help and support. Among those behind the scenes a special thank you to Margot K. for her work with the web page, and to Maria for putting together the programme book under a tight time schedule.

As hosts for the conference Karlstad University have contributed the expertise and support of many people. In particular a really big thank you is due to Lena and Maria at the conference secretariat, who have proved unfailing pillars of support for us all.

This event would not have been possible without the generous help from our supporting organizations. Here the Swedish Civil Contingencies Agency has taken the lead, so it is fitting that the conference theme “from the everyday to the extraordinary” summarizes the challenges that face this newly formed organization. The contributions submitted from many countries and a wide range of disciplines reflect these challenges, and set the scene for stimulating discussions over the next few days.

In planning the conference our aim has been that you should feel as at home here in Karlstad as in your everyday lives, but that your experiences here will also be memorable and even “extraordinary”. On behalf of the local organizing committee and all those involved in the preparation of this event I wish you heartily welcome to the 18th Annual SRA-E meeting.

Ann Enander
Chair, Local Organizing Committee

PROGRAMME SRA-E KARLSTAD 28/6-1/7 2009

Sunday 28th June

15.00-17.00 **CONFERENCE REGISTRATION** at the Clarion Plaza Hotel.

18.00-20.00 **RECEPTION AT ELITE STADSHOTELLET** (city centre) hosted by the County Governor Eva Eriksson and the County Administrative Board.

8.15-9.00 Bus transport from hotels to University of Karlstad. Conference registration at the university.

9.00-10.30 **PLENARY 1** Location: Aula Magna
Welcoming remarks – **Ann Enander** SRA-E, **Tomas Blom** prorektor Karlstad University, **Helena Lindberg** Director-General MSB, **Bo Hidén** municipality of Karlstad.

Round table – Theme “From the everyday to the extraordinary”. Speakers: **Åsa Boholm, Glynis Breakwell & Ortwin Renn**. Moderator: **Mats Ericson** SNDC.

10.30-11.00 Coffee and refreshments.

11.00-12.30	PARALLEL A1	PARALLEL A2	PARALLEL A3	PARALLEL A4	PARALLEL A5
	<p>RISK ANALYSIS AND ASSESSMENT Chair: Roberto Bubbico Location: Fryxellsalen</p> <p>Kozine Igor <i>Discrete event simulation as a versatile analysis tool for safety-critical systems</i></p> <p>Intarakosit Eakalak, Baecher Gregory, Peot Christopher, Ramirez Mark <i>Probabilistic dispersion model for assessing odour impacts from biosolids’ application sites</i></p> <p>Francois Matthieu, Graviere Julien, Langlet Bertrand, Loranger Sylvain <i>Sampling strategies optimization of brownfield sites prior to risk characterisation and risk management</i></p> <p>Lindhe Andreas, Rosén Lars, Bergstedt Olof, Norberg Tommy, Pettersson Thomas <i>Fault tree analysis of risk-reduction measures to reach water safety targets</i></p>	<p>NANOTECHNOLOGY, CHEMICAL RISKS Chair: Tomas Öberg Location: Sjöströmsalen</p> <p>Karlsson Mikael, Karlsson Hanna <i>Novel nanoparticles in consumer products: risk management that separate the wheat from the chaff</i></p> <p>Boström Magnus, Börjeson Natasja, Gilek Michael, Karlsson Mikael, Jönsson Ann-Maria <i>Chemicals in textiles: Managing environmental and health risks from products with complex product chains</i></p> <p>David Jean Francois <i>End to end Environment Health effects assessment: From assessment to mitigation and public understanding through licensing process</i></p>	<p>UNDERSTANDING RISK INFORMATION Chair: Margöt Kuttschreuter Location: Frödingsalen</p> <p>Siegrist Michael <i>Frequency and probability formats in risk communication</i></p> <p>Hess Rebecca, Visschers Vivianne, Siegrist Michael <i>Eye tracking in risk communication research: Visual attention on graphical risk communication and subjective numeracy</i></p> <p>Fage Butler Antoinette <i>The role of emotion in the prevention of injury: risk, benefit and reassurance in Patient Information Leaflets</i></p> <p>Visschers Vivianne <i>The Evaluability Principle in Nutrition Communication: How Reference Information Changes People’s Food Product Perception</i></p>	<p>RISK EXPOSURE AND VULNERABILITY Chair: Ulrika Postgård Location: Transformum</p> <p>Nieminen Kristofersson Tuija <i>Vulnerable but not alone – Swedish farmers’ situation after the 2005 storm Gudrun</i></p> <p>Pirone Anna Lisa, Nebbioso Annalisa, Vallerotonda Maria Rosaria, Landoni Adriano, Bragatto Paolo Angelo, Pittiglio Paolo <i>Personal individual risks for workers at chemical warehouses</i></p> <p>Bierkens Johan, Cornelis Christa, Van Holderbeke Mirja, Torfs Rudi <i>Children’s characteristics influencing exposure</i></p> <p>Lopez Esperanza <i>Mexico and the influenza. Some reflections on the Mexican problem</i></p>	<p>SYMPOSIUM SI Location: Lagerlöfsalen</p> <p>Visualisation of risk: opportunities for public engagement and communication</p> <p>Speakers: Afrodita Marcu Julie Barnett Nicholas Smith</p>

12.30-13.30 Lunch

13.30-14.15 **PLENARY 2** Location: Aula Magna
Keynote address – **Johan Schaar** “Living with risk – poverty in the era of climate change”. Moderator: **Lars Nyberg** Centre for Climate and Safety, Karlstad University

14.30-16.00	PARALLEL B1	PARALLEL B2	PARALLEL B3	PARALLEL B4	PARALLEL B5
	<p>RISK ANALYSIS AND ASSESSMENT Chair: Lars Bodsberg Location: Fryxellsalen</p> <p>Bubbico Roberto <i>CFD modeling of Jet Fires</i></p> <p>Hertzberg Tommy, Först Michael, Strandén Lars <i>Risk analysis of a fire fighting system for the first Visby-class corvette</i></p> <p>Sivertun Åke <i>The use of GIS for inventory and evaluation of potential Cascade or Domino effects in Environmental risks</i></p> <p>Serbanescu Dan <i>Some aspects on paradoxes in risk analysis</i></p>	<p>OCCUPATIONAL RISK, INJURY PREVENTION Chair: Agne Strandberg Location: Sjöströmsalen</p> <p>Österberg Johan, Börjesson Marcus <i>Risk perception among conscripts during compulsory military service</i></p> <p>Harvey Joan, Heslop David, Thorpe Neil <i>Do bored drivers behave differently to other drivers?</i></p> <p>Rådbo Helena, Andersson Ragnar, Renck Barbro <i>Feasibility of railway suicide prevention strategies; a focus group study</i></p>	<p>RISK INFORMATION, PUBLIC RISK PERCEPTION, GENOMICS Chair: Susanna Öhman Location: Frödingsalen</p> <p>Espluga Josep, Prades Ana, Horlick-Jones Tom, Farré Jordi, Gonzalo Jan, Oltra Christian, Navajas Joaquín <i>Actively ignoring risks. Reflections on cases of self-attributed ignorance and rejection of risk information</i></p> <p>Connor Melanie, Siegrist Michael <i>The influence of knowledge, health beliefs and trust on public acceptance of gene technology</i></p> <p>Dijkstra Anne <i>Participating publics in genomics research</i></p> <p>Börner Franziska, Schutz Holger, Wiedemann Peter <i>Communicating toxicogenomics – framing effects on lay and expert risk and benefit evaluations of toxicogenomics</i></p>	<p>DISASTER PREPAREDNESS AND EXPERIENCES Chair: Isabel Rego Location: Transformum</p> <p>Bergström Annika, Ruter Anders <i>A template for risk assessing and evaluation of disaster preparedness</i></p> <p>Johansson Magnus, Nyberg Lars <i>Evaluating the range of perspectives on lessons-learning from the 2005 storm in Sweden</i></p> <p>Hede Susanne <i>Crisis preparedness at a public authority level</i></p> <p>Sjöberg Misa, Nilsson Sofia <i>Moral distress in complex operations in national and international contexts</i></p>	<p>SYMPOSIUM S2:1 Location: Lagerlöfsalen</p> <p><i>Risk psychology, environment and safety: The RIPENSA symposium</i></p> <p>Presentations: Lennart Sjöberg Christian Klöckner Mons Bendixen & Ute Gabriel Marit Christensen Tone Aasen & Gunhild Åm Vatn Britt-Marie Drottz Sjöberg & Jorn Vatn J Peter Burgess</p>
16.00-16.30	Coffee and refreshments.				

16.30-18.00	PARALLEL C1	PARALLEL C2	PARALLEL C3	PARALLEL C4	PARALLEL C5
	<p>RISK ANALYSIS AND ASSESSMENT Chair: Kurt Petersen Location: Fryxellsalen</p> <p>Bligård Ola, Osvalder Anna-Lisa <i>Methods for risk analysis of use of medical equipment</i></p> <p>Gregori Dario, Berchiolla Paola, Ghidina Marco <i>Comparing Adaptive Bayesian Network, Artificial Neural Networks, Classification Trees and Classical Logistic Models in Quantitative Risk Assessment: the Case Study of Foreign Body Injuries in Children</i></p> <p>Zenié Alexandre, Schumann Michael, Heinemeyer Gerhard, Vickers Carolyn <i>WHO/IPS Guidance document on characterizing and communicating uncertainty in exposure assessment</i></p>	<p>CONSEQUENCES OF CLIMATE CHANGE Chair: Mikael Karlsson Location: Sjöströmsalen</p> <p>Briggs Chad <i>Abrupt climate change risks: policy and vulnerability assessments for national security</i></p> <p>Serra Llobet Anna, David Sauri Pujol <i>Living with floods, learning from risk: climate change and floods in the Costa Brava</i></p> <p>Nyberg Lars, Johansson Magnus, Blumenthal Barbara <i>Sustainability aspects of flood risk management – A case study of Lake Vänern and the Göta älv River, Sweden</i></p> <p>Aschberger Christine, Chen Deliang, Postgård Ulrika, Alexander Walther, Yaoming Liao, Tinghai Ou <i>Extreme rainfall events in Sweden and their importance for local planning</i></p>	<p>LAY PERCEPTIONS, FUSION TECHNOLOGY Chair: Rob Flynn Location: Frödingsalen</p> <p>Moser Corinne, Stauffacher Michael, Kruetli Pius, Scholz Roland <i>How do we perceive one million years? A qualitative investigation of time in risk perception of nuclear waste disposal</i></p> <p>Gadomska Magdalena <i>Communication Impact on Understanding, Acceptability and Risk Perception of Thermonuclear Fusion Technology – An Experimental Research</i></p> <p>Prades Ana, Horlick-Jones Tom, Oltra Christian, Navajas Joaquin, Espluga Josep <i>Towards creating a participative dialogue with society about fusion energy</i></p>	<p>PANDEMIC INFECTIONS, ZOOONOSIS Chair: Esperanza Lopez Location: Transformum</p> <p>Bengtsson Göran, Bjarke Martin, Holmqvist Johan <i>Metropolitan vulnerability of pandemic influenza</i></p> <p>Petts Judith, Draper Heather, Ives John, Wilson Sue, Parry Jayne, Greenfield Shiela, Sorrel Tom, Damery Sarah <i>Pandemic Influenza: Resolving the Risk Communication Gap?</i></p> <p>Bozek Frantisek, Krejčova Pavla, Dvorak Jiri <i>Alimentary zoonoses' infection risk analysis in the selected region of the Czech Republic</i></p> <p>Duckett Dominic, Busby Jerry <i>Images of Amplification: organizational communication of zoonotic risk and the Social Amplification of Risk</i></p>	<p>SYMPOSIUM S2:2 Location: Lagerlöfsalen</p> <p><i>Risk psychology, environment and safety: The RIPENSA symposium (continued)</i></p>
18.00-19.30	<p>EXHIBITION & POSTER SESSION Location: Café 21</p> <p>Drinks and refreshments hosted by the municipality of Karlstad.</p> <p>Bus transport to the hotels.</p>				

8.15-9.00 Bus transport from hotels to University of Karlstad. Conference registration at the university.

9.00-10.00 **PLENARY 3** Location: Aula Magna
Keynote address – **Paul Slovic** “The more who die, the less we care: confronting psychic numbing”. Chair: **Katarina Rydberg** Swedish Civil Contingencies Agency, MSB

10.00-10.30 **SRA EUROPE BUSINESS MEETING** – all conference participants welcome.

10.30-11.00 Coffee and refreshments.

11.00-12.30	SESSION D1	PARALLEL D2	PARALLEL D3	PARALLEL D4	PARALLEL D5	PARALLEL D6
	<p>RISK IDENTIFICATION AND ASSESSMENT, LOCAL LEVEL Chair: Ortwin Renn Location: Fryxellsalen</p> <p>Hassel Henrik <i>The Adoption of Systems Approaches in Swedish Municipal Risk and Vulnerability Analyses</i></p> <p>Bjarke Martin, Bengtsson Göran, Holmqvist Johan <i>Identifying and ranking hazards in municipal risk- and vulnerability analysis</i></p> <p>Kelman Ilan, Rauken Trude <i>Climate change or not? Policy lessons for flooding in Norwegian municipalities</i></p> <p>Van der Vlies Vincent <i>Institutionalised risks: An analysis of rail transport of hazardous materials and urban planning</i></p>	<p>RISK IDENTIFICATION, EMERGING RISKS Chair: Olivier Salvi Location: Sjöströmsalen</p> <p>Lundman Peter, Wilhelmsson Alexander <i>Safety investments in infrastructure projects – comparison between Swedish railway tunnel projects</i></p> <p>Lönnemark Anders, Ingason Haukur <i>The Safety and Security of Underground Hubs as an Emerging Risks Representative</i></p> <p>Carlsen Henrik, Johansson Linda, Wikman-Svahn Per <i>Planning and preparing for technological change and future risks to the critical functions of society using co-evolutionary scenarios and participatory methodology</i></p> <p>Busby Jerry, Kinder Katharina, Ball Linden <i>Risk and ubiquitous computing in the workplace</i></p>	<p>PUBLIC RISK PERCEPTION Chair: Judith Petts Location: Frödingsalen</p> <p>Van Poll Ric, Köhler Jutta, Devilee Jeroen <i>Environmental – Health risk characterisation in six European countries</i></p> <p>Öhman Susanna, Olofsson Anna, Rashid Saman <i>National, international or global threats – who fears what? Societal risk perceptions in Sweden 2004 and 2008</i></p> <p>Börjesson Marcus, Enander Ann <i>Perceptions of risk and safety among the Swedish population</i></p> <p>Rego Isabel, Palos Ana, Arrozo Ana <i>How to prepare for, respond to and recover from an earthquake? Seismic risk perception in the Azores</i></p>	<p>FINANCIAL AND ECONOMIC CONSEQUENCES Chair: Valery Lesnykh Location: Transformum</p> <p>Jaldell Henrik, Carlsson Fredrik, Daruvala Dinky <i>Preferences for lives, injuries and age</i></p> <p>Rosén Lars, Nimmermark Johan, Andreasson Mats <i>Assessing risk-cost of flooding</i></p> <p>Ippisch Tobias <i>Towards an impact assessment of telematics-based vehicle insurances</i></p>	<p>ROUND TABLE Location: Hus 1D 236</p> <p><i>Siting sensitive projects: Social acceptance in sensitive industrial projects.</i></p> <p>Participants: Nadja Eleznik Evelyn Hooft Jean-Francois David</p>	<p>SYMPOSIUM S3 Location: Lagerlöfsalen</p> <p><i>Results of the “International study of the effects of information about precautionary measures on risk perceptions of mobile telephony (ISEP)”</i></p> <p>Presenters: Peter Wiedemann Julie Barnett Martin Clauberg Flavia Natercia da Silva Medeiros Franziska Boerner</p>

12.30-13.30 Lunch

13.30-15.00	PARALLEL E1	PARALLEL E2	PARALLEL E3	PARALLEL E4	PARALLEL E5	PARALLEL E6
	<p>IMPROVING RISK COMMUNICATION Chair: Birgitta Johansson-Hidén Location: Fryxellsalen</p> <p>Löfstedt Ragnar <i>Risk communication: The Avandia case – a pilot study</i></p> <p>Köhler Jutta, Devilee Jeroen, Van Poll Ric <i>Environmental health risk communication in the Netherlands</i></p> <p>Modin Peter <i>Improving risk communication: ethical considerations and practical suggestions from the case of BSE</i></p>	<p>PUBLIC HEALTH RISKS Chair: John Agnew Location: Sjöströmsalen</p> <p>Navratil Josef, Adamec Vladimir, Kellner Josef, Bozek Frantisek <i>Health risk arising from air pollution by particular matters</i></p> <p>Öberg Tomas, Filipsson Monika, Lindström Marianne, Peltola Pasi <i>Exposure to contaminated sediments at a public bathing place</i></p> <p>Putcha Chandrasekhar <i>Risk values for lumbar spine in humans</i></p>	<p>RISKPERCEPTION Chair: Paul Slovic Location: Frödingsalen</p> <p>Poortinga Wouter, Bronstering Karin, Lannon Simon, Pidgeon Nick <i>Public Awareness and Perceptions of the Health Risks of Indoor Radon</i></p> <p>Cousin Marie-Eve <i>Impact of Knowledge and Voluntary Precautionary Recommendations on Risk Perception of Mobile Communication</i></p> <p>Espluga Josep, Prades Ana, Horlick-Jones Tom, Farre Jordi, Gonzalo Jan <i>Reflexivity, expectations and metaphors about health harms when living in a high industrial risk environment</i></p> <p>Horlick-Jones Tom, Prades Ana <i>After all these years: reflections on a decade of risk perception and risk communication research</i></p>	<p>IDENTIFICATION AND ASSESSMENT, BIOLOGICAL RISKS Chair: Michael Gilek Location: Transformum</p> <p>Sahlin Ullrika <i>Similarity or probability in risk assessment of invasive species</i></p> <p>Berglund Helena <i>Multiple threats to species – co-occurrence of non-indigenous species with other threats</i></p> <p>Sintorn Ida-Maria, Marshall-Heyman Heather, Hedlund Kjell-Olof, Mirazimi Ali, Kylberg Gustaf <i>Technology for Rapid Identification of Highly Pathogenic Viruses</i></p>	<p>COMMUNICATION WITH AND BETWEEN ORGANIZATIONS Chair: Kathryn Mearns Location: Hus 1D 236</p> <p>Bennett Chris <i>Prioritising the unusual: one explanation for adverse events?</i></p> <p>Kosugi Motoko <i>What activities have an effect on the public trust in different organizations?</i></p> <p>Harvey Joan, Jamieson Ron, Pearce Kim, Philipson John <i>Cultural differences and their potential risks to collaborative engineering design</i></p> <p>Alvinus Aida, Danielsson Erna, Larsson Gerry <i>The Inadequacy of an ordinary organization</i></p>	<p>SYMPOSIUM S4 Location: Lagerlöfsalen</p> <p><i>An information assurance perspective on future risks with technologies for security and safety</i></p> <p>Organised by MSB Daniel Haglund</p> <p>Presenters Åke J Holmgren Erland Jonsson Jan Skogqvist</p>
15.00-15.30	Coffee & refreshments.					
15.30-17.00	<p>PLENARY 4 Location: Aula Magna International Round Table – <i>The impact of the financial crisis on the long-term challenges faced by our Society.</i> Participants: Daniela Leonte, Alison Cullen, Roberto Bubbico, Esperanza Lopez, Valery Lesnykh, Sijian Zhao. Moderator: Olivier Salvi</p>					
17.00	Bus transport to the hotels.					
18.15	Assembly at Karlstad railway station for transport to Conference dinner at Rottneros Park.					

8.30-9.00 Bus transport from hotels to University of Karlstad. Conference registration.

9.00-10.30	PARALLEL F1	PARALLEL F2	PARALLEL F3	PARALLEL F4	PARALLEL F5
	<p>RISK COMMUNICATION, POLICY AND RHETORIC Chair: Julie Barnett Location: Fryxellsalen</p> <p>Agnew John <i>Historical perspective: Risks relieved and risks generated by the 1834 Poor Law Act in England</i></p> <p>Corvellec Hervé, Boholm Åsa <i>The risk/no-risk rhetoric of environmental impact assessments (EIA): the case of offshore wind farms in Sweden</i></p> <p>Alriksson Stina <i>Conjoint analysis as a decision tool</i></p>	<p>FOOD RISKS, PERCEPTIONS AND BEHAVIOUR Chair: Michael Siegrist Location: Sjöströmsalen</p> <p>Kuttschreuter Margot, Krause Anna, Ter Huurne Ellen <i>Information seeking on everyday risks: food risks versus industrial risks</i></p> <p>Schlag Anne Katrin <i>Risk perceptions of farmed fish and fish farming in seven European countries</i></p> <p>Tiozzo Barbara, Mari Silvia, Magaudda Paolo, Arzenton Valeria, Mantovani Claudio, Capozza Dora, Neresini Federico, Ravarotto Licia <i>Producing an effective health communication campaign to prevent salmonellosis infection</i></p>	<p>PUBLIC PERCEPTION AND INVOLVEMENT, ENERGY AND POWER ISSUES Chair: Ana Prades/Josep Espluga Location: Frödingsalen</p> <p>Flynn Robert, Miriam Ricci, Bellaby Paul <i>The limits of "upstream" public engagement: citizens panels and deliberation over hydrogen energy technologies</i></p> <p>Mearns Kathryn, Mearns Euan <i>Risks of energy decline: a crisis unfolding?</i></p> <p>Polic Marko, Drago Kos, Zeleznik Nadja <i>Nuclear objects risk perception and their siting</i></p>	<p>RISK MANAGEMENT, INDIVIDUAL, LOCAL AND SOCIETAL LEVELS Chair: Jerry Busby Location: Transformum</p> <p>Johansson-Hidén Birgitta <i>Discourses on municipal protection and safety work in relation to the "Civil Protection Act against Accidents"</i></p> <p>Johansson Anna, Postgård Ulrika <i>Societal risk and safety management work at local governmental level in Sweden</i></p> <p>Karlsson Lars <i>Local Government safety promotion</i></p>	<p>SYMPOSIUM S5 Location: Lagerlöfsalen</p> <p><i>Education Symposium of the SRA Education Committee</i></p> <p>Presenters: Martin Clauberg Tomas Öberg Peter Wiedemann</p>

10.30-11.00 Coffee & refreshments.

11.00-12.30	PARALLEL G1	PARALLEL G2	PARALLEL G3	PARALLEL G4	PARALLEL G5
	<p>RISK MANAGEMENT, POLICY, ENVIRONMENT AND TRANSPORT SYSTEMS Chair: Lennart Blomquist Location: Fryxellsalen</p> <p>Devilee Jeroen Van Poll Ric, Köhler Jutta <i>Appraisal of environmental health risks</i></p> <p>Boholm Åsa <i>Decision making on risk in railway planning</i></p> <p>Johansson Vicki <i>The implication of active governance issue networks for risk management in a road planning project</i></p> <p>Corvellec Herve <i>The immanence of risk to managerial practice</i></p>	<p>RELIABILITY, COMMUNICATION AND ORGANIZATIONS Chair: Joan Harvey Location: Sjöströmsalen</p> <p>Schröder Jens-Uwe, Ghirxi Kevin <i>Organizational factors in complex systems – the challenges in the maritime sector</i></p> <p>Kong Chee Sing, Busby Jerry <i>High reliability organization in Malaysian food manufacturing supply chains</i></p> <p>Merkelsen Henrik <i>How institutional contexts and communications flows affect conditions for risk expertise</i></p> <p>Davies Gareth, Kendall Graham, Soane Emma, Li Jiawei, Pollard Simon <i>An investigation into regulation decision making using agent based simulation</i></p>	<p>POLICYMAKING AND INTERNATIONAL COOPERATION Chair: Location: Frödingsalen</p> <p>Salvi Olivier <i>Analysis of the benefices of the “new approach” to improve the control of major accident hazards</i></p> <p>Molarius Riitta, Wessberg Nina, Keränen Jaana, Schabel Jari <i>Visualization of risk uncertainties in case of future climate risks – the case hydropower plant in Finland</i></p> <p>Gilek Michael, Andrén Elinor, Boström Magnus, Hammer Monica, Hassler Björn, Jönsson Anna Maria, Karlsson Mikael, Lönn Mikael, Söderström Sara <i>A framework for comparing the governance of environmental risks in the Baltic Sea</i></p>	<p>RISK AND THE MEDIA Chair: Anna Olofsson Location: Transformum</p> <p>Boholm Max <i>Risk relationships and causal complexity in media reporting: a Swedish case study</i></p> <p>Zemp Helena <i>Natural disasters: Given risks and potential risks posed by market-oriented disaster coverage (A longitudinal study of the reporting and portrayal of flood in the Swiss press)</i></p> <p>Hawkes Gillian, Houghton Julie, Wright Ione, Rowe Gene <i>Healthy eating in the media: A balanced diet?</i></p>	<p>SYMPOSIUM S6 Location: Lagerlöfsalen</p> <p><i>Framing climate change and energy futures</i></p> <p>Speakers: Alexa Spence Chris Jones Dan Venables Karen Parkhill</p> <p>Moderator: Nick Pidgeon</p>
12.30-14.00	<p>Closing of the conference.</p> <p>Lunch</p> <p>Bus transport to the hotels.</p>				



Åsa Boholm is professor of social anthropology at the School of Public Administration, University of Gothenburg.

She has a PhD in social anthropology and is honorary fellow of The Society for Applied Anthropology.

Since 1996 Dr. Boholm has been engaged in risk research focusing on cultural dimensions and meanings of risk, and the communication and management of technological risks in the public domain.

Within the Centre for Public Sector Research at Gothenburg University she is directing the research program “Societal Risk” focusing on regulation and policy issues, contested localization of large scale facilities, environmentalism and concern for nature, public trust and citizen involvement, and the role of science and technology in public administration, deliberation and decision making.



Prof. Glynis Breakwell took her PhD from the University of Bristol and DSc from the University of Oxford.

In 2003, in recognition of the significance of her contribution to the social sciences, she was awarded an honorary doctorate of laws from the University of Bristol and in 2004 became an Honorary Professor at the University of Shandong in China.

She is a psychologist specialising in research on leadership, on identity processes, on risk communication and on military cultures.

In 2002, she was elected an Academician of the Academy of Social Sciences. In 2006, she became one of the Honorary Fellows of the British Psychological Society. Professor Breakwell was appointed Vice-Chancellor of the University of Bath in 2001.

Professor Breakwell has published more than twenty books and hundreds of journal articles. Her latest book, *The Psychology of Risk* was published by Cambridge University Press in December 2007.



Ortwin Renn serves as full professor and Chair of Environmental Sociology and Technology Assessment at Stuttgart University (Germany).

He directs the Interdisciplinary Research Unit for Risk Governance and Sustainable Technology Development (ZIRN) at Stuttgart University and the non-profit company DIALOGIK, a research institute for the investigation of communication and participation processes in environmental policy making.

Since 2006 Renn is elected Deputy Dean of the Economics- and Social Science Department. He also serves as Adjunct Professor at Stavanger University. He has a doctoral degree in sociology and social psychology from the University of Cologne. His honours include an honorary doctorate from the Swiss Institute of Technology (ETH Zurich), the “Distinguished Achievement Award” of the Society for Risk Analysis and the Outstanding Publication Award from the Environment and Technology Section of the American Sociological Association.

Renn is primarily interested in risk governance, political participation and technology assessment. He has published more than 30 books and 250 articles, most prominently the monograph “Risk Governance” (Earthscan: London 2008).

MONDAY 29TH JUNE – MORNING

I. Round Table

“From the everyday to the extraordinary”, challenges for risk analysis and risk management.

■ The conference addresses a broad span of issues ranging from everyday risks to extraordinary events. The opening plenary session will focus on the challenges this poses for scholars, practitioners and society as a whole.

Moderator of this session is **Mats Ericson**, MD, Professor and Vice-Chancellor of the Swedish National Defence College.

Speakers at the Round Table session:

Åsa Boholm (Sweden)

Glynis Breakwell (UK)

Ortwin Renn (Germany)

MONDAY 29TH JUNE – AFTERNOON

II. Keynote address

“Living with risk – poverty in the era of climate change”, **Johan Schaar**



The international Commission on Climate Change and Development was launched by the Swedish Government in 2007 and is chaired by the Minister

for International Development Cooperation. In his keynote address, the director of the Commission Dr Johan Schaar will provide insights from this work and discuss some conclusions of the commission.

Prior to his assignment with the Commission, Johan Schaar led the tsunami recovery operation of the International Federation of Red Cross and Red Crescent Societies, Geneva.

Between 2000 and 2005 he was head of the Division for Humanitarian Assistance and Conflict Management at Swedish International Development Cooperation Agency (Sida), Stockholm.

He also has a background in the Red Cross Red Crescent Movement and holds a doctorate from the Swedish University of Agricultural Sciences.

TUESDAY 30TH JUNE – MORNING

III. Keynote address

“The more who die, the less we care: confronting psychic numbing”, **Paul Slovic**



Paul Slovic is president of Decision Research and a professor of psychology at the University of Oregon.

He studies human judgment, decision making, and risk perception, and has published extensively on these topics.

Dr. Slovic received a B.A. degree from Stanford University, M.A. and Ph.D. degrees from the University of Michigan, and honorary doctorates from the Stockholm School of Economics and the University of East Anglia.

He is past president of the Society for Risk Analysis and in 1991 received its Distinguished Contribution Award.

In 1993, Dr. Slovic received the Distinguished Scientific Contribution Award from the American Psychological Association, and in 1995 he received the Outstanding Contribution to Science Award from the Oregon Academy of Science.

TUESDAY 30TH JUNE – AFTERNOON

IV. International Round Table

The impact of the financial crisis on the long-term challenges faced by our Society.

Our environment is increasingly complex and globally interconnected. Risks are transcending geographical boundaries and have global implications. Global risk solutions are only possible if we learn from each other and collaborate, i.e. share experiences and results of research work, as well as the development of coordinated research projects to gain new knowledge.

This round table brings together an international panel of SRA leaders to discuss some current global risk questions.

Moderator of this session is **Olivier Salvi**, past president of SRA-Europe.

Introduction and background:
Daniela Leonte (Past president, Australia/New Zealand)

PARTICIPANTS

SRA International:

- Alison Cullen (President)

Europe:

- Roberto Bubbico (President)

Latin America:

- Esperanza Lopez (President)

Russia:

- Valery Lesnykh (Vice-President)

China:

- Sijian Zhao (Vice Secretary General RAC)

Japan:

- SRA representative

SVEN-ERIC ANDERSSON

Lower bounds of discount rates for investment subjects

ANDERS RÜTER

TOBIAS ANDERSSON

ANDERS GRANBERG

SANNE JOHAN

REBECCA STENBERG

ARNE JÖNSSON

KENT LINDQVIST

CARER – Center for advanced research in emergency response

ANGELA CASSIDY

JOHN MAULE

Stakeholder knowledge of food chain risk

YVONNE FRIMAN

CAMILLA KYLIN

SUSANNE HEDE

ANN ENANDER

Risk-related perceptions among military personnel preparing for an international mission

TOBIAS IPPISCH

STEPHAN VON WATZDORF

An empirical study of insurance-related mobile phone applications

TOBIAS IPPISCH

ALBRECHT BEREUTER

On the role of novel, pervasive technologies in the insurance business: Flash in the pan or new enlightenment?

CHRISTOPHER JONES

HERMAN ELGUETA

J. RICHARD EISER

What does the wind look like? How pro-wind and wind-sceptic groups use pictures to communicate their respective viewpoints

GEUN-SIK KIM

SEOYONG KIM

Beyond Micro-Perception: the Effect of Macro-Structural Factors on Acceptance of Nuclear Power Station

SEOYONG KIM

JU-YONG JUNG

Specification of Stigma Structure and Determinants in Risk Judgment of Nuclear Objects

BARRY ORR

J. RICHARD EISER

Carbon Capture and Storage: local attitudes towards a new type of power generation

ISABEL REGO

CAROLINA MAIA

LUIS SILVA

*How safe are we at work in the hospital?
Perceived occupational risk among nurses in an Azorean hospital*

Monday 29th June

SYMPOSIUM S1

Visualisation of risk: opportunities for public engagement and communication

SYMPOSIUM S2

Risk psychology, environment and safety: the ripensa-symposium

Tuesday 30th June

ROUND TABLE

Siting sensitive projects: Social acceptance in sensitive industrial projects

SYMPOSIUM S3

Results of the 'international study of the effects of information about precautionary measures on risk perceptions of mobile telephony (isep)'

SYMPOSIUM S4

Future risks with technologies for security and safety

Wednesday 1st July

SYMPOSIUM S5

Education Symposium of the SRA Education Committee

SYMPOSIUM S6

Framing Climate Change and Energy Futures

SYMPOSIUM

VISUALISATION OF RISK: OPPORTUNITIES FOR PUBLIC ENGAGEMENT AND COMMUNICATION

Monday 29th June 11.00-12.30

Aim

Visual imagery is a prominent aspect of contemporary culture. Every time we read a newspaper, turn on the TV or browse the internet we are continually bombarded with visual information. This in turn is likely to influence how individuals use visual information to engage with and understand complex risk issues.

The social sciences, however, have yet to majorly engage with the impact of visuals on the way people think about their worlds. As a consequence, there is growing empirical interest exploring the role this information has for both understanding and communication of risk.

It is also important, at a more theoretical level, to identify how visual information is used given the strong affective component researchers attribute risk perception processes. Does visual imagery 'position' individuals to respond and think about risk in particular ways? What emotions are associated when viewing one image over another? Can seeing really mean believing? The aim of this symposium is to bring together researchers to investigate these questions. Presentations will address a variety of risks but all have a specific interest in visual imagery and visualisation of risk more broadly.

Presentations

Disgust, imagery, and precautionary advice: Their impact on the risk perceptions of being bitten by ticks

Julie Barnett, Afrodita Marcu & Anna Mikolajek, University of Surrey, UK

■ Recent research suggests that visual material can have an impact on emotions and play an important role in persuasion, risk communication, and lay representations of illness (Joffe, 2008; Joffe & Haarhoff, 2002). The present research investigated whether the inclusion of precautionary information and of imagery, respectively, would increase the perceptions of risk of Lyme disease.

182 Polish volunteers (M age = 24) participated in a vignette experiment in which the researchers manipulated the inclusion of an image of a tick (*Ixodes ricinus*), and the inclusion of precautionary information about how to avoid being bitten by infected ticks and contracting Lyme disease.

A baseline measure of disgust was found to be affected by the experimental manipulations and was included as a covariate in the analyses of variance. Disgust was found to be a predictor of fear of being bitten by an infected tick, and of perceived severity of tick bites.

However, with the effect of disgust controlled for and with no tick image, more fear and more severity were reported when precautionary information was included than when it was not. When the tick image was present, there was no effect of precautionary information. Similarly, both disgust and the absence of tick image predicted higher intentions of precautionary behaviour.

The results suggest that the presence of precautionary information can augment the perceptions of risk. They also suggest that images of small apparently inoffensive creatures like ticks can reduce the perceptions of risk. The impact of imagery and of precautions on risk perceptions, as well as their interactions, will be discussed.

The power of visual material: persuasion, emotion and identification

Helene Joffe, University College London, UK

■ Helene Joffe's paper will integrate literature from the social sciences and humanities concerning the persuasive impact of visual material, highlighting issues of emotion and identification. Visuals are used not only to illustrate news and feature genres but also in advertising and campaigns that attempt to persuade their target audiences to change attitudes and behaviours. These include health, safety and charity campaigns that attempt to socially engineer change in people's beliefs, attitudes and behaviours.

With the increasing presence of such visuals comes a more emotive media environment with which people are forced to engage, and, under certain circumstances, disengage. The impact of visual information on the public's representation of a range of risks will be explored. The key focus will be on the emotions evoked by certain visuals, among those who identify closely with their content, as opposed to the cognitive pathways evoked by textual information.

Using visual imagery to communicate global warming risk

Nicholas Smith, University College London, UK

■ Global warming is currently presented in the mass media as one of the world's greatest global challenges. Although scientists agree that human activities are predominately to blame for recent temperature rises, considerable debate surrounds the exact nature of potential impacts. This in turn creates problems communicating risk information to the public and therefore influences how individuals engage with the global warming issue. Imagery provides a unique opportunity to investigate how visual information is being used in the mass media as a mechanism for engagement.

This presentation will report on an experimental study investigating how visualization of global warming risk in the mass media is affecting public understanding of the issue. In a between subject design, participants were asked to read a media article about global warming either presenting the science as certain, or identifying controversies and uncertainties. Type of image included was also manipulated between subjects.

Participants then answered a range of dependent measure questions assessing perceived level of certainty of the information just read and opinions about global warming more generally. Preliminary results indicate the potential role visual imagery has concretising uncertainty of the global warming issue.

Perceptions of risk from animals in text vs. images: A multiple sorting procedure approach

Afrodita Marcu, Julie Barnett, & Marta Brodzinska, University of Surrey

■ Social representations of causes of illness can have an impact on prevention and treatment, such as in the case of Lyme disease which is transmitted by ticks. The present research investigated how people conceptualized ticks in relation to other arachnids and insects, and whether presenting ticks in image vs. text would have an impact on their anchoring.

A card-sorting task was adopted, its open-ended format allowing the researchers to explore the reasoning behind the sorting of the elements. 25 cards were generated, including ticks, insects, mammals, and other arachnids

A pilot study had indicated that ticks were mostly associated with insects, disgust, fear, blood-sucking, and disease. These were represented in both word and image cards, but separately.

12 participants were allocated to one of the two conditions, words vs. images, and completed 3 free and 3 structured sorts, the latter asking them to sort the elements in terms of their dangerousness, their likelihood of transmitting disease, and the emotions they aroused. The results provide a pictorial representation of the extent to which the elements were viewed as similar or as different to each other.

The animals' perceived likelihood to transmit disease was underpinned by their categorization as dirty and as scavenger in the free sorts. The insects and the arachnids perceived as likely to transmit disease were those that feed on human blood and skin. More animals were perceived as likely to transmit disease in the image than in the text condition.

In this talk we will reflect on the implications of using text vs. images in relation to risk imagery research.

RISK PSYCHOLOGY, ENVIRONMENT AND SAFETY: The RIPENSA-symposium

Monday 29th June 14.30-16.00 and continued 16.30-18.00

Abstract

The presentations and discussions in this symposium cover recent research results from risk psychology, environment and safety reflecting the broad scope of the RIPENSA research team's collaboration and production.

The scope involves individuals' everyday risks, emotions, reactions and behaviour, studies of collective actions or community reactions related to risk and safety issues, health outcomes in social interaction and work environments as well as behaviours in the face of global environmental, or security, threats.

The RIPENSA team aims at specialisation as well as collaboration to produce insights and practices of complementary aspects to risk, environmental and safety issues. Therefore the approaches include the development of basic theory related to various theoretical perspectives, a broad range of utilized methodologies, and experimental as well as empirical testing and fields studies.

In the first paper Lennart Sjöberg focuses on emotions and the current conceptual confusion regarding the definitions of central concepts used to explain human reactions and behaviour in relation to central risk perception theories. In the following paper Christian Klöckner outlines driving forces behind human decision-making and action. He links the Comprehensive Action Determination Model (CADM) to how individuals relate to the risk of climate change and decide on the actions they want to take.

Mons Bendixen and Ute Gabriel present results on how sexual risk behaviour and sexual harassment relate to health outcomes in young people. The sexual risk – health outcome association is of central interest in the study. In the following paper Marit Christensen outlines how downsizing in a cornerstone industry, internal reorganisation and aspects of the psychosocial environment affect employees' job satisfaction in community services. She points out the varying importance of psychosocial factors for job satisfaction in different work circumstances.

Tone Aasen and Gunhild Åm Vatn report from a field study which investigated neighbours' concerns regarding a refuse incineration plant and suggested plans to increase the capacity of the facility. They point at health concerns, but also to concerns involving noise, smell, traffic, safety and esthetics.

Britt-Marie Drottz-Sjöberg and Jørn Vatn present community reactions to a planned liquefied natural gas (LNG) industrial application. The suggested placement of a LNG storage tank in a harbour area, together with scarce initial risk analysis and public information, as well as highlighted media reports developed concerns about public safety as well as about the procedural handling of the process.

J. Peter Burgess focuses on how security is financed, and discusses how costs and values are linked on the basis of a 2004 European Union report. How do European agencies make the calculation that permits them to put a price on human life and to differentiate that cost from one European member state to another?

These presentations and questions provide some input to the following discussion in the session. In highlighting examples from different perspectives we wish to embrace the complexity of real life situations and reflect the many important dimensions of the RIPENSA arena, e.g. individuals' perceptions and reactions in large or collective systems, the functions of emotions and values in individual as well as international and global decision-making and policy, the interrelationships between risk estimates or analysis and social systems and cultural frameworks.

Presentations

The Place of Emotions in a World of Risks

Lennart Sjöberg, Stockholm School of Economics, Sweden

■ Emotions, attitudes and values are all implicated as factors in risk perception. However, conceptual confusion has led to some unjustified generalizations with regard to the role of emotions. Attitudes, sometimes called affect, have long been known to correlate strongly with perceived risk but this is no proof that emotions do so. Values, as measured in Cultural Theory dimensions have, on the other hand, been found to have only weak relations with perceived risk. Other value scales, such as the ones devised by Schwartz, are even less related to risk perception. When emotions are measured in an appropriate manner it is found that they do have a strong relationship with perceived risk.

However, this is not true for "dread", the major factor in the Psychometric Model, because dread is measured, in the paradigm, as the emotions expected of others. It is the respondent's own emotions which are important, not what he or she expects from others. All these statements will be illustrated with results from my own empirical research, mainly on nuclear waste and nuclear power.

Understanding the Driving Forces behind Climate Behaviour of Individuals

Christian Klöckner, The Norwegian University of Science and Technology, Norway

■ Behavioural decisions of individuals in many different domains contribute to climate change. Understanding the different driving forces behind human action, their interplay, and varying importance in different situations helps to develop strategies to mitigate climate change and to adapt to predicted changes on the individual level. This presentation links

the Comprehensive Action Determination Model (CADM) developed by Klöckner and Blöbaum to the question of how individuals relate to the risk of climate change and decide on the actions they want to take.

The model assumes that individual behaviour is simultaneously influenced by intentional processes (including reasoned decision making, knowledge, attitudes), habitual processes (including routines, behavioural scripts, schemata), normative processes (including values, social and personal norms), and the situational impact (including both objective and subjective barriers and facilitators of behavioural alternatives).

The importance of the different sources of behavioural determination varies over time, between situations, between persons, and depending on behavioural domains. Empirical data from three studies from Germany and Norway applying the CADM to individual travel mode choice, decisions for a heating system, and household waste separation are presented to support the model.

Sexual Risk Behavior, Sexual Harassment and Health Outcomes

Mons Bendixen & Ute Gabriel, The Norwegian University of Science and Technology, Norway. mons.bendixen@svt.ntnu.no; ute.gabriel@svt.ntnu.no

■ A study was conducted to examine to what the extent involvement in sexual risk behaviour and being sexually harassed is related to health outcomes in a sample of male and female senior high school students. In particular we were interested in studying the sexual risk – health outcomes association.

The Sexual risk index covered one-night stand partners, unknown partners, not using contraceptives and being intoxicated during intercourse. Being sexually harassed covered various verbal and physical forms of harassment as well as indirect harassment (gossiping and using internet and mobile phones). Health outcomes indices covered symptoms of anxiety and depression, life-satisfaction, and bodily self-esteem.

Data were obtained from 1 610 students enrolled in nine senior high schools in and around Trondheim municipality (response rate 50%). We found that sexual risk behaviour was moderately associated with being sexually harassed. While being sexually harassed (physically as well as non-physically) was associated with a number of negative health consequences, we found no direct link between sexual risk behaviour and different health outcomes.

Additional analyses were performed for subgroups of the sample to identify conditions under which sexual risk behaviour might lead to negative health outcomes.

Job Satisfaction and Perceived Risks in Municipality Services related to Reorganization and Downsizing

Marit Christensen, The Norwegian University of Science and Technology, Norway
marit.christensen@svt.ntnu.no

■ The aim of the study was to investigate how (1) downsizing in a cornerstone industry, (2) internal reorganisation and (3) aspects of the psychosocial environment affected the employees in the local services concerning job satisfaction.

It is hypothesized that (1) downsizing in a cornerstone industry, (2) internal reorganisation, and (3) the psychosocial work environmental factors would negatively affect the job satisfaction of the people working in the local services.

The sample consisted of employees working in the social, health and labour administration services in 24 municipalities in Norway (N=470), 12 with cornerstone industry that either was downsizing or had closed down whereas 12 with no cornerstone industry.

The results showed that downsizing of a cornerstone industry, and internal reorganisation, did not have a pronounced impact on job satisfaction for the employees in the local services. Instead did the psychosocial work environment factors emerge as more important in explaining job satisfaction among the employees, and especially so the communication factors. The results also showed that there were differences regarding the psychosocial factors that explained job satisfaction related to if the employees were in a situation of downsizing in a cornerstone industry or not, or in no internal reorganisation, current reorganisation or finished reorganisation.

Concerned Neighbours to a refuse Incineration Plant

Tone Aasen, NTNU, Department of Psychology, Trondheim, Norway
Gunhild Åm Vatn, Language and Communication Studies, NTNU, Trondheim, Norway
gunhild.vatn@hf.ntnu.no; tone.aasen@svt.ntnu.no

■ Energy from waste provides important opportunities concerning the reduction of land-fill disposal and global warming. In the municipality of Oslo in Norway a refuse incineration plant is under expansion by the local incinerator operators (EGE). The aim of the expansion is to increase the productive capacity of the plant, produce biogas and biofuel.

However, local residents in the neighboring area to the plant have objected to such a proposed expansion of burning fuel derived from household garbage. Due to the local residents increased opposition, SINTEF/NTNU was asked to lead a process in order to facilitate and

improve risk communication vis-à-vis the local residents. Four focus group discussions, or dialogue groups, were carried out with the main objective to identify and elaborate on the most important concerns among the residents. The results showed that the participants were especially concerned about risk-related health issues, odor trouble, the increased traffic load, childhood environment, house prices and the visual aspect of a large industrial plant in the neighborhood. Participants were also dissatisfied with information access and general management in the decision-making processes.

The results and processes are currently followed up by the industry which will be mentioned in the discussion.

Community Reactions to the Development of a LNG Plant

Britt-Marie Drottz-Sjöberg, Jørn Vatn

Norwegian University of Science and Technology, Trondheim, Norway

■ The industrial application of liquefied natural gas (LNG) is developing rapidly in Norway. This paper reports results from a risk communication project financed by Lyse energy AS and conducted by SINTEF, Trondheim, in which interested, and often critical, parties voiced their questions and concerns.

The suggested placement of a LNG storage tank in Risavika, Sola municipality neighbouring the city of Stavanger, has given rise to an active debate in the municipalities, in the media, as well as among residents. A risk communication project invited individuals and representatives from assumed interest groups to be involved in focus group discussions.

The results showed that the participants wanted more information and further risk and safety analysis related to the planned industrial site and related transports, and that they had comments related to the preceding decision-making process as well as the planning of local preparedness and rescue efforts. Among the key concerns were a future increase of the planned capacity of the plant, the safety of regular passenger traffic and other activities in the harbour, and potential hazards for neighbouring housing areas. The results are discussed in a governance framework focusing on the close interaction between technological, including risk analytic, standards and specificities, and the societal processes of political decision-making and risk preparedness.

The cost of danger and value of security. The EU study on aviation security financing

J. Peter Burgess, RIPENSA

■ In 2004 the European Union published a comprehensive report with aim of documenting the ways in which security is financed in the EU and particularly changes in that funding schema since in the post-9/11 security environment.

The report details how differing wages, differing costs of living, taxes and surcharges are correlated with a unique value in the aviation industry: 'passenger safety'. Thus the wheels of significant political processes begin with the catastrophic attacks on New York and Washington D.C. and end with an overview of changes made in the financial system of EU aviation. What happened along this path? How are cost and value linked and how has that linked changed under the political pressure of the post-9/11 world? The proposed paper analyzes this correlation by examining how the link between passenger safety and the value of life is made in post-9/11 thinking. How do European agencies make the calculation that permits them to put a price on human life and to differentiate that cost from one European member state to another? How are thresholds for security measures detected and politically acted upon. What risks are acceptable, how determines their cost and what political processes determine them? By studying the link between cost and value in the context of aviation security this paper will seek understand the how human life is made an object of political economy.

ROUND TABLE

SITING SENSITIVE PROJECTS

Tuesday 30th June 11.00-12.30

■ The roundtable will describe how social acceptance in sensitive industrial projects is a key success factor which must be properly managed and cautiously looked after. Anyway, social acceptance relies both over legal regulations and social options to be set up and followed up by public authorities on a case by case basis. The subject will be tackled through a comparison of partnerships developed in Belgium and Slovenia in order to site a repository

for low and medium-level short-lived waste (LILW) and a cross examination with a French case of siting a different industry, rendering plant, also with a local partnership.

The roundtable will be an opportunity to:

- present general context, technical background and choices in siting two similar sensitive projects of radioactive waste management: disposal of low and medium-level short-lived waste (LILW) in two countries, Belgium and Slovenia,
- comparing some steps and key issues with an other kind of sensitive project, a rendering plant in France,
- present expectations from a local partnership representative view point,
- draw comparisons and common good practices in managing such upstream part of a technical project.

Participants

Nadja Železnik ARAO (Slovenia)

Evelyn Hooft NIRAS/ONDRAF (Belgium)

Stakeholder representative (local Belgian partnership)

Jean-François David, Compagnie Nationale des Experts de Justice en Environnement: (France)

The steps of the round table will link up as follows:

STEP 1: Context and history

From hard science to soft science, from technology to social expertise, listening and understanding, how to insert soft sciences in a technical project and how to listen to citizens.

Building local partnerships are well recognized frameworks for involvement and participation of local stakeholders ; those partnership obey to several steps developing inside pre established frameworks which will be described.

Belgian experience and model, by Evelyn Hooft

Slovenian experience and model, by Nadja Železnik

French experience: a rendering plant needing to be relocated outside a urban area, by Jean-François David

STEP 2: Social and political approach along with local partnership

The history and live of partnerships will be described in a comparative approach with rule of the games, mutual apprenticeship between public agencies and local partners, pros and cons, process description. A SWOT analysis will be presented for both projects to back the comparison and make it more understandable, stressing the differences and similarities.

The typology and number of partners, the mapping of their social expectations will be described.

Belgian experience:

- NIRAS/ONDRAF, by Evelyn Hooft

• a local stakeholder (local Belgian partnership) : *why did we accept the partnership*

Slovenian experience, by Nadja Železnik

STEP 3: Lessons learned

From SWOT analysis, the results for each partnership will be considered: what type of recognition, both at local level and at governmental level for each project, purposes and roadmap. Process calendar and time spans will also be subjects of comparisons. Differences and common rules will be drawn from those different approaches and siting processes .

Beyond that keys success factors and pitfalls will be listed.

Some key success factors:

- local and national involvement in future projects
- freedom and wide access of stakeholders, fulfilling their expectations
- keeping the balance between a project management system and a loose schedule: no hurry, we can listen to everybody and prepare sound answers
- keeping at bay predetermined scientific and technical imperialism.

Pitfalls to avoid:

- conflicting leaderships
- a weak communication scheme.

Slovenian experience: Nadja Železnik

Belgian experience: Evelyn Hooft and local stake holder

Cross examination through French experience: Jean-François David

SYMPOSIUM

RESULTS OF THE 'INTERNATIONAL STUDY OF THE EFFECTS OF INFORMATION ABOUT PRECAUTIONARY MEASURES ON RISK PERCEPTIONS OF MOBILE TELEPHONY (ISEP)'.

Tuesday 30th June 11.00-12.30

Symposium Authors (in alphabetical order):

Alvarez J, Barnett J, Boerner F, Clauberg M, Croft R, da Silva Medeiros FN, de Villiers B, Diaz A, Gutteling JM, Kemp R, Kikkawa T, Schuetz H, Shukla R, Wiedemann PM

Symposium Presenters (in chronological order):

Peter Wiedemann, Julie Barnett, Martin Clauberg, Flavia Natércia da Silva Medeiros, (Franziska Boerner – as facilitator for a discussion round at the end of the presentations)

Symposium Abstract

When risks are unclear or highly controversial, precautionary measures are called for to reduce the potential for risks and also oftentimes to primarily affect risk perceptions. Under-

standing how risk perceptions are influenced by precautionary measures is a critical component of the efforts to improve risk communication strategies and, indeed, risk management practices.

In a multi-national (9+3 nation) research project, survey experimental studies were performed to obtain crucial scientific data related to understanding trust, risk and benefit perception of mobile communication technology by the general public in regards to the issue of precautionary measures towards both mobile phones and base stations.

Contrary to the prevailing assumption that implementation of precautionary measures, or more precisely communicating or informing about taking such precautionary measures, will increase trust, alleviate fears, and reduce risk perceptions in the general public, previous findings from Western & Middle European countries indicated that the opposite effect may be observed. Preliminary data analyses for the ISEP study in these countries support the previous observations.

Various theoretical hypotheses may be posited to explain this countervailing effect. To verify whether this effect holds true across larger sample sizes and across different cultures and countries, an international comparative study was performed in nine countries using a standardized survey instrument that, however, was culturally adapted. Initial comparative analyses indicate that a countervailing effect may not be observed in all the ISEP partner nations. Survey variables included the information about the level of precautionary measure, the basic intention behind implementing it, and the order of addressing base stations and mobile phones.

Respondents rated their perceived risks, organizational trust, and benefits, and in addition self-reporting their own mobile phone usage patterns. The international results are comparatively presented in four talks that provide a project overview with discussions of the coordinated sampling and data collection approach, followed by separate presentations of the comparative findings for the perception of risk, trust, and benefits.

The implications of the results are not only important for improving the understanding of risk perception and risk communication, but may have significant ramifications for risk management.

ACKNOWLEDGMENT

This project is supported by the GSM Association (www.gsmworld.com) and the Mobile Manufacturers Forum (www.mmfa.org)

PRESENTATIONS

International Study of the Effects of information about Precautionary measures on risk perceptions of mobile telephony (ISEP): Project overview, coordinated sampling approach, and international comparisons.

Authors (in alphabetical order): Alvarez J, Barnett J, Boerner F, Clauberg M, Croft R, da Silva Medeiros FN, de Villiers B, Diaz A, Gutteling JM, Kemp R, Kikkawa T, Schuetz H, Shukla R, Wiedemann PM*

■ ISEP is a multi-national (9+3 nation) research project. The survey experimental studies described here provide crucial scientific data related to understanding trust, risk and benefit perception of mobile communication technology by the general public in regards to the issue of precautionary measures towards both mobile phones and base stations. Contrary to the prevailing assumption that implementation of precautionary measures, or more precisely communicating or informing about taking such precautionary measures, will increase trust, alleviate fears, and reduce risk perceptions in the general public, we previously found that the opposite effect is observed.

Preliminary data analysis for ISEP validates the previous observations. Various theoretical hypotheses may be posited to explain this countervailing effect which perhaps stems from an incongruity in the social amplification of the perceived risk as a result of trust issues towards those implementing the precautionary measure and the perceived need for them to implement it. To verify whether this effect holds true across larger sample sizes and across different cultures and countries, an international comparative study was performed in nine countries using a standardized survey instrument that, however, was culturally adapted.

Initial comparative analyses indicate that a countervailing effect may not be observed in all the ISEP partner nations. Stimulus texts in 20 different survey variants were randomly addressed by 400 respondents in each country. Survey variables included the information about the level of precautionary measure, the basic intention behind implementing it, and the order of addressing base stations and mobile phones. Respondents rated their perceived risks and organizational trust. The implications of the results are not only important for improving the understanding of risk perception and risk communication, but may have significant ramifications for risk management. This presentation will provide an overview of the project and discuss the coordinated sampling and data collection procedure. The basis for comparatively addressing the data from different countries will be presented here.

International Study of the Effects of information about Precautionary measures on risk perceptions of mobile telephony (ISEP): Effects of survey experimental variables on risk perceptions and international comparisons.

Authors: Alvarez J, Barnett J*, Boerner F, Clauberg M, Croft R, da Silva Medeiros FN, de Villiers B, Diaz A, Gutteling J M, Kemp R, Kikkawa T, Schuetz H, Shukla R, Wiedemann PM

■ A broad and at times heated debate over the potential health risks of mobile communication technology has been ongoing for several years in specific regions of the world, most heatedly in Western & Middle European nations. Various proponents and critics have seemingly become nearly entrenched and decisionmakers are forced to recognize the importance and impact of the ongoing debate on risk perception towards mobile communication technology by the general public in their development of effective risk communication and management strategies.

Consequently, strategies have typically reflected the prevailing assumption that implementation of precautionary measures, or more precisely communicating or informing about taking such precautionary measures, will increase trust, alleviate fears, and reduce risk perceptions in the general public. Previous survey experimental studies, however, have indicated that the opposite effect may be observed in some countries, i.e. if presented with information on precautionary measures the respondents' risk perceptions may increase rather than decrease.

Preliminary data analyses for ISEP's Western & Middle European nations validate these previous observations. To verify whether this effect holds true across larger sample sizes and across different cultures and countries, an international comparative study was performed using a standardized survey instrument. Each of the 20 different survey variants included a matched stimulus text on precautionary measures for mobile phones and/or base stations and respondents rated their perceived risks, among other survey variables. Initial comparative analyses indicate that a countervailing effect may not be observed in all the ISEP partner nations. The combined international results will provide crucial scientific data to support a better understanding of risk perception towards mobile communication technology and help to improve risk communication strategies. Implications for risk management will also be discussed.

International Study of the Effects of information about Precautionary measures on risk perceptions of mobile telephony (ISEP): Variations in organizational trust as function of survey experimental variables.

Authors: Alvarez J, Barnett J, Boerner F, Clauberg M*, Croft R, da Silva Medeiros FN, de Villiers B, Diaz A, Gutteling JM, Kemp R, Kikkawa T, Schuetz H, Shukla R, Wiedemann PM

■ Trust in regulatory and/or decisionmakers' knowledge levels and ability to reach acceptable risk-dependent decisions is a correlative, if not integral, component of the public's overall perception of risk.

In a multi-national (9+3 nation) comparative survey experiment study, crucial scientific data was obtained for a better understanding of trust, risk and benefit perception of mobile communication technology by the general public in regards to the issue of precautionary measures towards both mobile phones and base stations. While the prevailing assumption claims that implementation of precautionary measures, or more precisely communicating or informing about taking such precautionary measures, will increase trust, as well as alleviate fears, and reduce risk perceptions in the general public, previous observations found the opposite effect. Preliminary data analysis for ISEP validates these previous observations.

Trust issues may play a significant role in variations of the perceived risks for different levels of precautionary measures, perhaps due to incongruities in the social amplification relating to trust issues towards those implementing the precautionary measure and the perceived need for them to implement it.

To verify whether this effect holds true across larger sample sizes and across different cultures and countries, an international comparative study was performed. Survey variables included the information about the level of precautionary measure, the basic intention behind implementing it, and the order of addressing base stations and mobile phones. Respondents rated their perceived risks and organizational trust, which was operationalized by the assessment of the perceived level of knowledge.

The implications of the results are not only important for improving the understanding of risk perception and risk communication, but may have significant ramifications for risk management.

International Study of the Effects of information about Precautionary measures on risk perceptions of mobile telephony (ISEP): Benefit perceptions and usage patterns and their correlation to risk perception in international comparison.

Authors: Alvarez J, Barnett J, Boerner F, Clauberg M, Croft R, da Silva Medeiros FN*, de Villiers B, Diaz A, Gutteling JM, Kemp R, Kikkawa T, Schuetz H, Shukla R, Wiedemann PM

■ The perception of benefits is an influencing factor on the risk perception by various publics with – perhaps – different extent of influence across different nations/cultures.

In a multi-national (9+3 nation) research project (ISEP), survey experimental studies provided crucial scientific data related to understanding trust, risk and benefit perception of mobile communication technology by the general public in regards to the issue of precautionary measures towards both mobile phones and base stations.

Contrary to the prevailing assumption that implementation of precautionary measures, or more precisely communicating or informing about taking such precautionary measures, will increase trust, alleviate fears, and reduce risk perceptions in the general public, we previously found in some Western & Middle European nations that the opposite effect is observed. Preliminary data analyses for ISEP partners in Western & Middle European nations support these previous observations.

To what extent perceptions of benefits, as evidenced by self-assessment and self-reported usage patterns, can be correlated to overall perceptions of risk and trust and to what degree they may be variable across nations / cultures, was the focus of this analysis.

In addition to comparatively analyzing the benefit perceptions and the effects of the different precautionary measures and the survey variables on this measurement, usage patterns were comparatively contrasted across the different nations

EDUCATION SYMPOSIUM OF THE SRA EDUCATION COMMITTEE

Wednesday 1st July 9.00-10.30

■ This symposium is focused on the education initiatives of the Society for Risk Analysis' Education Committee (EduComm) and will present the initiatives of the SRA's EduComm as well as supported education-based presentations. The symposium is comprised of an overview of accomplished as well as ongoing and upcoming initiatives. In addition, standalone presentations of education-related topics will be presented. A final discussion round will allow the audience to discuss risk-educational topics of interest.

Symposium Authors (in alphabetical order):

Luis Cifuentes, Martin Clauberg, Leah Corr, David Hassenzahl, Garrick Louis, Tomas Öberg, Carolyn Ross, Brandolyn Thran, John Watt, Peter Wiedemann

Symposium Presenters (in chronological order):

Martin Clauberg, Tomas Öberg, Peter Wiedemann, Martin Clauberg

Symposium abstract

The Education Committee (EduComm) of the Society for Risk Analysis (SRA) has been chartered since December 2006 with the mission to "... provide guidance and support for individuals and institutions interested in teaching or learning risk analysis methods".

It is comprised of 20+ SRA members that have a common goal of fostering the educational resources and opportunities of the SRA membership and reaching out to students and teachers of risk analysis at all levels, from Kindergarten to University and beyond to adult professional training. This symposium will introduce the SRA EduComm and its ongoing and upcoming activities, with a focus on how participants can draw upon the resources and become involved in the activities of the EduComm.

After an overview of the goals and constitutive membership of the EduComm, a brief review of the accomplished initiatives of the EduComm will be followed by presentations of the ongoing and upcoming initiatives, which will be followed by three sponsored presentations of examples of European risk education perspectives. Accomplished projects include establishment of general risk analysis training workshops at Annual Meetings of SRA in the US and development of video excerpts of these workshops, coordination of symposia at various SRA meetings, and completion of data collection of a member survey on risk education programmes. Upcoming and ongoing initiatives include the First Risk Analysis in Education Conference in Reno, Nevada, USA on July 13-15th, 2009 and the development of a collection of online risk tutorials, among other activities of the EduComm. These latter initiatives will be presented in depth.

The results of the SRA Membership Survey on Risk Education Programmes will be presented and discussed in detail in one of the standalone presentations of examples of European risk education perspectives. A presentation of a Swedish experience in teaching the concepts of variability and uncertainty in environmental risk analysis will provide insights into the challenges and approaches for university-based teaching.

The third standalone presentation will focus on risk communication training in Germany from a theoretical and practical perspective. A final group/panel discussion round will allow for a free exchange of information and an opportunity for EduComm presenters to share their resource suggestions and address audience questions.

Individual presentation titles

- *Overview of the SRA Education Committee and its activities including development of the First Risk Analysis in Education Conference.*
- *Experience in teaching the concepts of variability and uncertainty in environmental risk analysis.*
- *Challenges for institutional education of risk communication for organizations in Germany.*
- *Insights into the future of risk education from a survey of SRA members.*

Group/panel discussion.

Overview of the SRA Education Committee and its activities including development of the First Risk Analysis in Education Conference

Luis Cifuentes¹, **Martin Clauberg**^{*2}, **Leah Cor**³, **David Hassenzahl**⁴, **Garrick Louis**⁵, **Tomas Öberg**⁶, **Carolyn Ross**⁷, **Brandolyn Thran**⁸, **John Watt**³ (in alphabetical order)

¹ Industrial Eng., P Universidad Catolica de Chile, Santiago, Chile

² The Institute for Environmental Modeling, Dept. of Ecol. & Evol. Bio., University of Tennessee, Knoxville, USA

³ Middlesex University, London, UK

⁴ Dept. of Environmental Studies, University of Nevada, Las Vegas, USA

⁵ Dept. of Systems and Information Eng., University of Virginia, Charlottesville, USA

⁶ School of Pure and Applied Natural Sciences, University of Kalmar, Sweden

⁷ Churchill County School District, Fallon, Nevada, USA

⁸ University of Nevada, Reno, USA

■ The Education Committee (EduComm) of the Society for Risk Analysis (SRA) has been chartered since December 2006 with the mission to "... provide guidance and support for individuals and institutions interested in teaching or learning risk analysis methods". SRA members who have a common goal of fostering the educational resources and opportunities of the SRA membership and reaching out to students and teachers of risk analysis at all levels, from Kindergarten to University and beyond to adult professional training serve voluntarily on this committee. This presentation will introduce the SRA EduComm and its ongoing and upcoming activities, with a focus on how participants can draw upon the resources and become involved in the activities of the EduComm.

An overview of the goals and constitutive membership of the EduComm will be followed by a brief review of the accomplished initiatives of the EduComm. The subsequent presentations in this symposium will present the committee's ongoing and upcoming initiatives. Accomplished projects include the establishment of general risk analysis training workshops at Annual Meetings of SRA in the US and development of video excerpts of these workshops, coordination of symposia at various SRA meetings, and completion of data collection of a member survey on risk education programmes.

Upcoming and ongoing initiatives include the organization for the First Risk Analysis in Education Conference in Reno, Nevada, USA on July 13-15th, 2009 and the development of a collection of online risk tutorials, among other activities of the EduComm.

Experience in teaching the concepts of variability and uncertainty in environmental risk analysis

Tomas Öberg

School of Pure and Applied Natural Sciences, University of Kalmar, Sweden.

■ Variability and uncertainty are key concepts in all quantitative risk assessments. Here, we will describe and discuss how these concepts can be introduced with practical examples and problem solving, in university teaching of environmental risk analysis. Our discussion will particularly focus on the methods found in two popular calculation and simulation software – Crystal Ball® and Risk Calc™ – that are used in our master's program at the University of Kalmar, Sweden. Multimedia models for exposure assessment are easy to implement with both software, although the separation of variability and uncertainty can be realized with fundamentally different approaches. Likewise, dependency assumptions and incomplete information is often treated differently. We have found it very useful for students in the advanced classes to experiment with these different approaches to model the same or similar problems. These exercises bring further insight into statistics, probabilities, modeling, and the many assumptions involved in probabilistic exposure models. Additionally, the different approaches to treat uncertainty – intervals, probability distributions, and 'p-boxes' – raise interesting questions regarding the boundaries of knowledge.

Challenges for institutional education of risk communication for organizations in Germany

Peter Wiedemann^{*1}, **Martin Clauberg**², **Holger Schuetz**¹

¹ Institute of Neuroscience and Medicine INM-8, Research Centre Juelich, Germany

² The Institute for Environmental Modeling, Dept. of Ecol. & Evol. Bio., University of Tennessee, Knoxville, USA

■ Effective management of risk communication challenges necessitates that organizations identify and address their educational needs for this knowledge area. Companies or organizations that ignore or are not vigilant in their institutional education as part of an integral risk communication strategy do so at their own peril. Not only are there legal requirements in Germany, as well as in Europe, for specific companies to have the capability to engage in risk communication with various stakeholders, but there are also compelling economic reasons for businesses to avoid risk communication failures that can lead to real crises for the company. Consequently, many organizations in Germany, from insurance companies to

regulatory agencies, have recognized the need to engage in institutional education efforts on the topic of risk communication.

We present a multi-step risk communication concept that has been developed and employed to assist organizations to self-evaluate their overall and issue-specific risk communication and education needs. A special challenge is that many organizations – even regulatory agencies that deal with the communication of risk situations – do not have dedicated risk communication departments or specialists on staff. Rather, they typically ad hoc assign professionals with other, perhaps closely-related, specialty backgrounds or even managerial professionals to perform the organization's risk communication.

Insights into the future of risk education from a survey of SRA members

Martin Clauberg^{*1}, **John Watt**², **Leah Corr**²

¹ The Institute for Environmental Modeling, Dept. of Ecol. & Evol. Bio., University of Tennessee, Knoxville, USA

² Middlesex University, London, UK

Abstract

Risk analysis is a complex and changing profession and the SRA is determined to be at the forefront of efforts to ensure that the best fit is achieved between the needs of the profession and the educational programmes available. In the Spring of 2008 the Education Committee of the SRA invited the members of the Society to take part in a survey which aimed to identify current practice and future opportunities for risk related education. The resulting sample (n=189), representing almost 10 % of the membership of the Society, provides a reflection of the many facets of the profession and a worldwide coverage with respondents from 29 different countries.

This paper presents the results of the research and, along with an earlier study that provided a synopsis of risk analysis academic syllabi and curricula currently available in the USA (reported elsewhere), provides a platform for the ongoing discussion over future provision. There is a large body of academic research to draw upon and one key challenge is to identify common components that need to be present for a programme to include risk analysis or risk management in its title.

Group/panel discussion.

Martin Clauberg¹, **Tomas Öberg**², **Peter Wiedemann**³

¹ The Institute for Environmental Modeling, Dept. of Ecol. & Evol. Bio., University of Tennessee, Knoxville, USA

² School of Pure and Applied Natural Sciences, University of Kalmar, Sweden.

³ Institute of Neuroscience and Medicine INM-8, Research Centre Juelich, Germany

This group/panel discussion will allow the audience to pose questions as well as provide the panel an opportunity to interact with each other and the audience. A set of challenge questions will be prepared in advance to stimulate and structure the discussion as needed, but preference will be given to audience questions.

SYMPOSIUM AN INFORMATION ASSURANCE PERSPECTIVE ON FUTURE RISKS WITH TECHNOLOGIES FOR SECURITY AND SAFETY

Tuesday 30th June 13.30-15.00

■ The growing dependence on, and interconnection of, technical systems in critical infrastructures has resulted in growing risks in society. One of the emerging issues is the intertwining of security and safety. The classic approach to risk assessment of single systems is no longer applicable as highly complex systems of systems are created.

This, for instance, raises new challenges on information assurance and hence calls for novel security risk assessment methods that contribute to increased confidence in and understanding of such technologies.

Moderator: **Daniel Haglund, MSB**

Presenters:

Åke J Holmgren, MSB information assurance section

The dependence on industrial control systems and the implications for risk analysis of critical infrastructures

Erland Jonsson, Chalmers University of Technology

On safety, security and risk in critical systems

Jan Skogqvist, IT auditor, Handelsbanken

Information assurance and risk analysis in financial IT-systems.

SYMPOSIUM FRAMING CLIMATE CHANGE AND ENERGY FUTURES

Wednesday 1st July 11.00-12.30

Discussant: Nick Pidgeon¹

Contributors: Alexa Spence^{1*}, **Chris Jones**², **Dan Venables**¹ & **Karen Parkhill**¹

¹ Cardiff University,

² University of Sheffield

* Contact: spencea1@cardiff.ac.uk

■ Climate change is an increasingly critical issue around the world and major changes within energy generation in Europe will be required in order to meet the related domestic carbon emission targets that have been set. Public support is important in the successful risk management of related policy decisions and therefore the way that these public issues are debated, communicated and decided upon is crucial.

This symposium will examine public perceptions of climate change and energy futures within Britain, in particular considering the importance of the impact of framing on these perceptions. The way that an issue is framed can have an important impact on perceptions and, for this reason, communications from stakeholders such as the government and energy companies have been scrutinised and at times criticised for the framings that they have employed.

Each of the papers presented as part of this symposium considers the impact of different frames on the way that climate change and energy sources are perceived.

Chris Jones will outline research that experimentally examined the impact of framing on the comparative favourability of nuclear power within Britain's electricity generating mix. Four different frames were utilised here, two pro-nuclear frames (climate change mitigation and increasing the security of energy supplies), one anti-nuclear frame (nuclear waste) and one neutral frame (how nuclear power produces electricity).

Participants were provided with textual information relating to one of these four frames before deciding the respective contributions that five key energy sources (coal, gas, nuclear, renewables, and electricity import) should make towards Britain's electricity demand. Participants then answered a series of questions assessing related socio-cognitive constructs including attitudes and beliefs about nuclear power.

Results indicated that whilst renewables were the most favoured of energy sources, framing had a significant impact on constructs measured; in particular the climate change mitigation frame appeared to increase support for future use of nuclear power.

A second experimental examination of framing will be presented by **Alexa Spence** however this paper focuses on framing climate change. This research examined how framing climate change mitigation in terms of gain or loss outcomes or in terms of personal relevance can impact related perceptions. Frames were developed using text adapted from the most recent IPCC (Intergovernmental Panel on Climate Change) report on climate change impacts alongside maps and images.

Results indicated that participants provided with gain framed climate change information exhibited more negative attitudes towards climate change and more positive attitudes towards climate change mitigation than those provided with loss framed information. However, mediation analyses demonstrated that the greater impact of the gain framed information noted on attitudes was partially suppressed by lower fear responses and a lower amount of information recalled within gain framed information. Implications for designing communications about climate change will be outlined.

Continuing the theme of concern about climate change, risk perception, and energy choices, **Dan Venables** will outline some of the results from a major questionnaire survey, conducted in summer 2008 with two communities situated in close proximity to a nuclear power station.

The questionnaire incorporated a scale designed to measure place attachment, alongside indicators of environmental concern, individual risk perceptions, trust, attitudes, and risk-benefit judgements in relation to the nearby nuclear power station. Associations between key variables and constructs will be discussed with reference to factors such as place attachment,

concern about climate change, and risk-benefit judgements with regard to the nearby nuclear power station.

The results have implications both for existing theory and for current policy on the building and siting of new nuclear power stations in the UK.

Karen Parkhill continues this theme with a further analysis of the way that proximity, space and place have an influence on perceptions of nuclear power risks. Using biographical and narrative data, the way in which local residents living close to two nuclear power stations in the UK (Bradwell, Essex and Oldbury, South Gloucestershire) have come to view their local nuclear power station is explored.

The interpretive, qualitative (thematic and discourse) analysis reveals how perceptions of the station are constructed through processes of familiarisation and/or the normalisation/normification of risk as part of everyday life. The ordinariness of the power station is juxtaposed with moments of extraordinariness (the "nuclear uncanny") in which due to direct and mediated events the power station is reconstructed as a risk issue leading to moments of anxiety which ebb and flow through interviewees' lives.

Findings suggest that (nuclear) risk or ideas of what constitutes a possible threat, is open to renegotiation dependent on socio-cultural, political, geographical and biographical influences. The significance of climate change and energy security discourses to interviewees' perceptions of the local nuclear power stations will also be discussed.

Keywords: Climate Change, Framing, Nuclear Power, Energy, Place

ABSTRACTS

A1 Risk analysis and assessment

Discrete event simulation as a versatile analysis tool for safety-critical systems

Igor Kozine (Technical University of Denmark)

■ The paper will describe three risk-related cases from domains different in nature. One case is about the assessment of human reliability in time pressured scenarios, the other is about safe manning of ships, while the third one is about gas supply reliability through a pipeline. While the systems being described are so unlike, the approach used to their analysis is the same.

The approach is to mimic the behaviour of a system with a model developed in a Discrete Event Simulation (DES) environment, monitor and collect statistics concerning abnormal or/and accidental events, and finally make assessments of the measures of interest. As DES environments are rapidly developing, they appear promising tools for building reliability

and risk analysis models of safety-critical systems and human operators. DES models are an alternative to the conventional human reliability analysis models and systems analysis methods such as fault and event trees and Bayesian networks.

Indeed, these conventional methods appear more difficult to apply when taking into account the dynamic dimensions such as time pressure on operators under an accident, seasonal changes in the volumes of fuel supply, residual time of gas delivery from the line pack storage in a pipeline, down times, gradual recovery after a failure, loss of partial performance, and some other relevant features. On the contrary, DES models can rather easily account for these dynamic dimensions and other important features that can hardly be captured by the conventional models. DES models executed on a computer have become the method of choice that will be described in the paper.

Probabilistic dispersion model for assessing odour impacts from biosolids application sites

Eakalak Intarakosit, Baecher Gregory (University of Maryland, College Park, USA), Peot Christopher (District of Columbia Water and Sewer Authority), Mark Ramirez

■ Wastewater biosolids applied to agriculture lands may generate nuisance odour due to variability and uncertainty of odour emission levels and atmospheric conditions. These factors are challenging management of biosolids since these odours may upset communities neighboring the land application sites, often resulting in legislation to ban or minimize biosolids recycling. In addition, estimation of odour concentration is usually difficult to certainly quantify when there is a limited availability of emission data, imperfections of instruments, and limitation of models to represent physical and chemical processes. Accordingly, traditional deterministic approaches such as a dispersion model are commonly used for estimation. Nevertheless, a deterministic method could not provide a guide to decision makers when variability and uncertainty are explicitly presented. This paper describes probabilistic odour dispersion model to evaluate biosolids emission impacts on surrounding communities.

The U.S. Environmental Protection Agency (EPA) Regulatory Model, AERMOD, the Geographic Information System (GIS), and probabilistic techniques are used to address odour impacts from District of Columbia Water and Sewer Authority (DCWASA) land application sites. Particularly, this study develops the probabilistic emission model for estimation of emission rates, and potential odour impact areas are presented in prediction maps. The results considerably improve the assessment of odour impacts to local communities comparing to deterministic approaches. The proposed method will support biosolids manager's decision making process when planning biosolids application sites.

Sampling strategies optimization of brownfield sites prior to risk characterisation and risk management

Matthieu Francois, Graviere Julien, Langlet Bertrand, Loranger Sylvain (Qsar Inc Risk Assessment Service)

■ Few contaminated site characterizations are actually based on simple random or systematic sampling, using target sampling in place ("hot spot sampling"). As a consequence data are not statistically representative of the entire site (population) and could lead to a significant bias of the mean. Besides, some regulations require an intensive sampling strategy which is not convenient with either the size or the economic value of the site. Risk-based management of contaminated sites is totally dependent of the representativeness and the accuracy

of the data. As a result, some site characterisation may include a large number of samples which are not fit for the purpose of risk management. Conversely, some site characterisations may present a good sampling strategy with high degree of representativeness and precision but do not meet the regulation requirements. In addition, the size of the sampling unit (e.g. Quadrat) may also affect the final result. The aim of this study is to propose a simple tool to improve the sampling strategies of contaminated site characterization to fit the need of risk-based analyses using adjusted sampling strategy, sample size method and cost-efficiency. The theory of sampling is discussed in parallel with the a posteriori empirical validation (statistical and geostatistical) of the sampling requirements using several brownfields data.

Fault tree analysis of risk-reduction measures to reach water safety targets

Andreas Lindhe, Lars Rosén (Department of Civil and Environmental Engineering, Chalmers University of Technology), Olof Bergstedt (Chalmers University of Technology, Department of Civil and Environmental Engineering, and Göteborg Vatten), Tommy Norberg (Department of Mathematical Sciences, Göteborg University and Chalmers University of Technology) and Thomas Pettersson (Department of Civil and Environmental Engineering, Chalmers University of Technology)

■ The World Health Organization emphasises that integrated management of risks in source waters, treatment systems and distribution networks is the most effective way to guarantee safe drinking water to consumers. An integrated approach including the entire supply system is important also in order to avoid sub-optimisation of risk-reduction measures. Furthermore, a thorough evaluation of possible measures including economic aspects is important to facilitate well-informed decision-making.

A new method for integrated and probabilistic fault tree analysis was applied for comparing risk-reduction measures to support decisions for reaching specified water safety targets. The risk was expressed as the expected value of Customer Minutes Lost (CML). Input data was a combination of hard data and expert judgements. Uncertainties in input data were modelled by a Bayesian statistical approach. The Gothenburg drinking water system was used to exemplify model application. Quantitative water safety targets have been confirmed at the political level as a basis for long-term planning of investments and reinvestments. The effects of four different risk-reduction measures were modelled and evaluated based on the extent of risk reduction, cost effectiveness and uncertainties in results. The study describes how a structured and thorough analysis of risk-reduction measures can facilitate transparency and long-term planning of drinking water systems.

Novel nanoparticles in consumer products: risk management that separate the wheat from the chaff

Mikael Karlsson (School of Life Sciences), Hanna Karlsson (Karolinska Institutet, Stockholm, Sweden)

■ The use of engineered nanoparticles increases rapidly in various applications, including consumer products. These small particles may have novel properties and are therefore used in e.g. textiles, cosmetics, toys and food. However, the very same properties imply complex health and environmental risks. Studies have shown that nanoparticles may penetrate the skin, reach deep in the respiratory system and be translocated within the body via lymph, blood and nerve systems. In many cases nanoparticles are more reactive than larger particles of the same chemical composition and thus have a higher ability to cause oxidative stress and inflammation leading to toxic effects. A fundamental lack of knowledge on inherent properties and exposure routes, combined with fast expansion of development and use of nanoparticles, obstructs conventional risk assessment and management. The modern approach under such circumstances is to apply the precautionary principle, but the high complexity challenges even precautionary management, such as the application of default values.

This article describes similarities and differences between nanoparticles and bulk chemicals and how these may affect risk assessment and risk management, in particular concerning nanoparticles in consumer products. We discuss the need for new assessment methods and management strategies that separate the wheat from the chaff, enabling a use of nanoparticles that promotes sustainable development. It is concluded that conventional and precautionary management must be complemented with broader risk governance strategies, including fostering environmental considerations in early stages of research and innovation.

Chemicals in textiles: Managing environmental and health risks from products with complex product chains

Magnus Boström (School of Life Sciences), Natasja Börjeson (Södertörn University), Michael Gilek (School of Life Sciences), Mikael Karlsson, Anna Maria Jönsson

■ Our inter-disciplinary project – CHEMTEX – aims at increased understanding of private and public purchasing organizations' conditions, difficulties and opportunities to manage environmental and health risk in different parts of a complex product chain. We focus

on chemical risks in textiles. Organizations face an increasing pressure, addressed from a number of audiences, to seriously dealing with various kinds of risks in their procurement strategies. However, there are great difficulties (in terms of resources, knowledge, and communication) involved in such risk management, which relate to high complexity in product chains. In the case of textiles, for instance, the product chain from raw material to consumption often involves a great number of production steps, sub-contractors and users.

We use a comparative case study approach by strategically selecting organizations and products, and in which we use semi-structured interviews and document studies as the main empirical sources. In this presentation, we will describe and discuss our analytical framework and methodological challenges, and relate it to initial findings gained from interviews with people responsible for procurement in Swedish public and private organizations. Our analysis include a focus on (i) actors' knowledge about chemical risks in different parts of the production chain; (ii) the communicate strategies and channels of purchasing organizations and other actors, and (iii) how purchasing organizations use and interpret existing mandatory and voluntary regulatory. Theoretically, the project relates to literature on commodity chains, environmental risk governance, risk assessment and management, as well as risk communication.

End to end Environment Health effects assessment: From health assessment to mitigation and stake holders information through licensing process

Jean Francois David (Compagnie Nationale des Experts de Justice en Environnement)

- Presentation will describe:
- end to end approach of environmental health effects
 - a practical experience (inside an animal by-product industry where hazards are linked both with environment & health protection, under strong regulatory frame)
 - two kinds of contamination: chemicals and pathogens.

Two main topics will be tackled: first environment and health approach then social and stake holders oriented information. In the case under scrutiny, environmental health effects assessment derive both from chemicals exposure and from biological pathogens or agents.

Exposure to chemicals is assessed through three steps:

first: select chemicals or substances, likely to be emitted, with a toxicological reference value, second: according to existence of threshold values or non threshold values, calculate either a remaining excess of exposure and risk exceeding an acceptable level, or an excess of exposure above threshold, third: mitigate the excess risk, if any.

Chemicals health effects are assessed first in accordance with national guidelines, then through specific method and practices studied at national industry level, with appropriate information of public authorities. Then a case by case assessment is mandatory.

For biological agents or pathogens the method and steps are as follow:

- listing pathogens and ways of dissemination,
- analysing possible consequences, starting from occupational safety and health data, as occupational exposure is an overestimation of environmental exposure.

Ways and means to reach public understanding: Those two sources of hazards are to be assessed and mitigated both to get public understanding through a public information and cross examination, public acceptance, and that mitigation described in the application for the environment.

A3 Understanding risk information

Frequency and probability formats in risk communication

Michael Siegrist (ETH Zurich)

■ Research in the tradition of the heuristics and biases paradigm suggests that most people don't follow the laws of probability when making decisions under uncertainty. This pessimistic view has been challenged by a number of studies. Several researchers concluded that evolution shaped the human mind to make accurate judgments based on natural frequencies. In all these studies, however, students or academics were tested. The goal of our first study was to examine how often both probability-based and frequency-based versions of a medical diagnostic problem elicit Bayesian responses in a random sample of the general female population. In line with previous studies, we found that subjects are more likely to correctly solve a Bayesian problem when the information is presented in a frequency format compared with a probability format. The percentage of respondents who correctly solved the frequency problem was much lower than the percentage reported in earlier studies. The present results call into question the proposition that humans are automatically good intuitive statisticians when information is presented in a frequency format. Humans may not be suitably adapted to solve medical decision problems, but humans could be well adapted to solve Bayesian problems in the domains of food and social cognition. Results of two additional studies with participants from the general population suggest that peoples abilities are domain specific.

Eye tracking in risk communication research: Visual attention on graphical risk communication and subjective numeracy

Rebecca Hess, Vivianne Visschers, Michael Siegrist (ETH Zurich, Institute of Environmental Decisions (IED), Consumer Behavior)

■ To insure informed decision making within the context of prenatal diagnosis, it is important that risk information be comprehended correctly. Understanding people's visual attention patterns in response to graphically depicted risk information can help to improve visual communication tools in this field. Previous research has shown that a person's numeracy skills can influence the interpretation of the Paling Perspective Scale (PPS) (a graph specially designed for the communication of medical risks) and the risk perceived on the basis of this graph.

The aim of the present study, therefore, was to investigate how people look at the PPS and to determine if there is a relation between numeracy skills and visual attention patterns in regard to watching the PPS. The gaze movements of 47 participants were recorded, by means of an eye tracker, while watching and interpreting a PPS containing risk information about Down's syndrome. Visual attention was classified into the following categories: duration of gazes in certain areas of the graph, number of gazes, sequences of gazes, as well as time of first occurrence of certain areas. The distributions of these variables were used to analyse overall visual attention on the PPS. In addition, they were correlated with participants' subjective numeracy. The results indicate that the lower subjective numeracy is the more difficult and time consuming the processing of the PPS appears to be, even though all participants seem to be able to identify the informative parts of the graph. Implications for risk communication in practice are given.

The role of emotion in the prevention of injury: risk, benefit and reassurance in Patient Information Leaflets

Antoinette Fage-Butler (Language and Business Communication, Aarhus School of Business)

■ Patient information leaflets (PILs) that accompany medication are designed to provide information about risk, as they inform about potentially serious side-effects, correct dosage, as well as what drug combinations to avoid. However, despite the importance of such information to consumers, PILs are often poorly received: a study by MHRA (2005), for example, reveals that the "negative" language of risk in PILs impedes successful communication. The affective nature of risk communication is well-attested (e.g. Slovic, 2000), as is patient concern about side-effects (Cohen, 2003). Psychological understandings of risk such

as the above provide the framework for the interdisciplinary study of everyday risk presented here. Previous research into PILs has mainly rested on lexical or presentational elements, but my PhD, of which this paper is a part, integrates communication theory, linguistics, risk theory as well as psychological/cognitive approaches, with the overall aim of improving the communication of risk in PILs.

In this paper, I explore the strategies used to realise risk communication in PILs. My method is first to use corpus analysis to investigate the linguistic features of risk, benefit and reassurance in PILs. I then use the results from the corpus analysis in interviews with individuals and focus-groups to test the hypothesis that the reception of risk information can be improved by including statements about benefits to the patient as well as reassurances about the relative unlikelihood of adverse effects.

The findings that emerge from the fieldwork are used to suggest improvements to risk communication in patient information leaflets.

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The Evaluability Principle in Nutrition Communication: How Reference Information Changes People's Food Product Perception

Vivianne Visschers (ETH Zurich, Institute for Environmental Decisions, Consumer Behavior)

■ Many people have difficulty estimating the healthiness or riskiness of food products. One of the reasons for this problem is that they do not understand the nutrition value information. We argue that this can be explained by the evaluability principle, which posits that people's perception of a product corresponds more with its actual value when people receive reference information about the product than when they do not get this information.

We tested this assumption concerning nutrition value information in two studies. In Study 1, respondents received one of six nutrition tables that differed on reference information about either a relatively healthy or a relatively unhealthy product, from different product categories (i.e. yogurt and chocolate). In Study 2, we compared three nutrition tables from the previous study, as applied to either a relatively healthy or a relatively unhealthy product from the same category (i.e. yogurt).

Participants were asked to rate the product's attractiveness and its perceived healthiness in both studies. As predicted by the evaluability principle, our results indicated that reference

information can change people's product perception. This however seems to depend, firstly, on the product's actual riskiness. Secondly, people's primary association with the product appears to determine what kind of perception is affected, e.g. for chocolate, its attractiveness changed. Thus, nutrition communication material that is adapted to the evaluability principle can influence people's product perception so that it becomes more in line with its actual risk. Implications for other risk fields and for further research are given.

A4 Risk exposure and vulnerability

Vulnerable but not alone – Swedish farmers' situation after the 2005 storm Gudrun

Tuija Nieminen Kristofersson (Lund university, Department of Social and Economic Geography)

■ The aim in my two projects is to investigate social vulnerability and how citizens manage their situation after a disaster. The first study is based on interviews with 16 persons affected by the Asian tsunami 2004, by a toxic accident in a Swedish town and by the 2005 storm Gudrun which devastated the forest in the southern part of Sweden.

The results indicate that the affected were vulnerable in different ways: lack of information, need for existential counseling and economic problems. The farmers were not only vulnerable. They were also using their resources successfully e.g. to make the roads open again. Their efforts had a social dimension when they helped elderly people living alone before the authorities could.

In the ongoing second project I am investigating how the farmers and their organization, LRF, carry on dealing with practical and social issues some years after the storm. What is the impact of the storm today? How are the municipal authorities using the experiences and resources of the farmers and their organization when planning for future disasters and accidents? The seven farmers who participated in the first study were interviewed again two years after the first interview. Three representatives of municipal authorities and three representatives of the farmers' organization were also interviewed. The results show that the change of the forest exposed the farmers' sense of place. The practical measures were possible on account of previous social networks. The municipal authorities have no special interest in the social dimensions of the farmers' organization, but have supported a local risk and vulnerability analysis where the farmers contributed with their experiences.

Personal individual risks for workers at chemical warehouses

Vallerotonda Maria Rosaria, Annalisa Pirone, Annalisa Nebbioso, Paolo Pittiglio, Adriano Landoni, Paolo Bragatto (ISPESL-National Institute for Occupational Safety and Prevention)

■ Even though the focus of risk analysis at Seveso facilities is usually on external environment and population, the on site workers were the actual victims in most accidents in Italy. Furthermore, for most potential accidents at small sized facilities, including chemical warehouses, all potential victims are employees or contractors, as damage areas are definitely inside the fences. For these reasons, a new quantitative method for evaluating the risk for individual worker at Seveso facility is proposed here. Job descriptions, worksite operations and unit locations have been considered in order to get the time period actually spent by the workers inside the potential damage area and to calculate the probability to get injured by an accidental release. The method has been tested at a warehouse, where many hazardous materials are stored.

According to the Seveso Legislation, the probabilities and impact area of the accidental releases had been provided by the Safety Report. Based on job descriptions, the relevant workers and their displacements inside the layout have been simulated, using a networked schema. By a simple random numerical method, the personal risk has been obtained for all job profiles in the site, including forklift operators, storkeepers, maintainers, security guards, truck drivers, chemists, clerks and salesman. Results may be used to address a few issues in the safety management system, including emergency planning and training, PPE management, inspection and maintenance prioritization. The method has been demonstrated suitable for small sized facilities, but the implementation for more complex sites is possible.

Children's characteristics influencing exposure

Johan Bierkens, Christa Cornelis, Mirja van Holderbeke, Rudi Torfs (VITO, NV, Belgium)

■ Within the context of the EU funded Integrated Research Project 2-FUN, specific exposure pathways for children have been reviewed. In a second stage of the project the associated exposure factors will be parameterised. Underlying this attempt is the growing conviction that children are not mere "little adults" but that their exposure changes throughout childhood as physiological, dietary and behavioural characteristics change. While physiological characteristics may influence exposure by affecting the child's rate of contact or by altering the exposure-uptake relationship, the developmental changes in behaviour and ways of interacting with the environment may have a profound effect on the routes and the extent of

exposure. From early on clear differences exist between sexes in the type of games, the frequency of play and the activity level. A child's exposure not only highly depends on what it is doing but also where it is doing it, e.g. outdoor versus indoor activities. Furthermore, the amounts and the type of diets differ significantly between adults and children and between children of different age. Also, the socioeconomic status of children may determine e.g. the proximity to the source or the location and quality of living, and therefore exposure. All these factors have been inventoried. The final aim of this project is to parameterise child specific exposure pathways so as to be able to integrate them in exposure assessment and perform a separate risk assessment for children.

Mexico and the influenza. Some reflections of the Mexican problem

Esperanza Lopez (Universidad Autónoma del Estado de Morelos)

B1 Risk analysis and assessment

CFD modeling of Jet Fires

Roberto Bubbico ("La Sapienza" University of Rome)

■ One of the fundamental steps in the assessment of the risk associated with industrial installations is the evaluation of the magnitude of the consequences deriving from the incidents possibly occurring in the installation. Some of these accidental events (toxic release and explosions) can impact quite large areas, and can therefore affect a large number of the exposed population, while some others (pool fires, jet fires) are usually limited to small areas close to the site of the accident. Nonetheless, even these latter can give rise to more serious accidental events when involved in so-called "domino effects".

In the present work Computational Fluid-Dynamics (CFD) has been used for the numerical simulation of jet fires due to the ignition of flammable materials accidentally released from storage tanks. As a matter of fact, computational fluid dynamics can provide an efficient tool for the prediction of large-scale effects taking into account all the inherent complexities associated with this phenomenon, such as gas-dynamics, multi-phase flow, turbulent mixing and combustion, radiative, convective and conductive heat transfer and so on. The analysis allowed to predict shape and trajectory of the flame, its length and the heat transfer to the surrounding environment. The effects of wind and other ambient conditions have also been

taken into consideration. Finally, the results have been compared with some of the available empirical models and with experimental data reported in the literature, thus providing an assessment of the reliability of the method.

Risk analysis of a fire fighting system for the first Visby-class corvette

Tommy Hertzberg, Michael Först, Lars Strandén (SP Technical Research Institute of Sweden)

■ The Visby corvette has an aft deck with a landing platform for helicopters. The deck is required by regulations to withstand a 15 minute fuel fire and to have a surface providing low flame spread characteristics. In itself, a plastic composite does not meet these requirements and has therefore to be covered by insulation, i.e. a passive fire protection. However, the use of additional materials and weight may be critical for a vessel that must meet a number of different design requirements. An alternative could be to use an active fire protection system instead, provided that the safety level obtained is acceptable. The regulation 17 concerning “Alternative design and arrangement” was added in 2002 to SOLAS, the code that regulates safety requirements at sea. It is stated that an alternative design will be allowed provided that an “equivalent” safety level can be demonstrated. Regulation 17 opens up for un-traditional ship design and also provides a schematic methodology for safety demonstrations. However, the scheme does not define a technique for making safety estimates. In the project reported, a sprinkler system was tested in full scale fire tests and a Risk analysis methodology was used to demonstrate equivalent safety in accordance to SOLAS regulation 17. The results obtained made it possible to obtain fire safety on the helicopter deck in accordance to the regulations at a very low cost, just by modifying an already existing sprinkler system, protecting against NBC (Nuclear-Biological-Chemical) weapons.

The use of GIS for inventory and evaluation of potential Cascade or Domino effects in Environmental risks

Åke Sivertun (Swedish National Defence College)

■ Several environmental hazards are not coming alone or are induced by a single factor. In several studies involving Geographical Information Technology including digital maps and data from sensors like satellites and air borne systems we have demonstrated that a distributed analytical model is required for an early identification of and the possibilities to take counter measures. Also in cases where an early identification has been made and all possible counter measures been taken crises and catastrophes take place. If the rescue authorities and

other involved parties have access to the digital maps, databases and the models for simulation of the outcome of the situation it is much easier for them to build up the knowledge about the areas and objects they have to protect and in case fight the fires or other damages, bring assistance to the victims and reduce the damages. It is also essential to be able to use these models as to find what factors that can create Cascade and Domino effects in the hazards and risks! A small or not fully recognized flood can for example induce a mud stream, cut electricity or other infra structures, cut roads for rescue work etc. Our suggestion is to develop multi purpose GIS based information tools that can be used in the whole rescue and risk prevention circle for everyday preparation and training to the extra ordinary situations during crises and accidents and for recovery after damages.

Some aspects on paradoxes in risk analyses

Dan Serbanescu (DG JRC IE Petten and from March 1 2009 DGTREN)

■ Risk analyses are performed for a large number of complex systems and various theories and methods were developed to perform this task. There is therefore a diversity of theories, methods and uses related to risk evaluations. However the experience so far indicated on many common problems in any type of risk analyses. Even if theories are logically consistent and the applied methods are correctly used there is a set of problems, which appear during the process of risk evaluation and use in the decision making process and which are mainly generated by the existence of specific paradoxes. The paper will present a view on how the paradoxes are generated and which are the possible solutions to identify them and use the results of risk analyses by considering these specific biases. Examples are being presented based on the author's experience in risk analyses in the nuclear, hydrogen, security of energy supply and some renewable energy issues

B2 Occupational risk, injury prevention

Risk perception among conscripts during compulsory military service

Johan Österberg, Marcus Börjesson (Swedish National Defence College)

■ Since 1960 extensive research has been conducted within the field of risk psychology. However, this area seems to be somewhat neglected when it comes to research with military applications. This is remarkable, since military activities put demands on military personal,

especially military leaders, to handle a great spectrum of risk and threat situations. Aspects such as risk perception, risk taking and safety attitudes should be critical to such situations. The purpose of this paper is to examine risk perception and safety attitudes among conscripts during their compulsory military service. In addition, the leadership influence regarding these issues is also studied. One age group conscripts (N=389) from a logistic regiment was studied. Three questionnaires were administered during the conscript's compulsory military service. The first questionnaire was completed one week after the joining up, the second one was completed after the first term of basic training and the third questionnaire was concluded one week before the conscripts would end their compulsory military service.

Besides questions regarding risk perception, the questionnaire also included assessments of the military training education and the closest officers' leadership. The latter aspect focused in particular leadership behaviors related to risk and safety issues. This longitudinal approach gives the opportunity to study whether risk perception and safety attitudes are affected by conscript's compulsory military service and by terms of the leadership. Furthermore, through reliability testing of the questionnaire used, the study forms the basis for further studies of these issues within the military context.

Do bored drivers behave differently to other drivers?

Joan Harvey, Simon Heslop, Neil Thorpe (Newcastle University)

■ There is relatively little research showing how drivers tend to mitigate the effects of boredom. They may use a variety of techniques, such as changing speed or other driving behaviours, seek new stimulus from, for example, the radio. Some drivers may be more prone to boredom than others, and we need to understand the variety of different responses by drivers depending not only on the context but also on individual differences. This paper reports the findings from a major questionnaire survey of driver behaviour and boredom, based on a sample of ca 1500 respondents from all age groups.

Feasibility of railway suicide prevention strategies; a focus group study

Helena Rådbo, Ragnar Andersson, Barbro Renck (Karlstad University)

■ Suicide is a major public health concern, both nationally and internationally. Five percent of all suicides in Sweden occur on railways and from a railway safety perspective; suicide constitutes a clear majority (about 75 %) of all railway-related fatalities. Objectives: The overall aim of this study is to explore preferences for preventative strategies against railway suicide among relevant professional groups. Method: For the above purpose, a focus group approach

was chosen. Based on a pre-designed model, themes raised for discussion included reducing attractiveness, physical barriers, psychological deterrents, technical surveillance and train design properties, each of them resulting in a number of concrete measures proposed by the participants. Results and conclusion: Our results show that there is general acceptance and understanding among practitioners of our earlier theoretically derived strategies to prevent railway suicide, although individual participants expressed some scepticism regarding how far one can go in hindering individuals who are really determined to kill themselves in front of a train. Several concrete proposals were met with optimistic expectation and support.

B3 Risk information, public risk perception, genomics

Actively ignoring risks. Reflections on cases of self-attributed ignorance and rejection of risk information

Josep Espluga (Universitat Autònoma de Barcelona - Institute of Government and Social Policies), Ana Prades (CIEMAT - Socio-technical Research Centre), Tom Horlick-Jones (University of Cardiff - School of Social Sciences), Jordi Farré (Universitat Rovira i Virgili – Communication Studies). Jan Gonzalo (Universitat Rovira i Virgili – Communication Studies). Christian Oltra (CIEMAT – Socio-technical Research Centre). Joaquín Navajas (CIEMAT – Socio-technical Research Centre).

■ There is a worldwide tendency to develop public information measures regarding risk management. However, the public not always seems open to accept this kind of information, even though ignorance is clearly expressed. People may actively and intentionally ignore certain risk information that is at their disposal. In this paper we analyze three empirical cases in which people who perceive themselves exposed to technological risks –petrochemical and nuclear fusion, in Spain and UK-express their ignorance and, at the same time, refuse to absorb new information about the alleged risk. A qualitative approach using different types of focus groups and discourse analysis has been done. Our results underline how the institutional landscape prevents citizens to openly articulate their information needs. Avoiding actively new information about risk people express their reluctance to accept some responsibilities linked to this information (in particular about what to do in case of emergency). According to our results, people can hardly accept their responsibilities to protect themselves without acquiring a certain capacity to make decisions about the risks to which they are exposed. In

this sense, public claims on more information about technological risk should be interpreted as concerns related with social, economic, politic or cultural issues, and therefore providing merely more technical information can be useless if it is not accompanied by structural reforms designed to give greater decision-making power to the people. Otherwise, communication become a measure adressed to absolve the institutions (companies and public administrations) of the potential harm to humans that could be produced by technological risk.

The influence of knowledge, health beliefs and trust on public acceptance of gene technology

Melanie Connor, Michael Siegrist (Institute for Environmental Decisions, Consumer Behavior)

■ Various factors may influence the acceptance of new food technologies. The present study assessed people's perception of gene technology and how strongly knowledge, health concerns, importance of naturalness, social trust, gender, and level of education influence people's perception and acceptance of gene technology. Data were collected in spring 2008 from a representative (N = 824) mail survey in the German speaking part of Switzerland. A reliable 12-item knowledge scale was created. Principal component analyses resulted in two factors; one related to medical applications, the other to non-medical applications. Knowledge had a significant influence on people's benefit perception and acceptance of medical applications, but not on the perception and acceptance of non-medical applications.

The perception of both medical and non-medical applications was highly influenced by people's health concerns, perceived importance of naturalness and social trust. People with higher educational achievement and younger people possess more knowledge than people with lower educational achievement and older people. Naturalness and social trust are negatively correlated; naturalness and health concerns are positively correlated. No correlation was found between social trust and knowledge. Our findings show that increasing knowledge about gene technology does not necessarily result in higher acceptance and that it is not possible to increase the acceptance of gene technology without an increase in social trust.

Participating publics in genomics research

Anne Dijkstra (University of Twente)

■ In a risk society the introduction of new technologies, such as biotechnology or genomics, requires public acceptance. New technologies cannot be developed without support of the public anymore. Furthermore, public participation seems to be the way to get support. However, although interested, the public does not always participate actively in science issues. In a survey

study we investigated how publics in four Dutch samples differed in their relationship with genomics research, e.g., their levels of participation, and which factors predicted this passive participation and active participation.

Two samples, an inexperienced public group (N=986), an experienced patient group (N=41) were randomly recruited via a commercial organisation and are representative for the Dutch population. Two other samples, a celiac disease patients group (N=68) – approached via their patients organization – and a group of genomics experts (N=45) – approached via their research program – were included as well. We investigated which groups participated passively or actively in genomics research, measured by five items ranging from reading newspaper articles to engaging in public meetings about genomics research. Other measurements included e.g., respondents' information-seeking behaviour and their perceptions of genomics applications. Significant differences exist between the samples regarding their levels of participation in genomics research. Furthermore, active publics (patients and experts) differ from the passive public (inexperienced public) in their information-seeking behaviour. Finally, the findings revealed that information-seeking behaviour, relative knowledge, and the level of education were predictive for passive participation, while relative knowledge and gender predicted active participation.

Key words: public participation, risk communication, genomics.

Communicating Toxicogenomics – framing effects on lay and expert risk and benefit evaluations of toxicogenomics

Franziska Börner, Holger Schütz, Peter Wiedemann (Research Center Jülich)

■ Toxicogenomics is a technology with a great potential in risk assessment and public health. A promising field of application is the early detection of susceptible individuals who might be at risk from a particular environmental hazard or susceptible to side effects of drugs. However, the application of toxicogenomics technologies may not only yield great benefits but also risks, for instance with regard to privacy information and other ethical considerations. Thus, the public acceptance of new genomics applications such as toxicogenomics technologies may depend on how risks and benefits are perceived.

Research has shown that such evaluations are often fragile, depending on how a technology is framed with regard to risk and benefits or context factors such as field of application. Risk perception studies have also shown that lay people's risk perception differs from expert's opinion and assessment, which is often a major reason for risk conflicts in society. In this study explicit evaluations include risk, benefit judgments and implicit evaluations were mea-

sured with the Implicit Association test (IAT). The following questions were investigated: 1) do lay people evaluate toxicogenomic technologies differently than experts, 2) does the contextual story framing influences the evaluation of toxicogenomic technologies and 3) do implicit and explicit evaluations of toxicogenomic technologies differ?

Method: 130 subjects (54 visitor at a science fair, 44 expert scientists and 32 academics) participated in a computer supported experiment. We used a 2x2 factorial design. Factor 1 was a field of application story frame (diagnosis vs. therapy). Factor 2 was a beneficiary story frame (industry vs. regulatory agencies). Subjects read vignettes which described the potential of toxicogenomics for the early detection of susceptibility in a diagnostic or therapeutic context (Factor 1). The vignettes also included a paragraph informing about who would benefit most, industry or regulatory agencies (Factor 2), from toxicogenomic technologies. Subsequent, for explicit evaluations of toxicogenomic technologies, participants rated risk and benefits on 7-point Likert scales before going through the IAT.

IAT: Implicit measures are actions or judgments that are under the control of automatically activated evaluation, without the performer's awareness of that causation. The Implicit Association Test (IAT) measures implicit evaluations based on response latencies of positive-negative evaluations.

Results: With regard to the differences in explicit risk evaluations, a significant main effect on risk judgment was found for Factor 1 "Field of Application". However, there was also a significant interaction between this factor and expertise. That is, story framing mainly effects' lay risk judgments and lay experts and only marginally expert risk judgments. Lay people seem to judge the application of toxicogenomic technologies within the diagnosis condition as riskier than in the therapy condition, the evaluation is reversed for lay experts. Scientific experts evaluate both application conditions similarly in their risk judgments. No statistical significant effect nor interaction was found for the second factor (beneficiary).

The Implicit evaluations measures showed a statistical significant interaction effect between Factor 2 "Beneficiary" and expertise ($p < .05$). Experts and lay experts evaluate toxicogenomic technologies more negatively in the condition there companies are beneficiaries of these technologies versus a more positive evaluation in the regulatory agency context compared to lay people.

Discussion: Toxicogenomics has, other than pharmacogenomics or nutriogenomics, not yet received any notable public or media attention, however, with further rapid developments in research, technology and policy standards - toxicogenomics will find it's way into the public mind and into the media. As the experiment has shown, simple contextual manipulation

within the presented stories can lead to changes in risk and benefit evaluations of unknown and new technologies, particular for lay people. Although the effects are weak, it shows the impact story framing has on lay risk and benefit perception for new technologies. Furthermore the difference in lay and expert risk benefit evaluation of new technologies such as toxicogenomics needs to be taken seriously as it may provide further ground for public controversy.

B4 Disaster, preparedness and experiences

A template for risk assessing and evaluation of disaster preparedness

Annika Bergström, Anders Rüter (Centre for teaching and Research in Disaster Medicine and Traumatology)

■ There is no accepted method of assessing disaster preparedness. Reports from incidents have often demonstrated the same problem areas (management, information and communications), and lessons that should have been learned are often only observed. If shortcomings could be identified and corrected in beforehand this could lead to improved management of an incident and possibly also to improved patient outcome. This most likely requires a general method for assessing and improving the disaster preparedness. The aim of this project is to increase the possibility to assess preparedness in a systematically way where results can be compared and analysed statistically.

Method: Using the national regulations on disaster preparedness issued by the Swedish national board of health and welfare as a module, a template was developed. The five defined components of disaster preparedness where all studied using a risk assessment method in relation to what the regulations defined as the four areas of special interest.

Results: A template was developed where all identified risks were classified and assessed regarding probability to occur and impact. Measures that need to be taken to avoid the risks were identified, and standards of what is to be considered as a good level of management in order to minimise the identified risks, were identified. After this measures to achieve these standards were listed and put into order of importance.

Conclusion: The developed template has proven to be a useful tool in identifying risk in disaster preparedness.

Evaluating the range of perspectives on lessons-learning from the 2005 storm in Sweden

Magnus Johansson, Lars Nyberg, Barbara Blumenthal (Centre for Climate and Safety, Karlstad University)

■ Lessons learning from systematic analyses of past natural disasters is of great importance for future risk reduction and vulnerability management. It is one crucial piece of a puzzle towards disaster resilient societies, together with e.g. models of future emerging climate-related risks, globalization or demographic changes. Systematic analyses of impact and management of past events have commonly been produced in many sectors, but the knowledge is seldom shared outside the own organization or produced for other actors. LPHC (low probability high consequences) disasters usually comprise most analytical activities, since they often are met with surprise and highlight the failure to integrate resilience into normal societal planning.

During the last 50 years, several LPHC events in Sweden have functioned as alarm clocks and entailed major changes and improvements in government policies or legislations, safety management systems, risk assessments, response training, stakeholder communication, etc. Such an event occurred in January 2005 when Northern Europe was confronted with one of the most severe storms in modern history. Accidents that caused 24 fatalities occurred (17 in Sweden), several regions in UK and Germany were flooded and extensive areas of storm-felled forests left nearly one million households in Scandinavia without electricity. In Sweden the quantity of storm-felled trees was equivalent to the combined volume felled by other storms during the whole of the 20th century, which caused exceptional damage to forests, roads, railways and electricity and telecommunications networks, including cell-phones.

Follow-ups and evaluations at local level, as regulated by law, together with government commissions to central authorities and interest from research communities, have resulted in an extensive production of documented lessons learning. The production of in total 24 reports, 7 scientific articles and 2 economic reports from business associations divides thematically quite equally within coping capacity and exposed and susceptible elements. Most attention allots crisis management and response issues (45 %). Only one attempt is made to present a holistic view of the event and it is not a law bounded initiative. Evaluations from other recent events, e.g. the flood 2000 in Arvika and the landslide at Munkedal 2006, show the same clear focus on crisis management and less or none consideration taken to environmental, social or socioeconomic consequences. It reflects the traditional political financial will to invest in a high level on response capacity on expense of preventive work.

Crisis preparedness at a public authority level

Susanne Hede (Swedish National Defence College)

■ Crisis preparedness has increasingly come into focus in Sweden during recent years. Main reasons are actual events, both in Sweden and internationally, that have directed attention towards the need for better preparedness. New legislation accentuates demands on all levels of society to be prepared for and manage crises. Furthermore, from 2009, a new government agency has been created with the responsibility for all work related to public safety, emergency management, and civil defence. In light of these developments, it might seem obvious that authorities should put considerable effort into crisis preparedness work. However, studies at the local level indicate that preparedness is not easy to maintain.

The purpose of this study is to investigate how key actors with responsibility at the national level view preparedness related issues. Interviews have been conducted during 2008 with 15 persons working with risk and safety issues in 11 different government organizations including: the Prime Minister's Ministry, Regional Social Insurance Office, the National Board of Health and Welfare, the National Food Administration and the National Police Board. In analysis of the interviews four themes emerged: previous crisis experience (effect on preparedness issues), maintaining preparedness (motivation, exercises), dilemmas in crisis (hard decisions) and future preparedness (risk perception and capability). This paper will discuss similarities and differences in the way informants view these four themes and how these might have implications for a crisis management system.

Moral Distress in complex rescue operations: in national and international contexts

Sofia Nilsson and Misa Sjöberg (Swedish National Defence College, Department of Leadership and Management)

■ Regarding large-scale and/or complex operations, both staff and organization have to go beyond existing frames and routines to organize; act flexible and new. Operations are frequently characterized by managing a network of temporarily collaborating authorities and NGO's, as well as severe stress. In an international setting, operations tend to become even more complex, since employees as well as the organization have to consider laws and regulations of other countries.

Often, there is not enough time to choose between decision alternatives. This may lead to difficulties in deciding whether to break the law or resign to own moral standards, e.g. to maintain the principles of human rights. Such situations may evoke moral distress amongst the humanitarian assistant workers. Moral distress refers to a negative state of painful psy-

chological imbalance experienced when a person makes a moral decision but cannot act accordingly because of real or perceived institutional constraints.

This presentation combines two studies, based on both qualitative and quantitative data from leaders and humanitarian assistant workers in both national and international contexts. The aim was to gain a deeper understanding the nature of moral distress. The results show that earlier experiences from complex and international operations are invaluable. The results also suggests the strategies to cope with moral distress – feelings of insufficiency, powerlessness, and meaninglessness – to comprise of breaking laws and regulations when not being practically or humanly able to comply with them.

C1 Risk analysis and assessment

Methods for risk analysis of use of medical equipment

Lars-Ola Bligård, Anna-Lisa Osvalder (Chalmers University of Technology)

■ In health care the use of technical equipment plays a central part. To achieve high patient safety and efficient use, it is important to avoid usability problems and user errors. This can be achieved by performing usability evaluations to detect and mitigate potential use errors and usability problems before they occur in reality with serious consequences for the patients. The purpose of this paper is to present a generic risk analysis approach for predicting and identifying use errors and usability problems when handling technical equipment. By using an action research approach, two new methods have been developed – Enhanced Cognitive Walkthrough (ECW) and Predictive Use Error Analysis (PUEA) – based on CW and PHEA. The methods respond to four questions: Will the user act correctly? Why does the user act correctly? Which errors can the user commit? Why does the user act incorrectly? ECW is an analytical usability inspection method, which employs a detailed procedure for simulating the user's problem-solving process in the interaction, and thereby predicts and identifies usability problems. PUEA is a theoretical analysis method for predicting and identifying potential errors of use. The methods have been applied in usability analyses of various medical devices. It was possible to predict and identify several presumptive use errors and usability problems in the design. The evaluations gave the manufacturers specific information about usability issues of their existing products and new developed prototypes than they previously possessed.

Comparing Adaptive Bayesian Network, Artificial Neural Networks, Classification Trees and Classical Logistic Models in Quantitative Risk Assessment: the Case Study of Foreign Body Injuries in Children

Dario Gregori (University of Padova), Paola Berchiolla (University of Torino), Marco Ghidina (ZETA Research SRL)

■ A wide range of techniques (engineering, statistical or causal modeling) have been developed to perform quantitative Risk Assessment. While engineering techniques are mainly devoted to simulate the causal process that lead to an adverse outcome, statistical modeling strategies rely on observed data and have been successfully applied across various disciplines. An increasing interest has been focused on modelling techniques like Bayesian Networks (BN) since their capability of (i) combining in the probabilistic framework different type of evidence including expert judgements and objective data; (ii) overturn previous believes in the light of the new information being received, and (iii) making predictions even with incomplete data. In this work we proposed a comparison among Bayesian networks (BNs) and other classical Quantitative Risk Assessment techniques such as neural networks, classification trees and logistic regression. Hybrid approaches, which combine classification trees and BNs, are also considered.

Among Bayesian Networks a clear distinction between purely data driven framework and BN which are built using expert knowledge is made. The aim is directed to evaluate among this set of Quantitative Risk Assessment tools which best can be applied to assess the safety of children who are exposed to the risk of inhalation/insertion/aspiration of consumer products. Results showed that Bayesian networks appeared to have both the easy of interpretability and accuracy in making classification, thus outperforming other methods.

WHO/IPCS Guidance Document on Characterizing and Communicating Uncertainty in Exposure Assessment

Alexander Zenié, Michael Schümann, Gerhard Heinemeyer, Carolyn Vickers (European Commission, Joint Research Center for Health and Consumer Protection)

■ Contribution on behalf of the WHO/IPCS working group on uncertainty in exposure assessment: Literature is replete with papers on uncertainty analysis and books addressing uncertainty analysis in risk assessment, but there is very little agreement by practitioners as to what constitutes an adequate treatment of uncertainty in exposure assessment. There are many types of uncertainty, which is a major issue in the exposure assessment process, and a lack of papers dealing with this issue that can be used by risk assessors who are unfamiliar

with sophisticated mathematical approaches. The aim of the WHO/IPCS harmonisation project is to improve chemical risk assessment globally, through the pursuit of common principles and approaches. The results of these activities include a harmonised “IPCS Glossary of Key Exposure Assessment Terminology”, a monograph on “Principles of characterizing and applying Human exposure models” as well as a monograph on “Characterizing and Communicating Uncertainty in Exposure Assessment”.

The main objective of the Project on Characterizing and Communicating Uncertainty in Exposure Assessment is to define uncertainty in exposure assessment, identify sources of uncertainty, evaluate their effectiveness in giving decision-makers the types of information they need, and derive a set of guiding principles for uncertainty analysis. The project provides guidance on expressing or characterising this uncertainty, its use in the overall risk assessment of chemicals and risk management decisions and appropriate communication of the outcome. Illustrative case reports and practical examples are also included. The focus of the document is chemicals, although it was also considered by the WHO expert group to be broadly applicable to other (physical, biological) agents. This WHO/IPCS monograph is a first attempt to describe, characterize and provide guidance for uncertainty analysis in routine exposure assessment work. Clearly, this monograph cannot address all the complex questions which may arise during the uncertainty analysis. However, it intends to describe the essential elements of a typical uncertainty analysis and various approaches to deal with some of challenges likely to be encountered during the course of an iterative evaluation of uncertainties.

The monograph constitutes Part 1, entitled “Guidance Document on Characterizing and Communicating Uncertainty in Exposure Assessment” of the Harmonization Project Document No. 6 entitled “Uncertainty and Data Quality in Exposure Assessment”. It is available at www.who.int/ipcs/publications/methods/harmonization/exposure_assessment.pdf

C2 Consequences of climate change

Abrupt climate change risks: policy and vulnerability assessments for national security

Chad M Briggs (Lehigh University)

■ Increased policy attention has been paid to climate change and disaster risk, with new international agreements set to conclude at Copenhagen in December 2009. Contrary to

IPCC and related sources, recent data suggest that climate change impacts may occur earlier and with more extreme impacts, including second and third-order effects. New efforts are underway to integrate abrupt climate change risks into national and international security policies, largely based upon work in risk and vulnerability studies.

This research examines the crucial role of risk assessment and communication tools in national security and strategic intelligence policies. Focusing on the issue of abrupt climate change risks, the study draws upon past risk and vulnerability research to explain underestimation of severe security consequences, and what policy tools may be employed to assess and communicate high-risk, low- or unknown-probability events. Assessments are then made of policy efforts in North America and Europe to address abrupt climate change, explaining how environmental and disaster risk assessment is being integrated into security and intelligence forecasting. Particular attention is paid to Swedish and United States policies in preparation for the Copenhagen UN-COP meeting. Obstacles to greater effectiveness and visibility are identified, including the crucial roles of private, government and academic researchers in assessing and communicating climate change risks.

Living with floods, learning from risk: climate change and floods in the Costa Brava (North-East Iberian Peninsula)

Anna Serra Llobet, David Saurí Pujol (Environmental Science and Technology Institute – Autonomous University of Barcelona)

■ According to the IPCC Fourth Assessment, coastal zones stand as one of the most vulnerable areas to climate change in Europe. This is due to sea level rise combined with increased risks from storms. Coastal wetlands, in particular, are projected to be negatively affected by sea-level rise especially where they are constrained on their landward side, and lack sediment supply. Approximately 20 percent of existing coastal wetlands may disappear by 2080 because of the expansion of the sea. Mediterranean low-lying sedimentary coasts with highly diverse ecosystems appear to be the most vulnerable areas to this phenomenon. The 4th IPCC Report also warns about the increasing likelihood of extreme events such as floods. However, for coastal wetlands (as well as for other ecosystems) floods need not to be considered necessarily a hazard. Rather, they could be seen as an important natural process contributing to groundwater recharge, to the provision of sediment loads to the coastal zone, and, more generally, to the equilibrium between fresh and salt water that, among other factors, make this transition areas so ecologically productive.

In this paper we want to present the case study of the Aiguamolls de l'Empordà natural

park, located in the North of the Costa Brava, to illustrate the possible benefits of larger floods originating from climate change for coastal wetlands. However, for this benefits to materialize it is fundamental to improve adaptation to flooding through a new management philosophy that accepts the axiom of living with floods rather than the usual, policy of minimizing or eliminating the hazard through hydraulic control works. Through mechanisms such as land use control, the adaptation of the built environment to flooding and compensatory mechanisms such as insurance, security can be enhanced and floods may play a very important role in redressing the effects of sea level rise.

The aim of the study is to assess the positive and negative impacts of climate changes across la Costa Brava, focusing on Empordà wetlands, as well as on tourism and vulnerable members of society, to identify possible adaptation measures to counter the impacts.

The growing interest raised by climate change impacts on natural hazards, such as floods, is generating a large number of methods which require a trans-disciplinary approach from very different angles. The method proposed in this study is based on interpreting the way in which an environment that is understood as a complex system, such as the Empordà wetlands, works through the use of several complementing sources of information sources: archival, graphic and oral (interviews, workshops). The result is to achieve a climate and scenario review that is conditioned by the dynamics of the different intervening elements, and includes both scientific and institutional data, as well as the stakeholders perception of climate change impacts in the study area. The methodological approach is divided into 3 stages combining both quantitative and qualitative methodologies: 1) climate change impact assessment through a Geographical Information System design and the climate change and floods perception analysis 2) flood threats and opportunities appraisal in the study area, and finally 3) the Empordà wetlands adaptation strategies design, with stakeholders and expert consultation.

Physical exposure to floods may have increased in the area (because of the occupation and transformation of flood prone land) but this trend has been attenuated by a larger social capacity to absorb losses and by greater effectiveness of flood management measures. The crucial balance necessary with regard to major floods is to take advantage of their beneficial effects and at the same time avoid or compensate the material losses they may cause. The main strategy, developed by the wetlands managers, attempts to recreate natural flooding cycles which are seen as fundamental to ensuring the survival of wetland ecosystem. Floods have tremendous benefits for the Empordà wetlands ecosystem. Ecosystems need disturbances to accomplish indispensable tasks such as the production of clean water or flood control.

Thus, its important to incorporate the essential role of floods in the environmental management. To perform an effective adaptation strategy it is necessary to do an assessment of all costs and benefits in order to design risk management policy taking into account the benefits of floods, otherwise the use of some structural measures could result in the positive role that natural disturbances play being lost. If climate change in the area leads towards an increase in the number of flood episodes this has to be turned into an advantage and not a problem.

Sustainability aspects of flood risk management- A case study of Lake Vänern and the Göta älv River, Sweden

Lars Nyberg, Magnus Johansson, Barbara Blumenthal (Centre for Climate and Safety, Karlstad University)

■ A great challenge within flood risk management is to balance ecological, economical and social aspects on preventive and mitigative measures in water systems. Efforts to protect people's lives and societal infrastructures could potentially be in conflict with the protection of ecosystems or cause conflicts in upstream/downstream relations. Therefore a framework of sustainability is needed to support a wider perspective on flood risk management. A case study of a large water system in south-western Sweden – Lake Vänern and the Göta älv River – was used to analyse different types of water-related opposing interests. Lake Vänern with its area of 5,500 km² is the largest lake in Sweden and in the European Union. The Göta älv River runs from the lake outlet 90 km down to the sea at Gothenburg. The total catchment area upstream of the river mouth is 51,000 km².

Vänern and Göta älv are used for hydropower production, shipping, tourism, fishing, drinking water supply, as waste water recipient, etc. The risk system is complex where flood risks in the lake and in Gothenburg are connected to landslide risks and industrial risks in the river valley, and where the drinking water supply for the Gothenburg region is at stake.

This study is focused on differing interests in relation to floods in Lake Vänern: Firstly, the interest to keep a low and steady water level in the lake to reduce flood risks, in relation to nature conservation interest which advocates large water level amplitudes to maintain the natural variations from the unregulated period before 1937. Secondly, the upstream/downstream risk distribution between flood risks around the lake and a downstream system of landslide risks, industrial risks and water quality risks in the river and in Gothenburg, where most of the economic and social values are located. The landslide risks along the river valley are closely related to wet periods and erosion due to high discharge from the lake. Therefore a maximum discharge is decided which, however, increase the flood risks in the

lake. Climate scenarios for the 21st century describe substantially increased flood risks for Lake Vänern due to increased amounts of precipitation.

Extreme rainfall events in Sweden and their importance for local planning

Ulrika Postgård (University of Gothenburg), Dewliang Chen (ICSU, International Council for Science, Paris, France), Walther Alexander (University of Gothenburg), Liao Yao-ming (University of Gothenburg, Sweden and Beijing Climate Center, China), Ou Tinghai (University of Gothenburg, Sweden)¹ University of Gothenburg ⁴ Beijing Climate Center, China

■ The impact of climate change on society due to changes in the atmospheric greenhouse gas concentrations is of fundamental importance for the future societal planning and management. For many impact applications and decision support systems, changes in extreme events are much more important than changes in the mean climate. The awareness that global climate change may cause more frequent and more severe weather extremes has triggered an intensive research to answer the question whether or not the climate is becoming more extreme.

This study presents the results from the project 'Extreme rainfall events in Sweden and their importance for local planning'. Two main tasks have been at focus: a) identifying trends of precipitation extremes in Sweden using daily precipitation observations from 220 stations during the period 1961-2004, and b) projecting future changes in the extremes over the next 100 years by using a weather generator developed for Sweden. Earlier studies on precipitation extremes in Europe also included data from Nordic countries, but the number of Swedish stations was generally rather limited, which did not allow studying rainfall extremes in more detail. In this study, extreme precipitation is expressed in terms of eight indices describing specific aspects of extreme precipitation considered to be important for Sweden. These indices also quantify precipitation means as well as dry conditions. In the future, the results will be used to support local planning measures to adapt to future precipitation extremes like heavy rainfalls and drought.

C3 Lay perceptions, fusion technology

How do we perceive one million years? A qualitative investigation of time in risk perception of nuclear waste disposal

Corinne Moser, Michael Stauffacher, Pius Kruetli, Roland Scholz W. (ETH Zurich, Natural and Social Science Interface (NSSI))

■ Socio-technical systems often involve timescales that are extensive with respect to the lifespan of human beings. This is particularly the case in nuclear waste disposal, where technical experts worldwide consider a period of one million years for spent fuel and high-level nuclear waste in their safety assessments. How these timescales are perceived is, however, not researched systematically, even though this could potentially contribute to a better understanding of environmental risk perception.

The purpose of this study therefore is the investigation of people's perception and internal representation of extensive timescales in general (past/future) and specifically with respect to nuclear waste. Qualitative interviews (N= 40) were conducted with experts from different scientific disciplines and with laypeople. We expect people to perceive and represent timescales differently depending on their scientific background and on individual dispositional variables: People who are oriented toward past events to construct future timescales tend to have a cyclic and therefore rather determined time representation.

In contrast, people who are not oriented toward past events tend to have a linear and more open, undetermined time representation. We discuss how scientific background and personality variables as well as their interaction contribute to this differentiation. Moreover, we discuss how different time representations affect risk perception of nuclear waste disposal. Our findings could as well be of interest for other fields where long timescales are relevant, e.g. governance of climate change mitigation and adaptation.

Communication Impact on Understanding, Acceptability and Risk Perception of Thermonuclear Fusion Technology – An Experimental Research

Magdalena Gadowska (Institute for Plasma Physics and Laser Micro-fusion, Warsaw)

■ The paper reports the results of the empirical study investigating how scientific information and the pre-existent attitudes shape lay awareness of fusion technology and how specific features of message differentiate reasoning about thermonuclear fusion, including its understanding and acceptability. The field research executed in Poland on university stu-

dents' sample combined many techniques of sociological enquiry but essentially it followed the experimental research design. Five groups of students (of 20-24 persons each, matched under the respect of age, gender and the course attended, and randomly assigned to experimental groups) read five versions of informative material on fusion technology prepared by fusion researchers and these groups' knowledge and judgements have been confronted among them and with the control group which has not been taken through a learning process. Understanding of fusion measured by the knowledge test was markedly higher in the experimental groups which enabled the examination of the role of fusion understanding for its acceptability and risk perception.

Judgements about various aspects of fusion technology (general favourableness, feasibility evaluation, support for public investment, risk perception, benefits perception, agreement for hypothetical thermonuclear plant siting near to one's locality) turned out to be strongly interrelated among them and interacting with being exposed or not to scientific information: Whereas in the lack of knowledge, lay reasoning about thermonuclear fusion was risk perception-driven, it became benefits perception-driven after being taken through a learning process. Attitudes towards fusion technology turned out to depend on pre-existent dispositions such as generalised risk perception level, trust in scientists and general orientation with regard to scientific and technological progress ("technological optimism") more than on knowledge about fusion.

Mental-model based messages, i.e. explaining of thermonuclear fusion technology through the confrontations with nuclear fission promoted better understanding, but it did not induce favourable attitudes towards fusion; on the contrary, students exposed to this type of informative text expressed lower fusion acceptability, which suggests the greater role of affective than cognitive elements in attitudes shaping. The message presenting scientific uncertainties and not yet solved problems as dividing scientific community, on the contrary to the message presenting the same uncertainties without painting the picture of experts' controversy, strengthen the relationships of attitudes towards fusion with the pre-existent generalised risk perception level.

The results demonstrated the holistic nature of public awareness of technology, composed of many cognitive and affective elements, interacting among them and enrooted in pre-existent attitudes and dispositions. Scientific information can enhance or weaken this enrooting and make response to fusion more reasoned than affective, depending on how it is communicated.

Towards creating a participative dialogue with society about fusion energy

Ana Prades (CIEMAT Socio-technical Research Centre), Tom Horlick-Jones (Cardiff School of Social Sciences, Cardiff University), Christian Oltra, Joaquin Navajas, (CIEMAT), Josep Espluga (Universitat Autònoma de Barcelona, Department of Sociology)

■ In April 2008 a new research agenda was agreed by the European nuclear fusion R&D community, of which an essential pillar was a commitment to move towards creating a dialogue with society about fusion energy. There was an associated recognition that a key research challenge was to gain an enhanced understanding of lay and stakeholders' perceptions about fusion.

This paper reports on current progress in the implementation of a novel methodology to investigate lay and stakeholders' perceptions of nuclear fusion as an energy source. This approach has concentrated on generating a learning and deliberative process that allows groups of lay participants and stakeholders to engage with information about fusion in a quasi-naturalistic fashion. Empirical work has been carried out in Spain and the UK, in order to create a comparative cross-cultural understanding of these reasoning processes. In the next stage of the work, this enhanced understanding will form the basis for the identification of practical communication and participation options for the implementation of a suitable societal dialogue about fusion.

C4 Pandemic infections, zoonosis

Metropolitan vulnerability of pandemic influenza

Göran Bengtsson (Lund University, Sweco), Martin Bjarke, Johan Holmqvist (Sweco)

■ As part of pandemic influenza preparedness planning, specific vulnerability of the metropolitan area of Malmö, Sweden, has been evaluated. Specific routes of entry for a pandemic virus has been identified and characterized, showing that the area is more susceptible than surrounding rural areas. Direct effects, such as increased sickness, hospitalizations and mortality rates, and possible counter measures are evaluated using mathematical simulation models. The importance of contact patterns is studied, specifically for the individual municipality within the specific metropolitan area, showing how the increase in contacts affects the pandemic impact. Indirect effects, such as loss of productivity and increased costs for healthcare, are identified for the specific metropolitan area and quantified where possible.

Critical services specific to the area are identified and their pandemic planning reviewed. The work ends in some conclusions about the effect of a pandemic influenza, specific to the area, and possible responses.

Pandemic Influenza: Resolving the Risk Communication Gap?

Judith Petts, Heather Draper, Jon Ives, Sue Wilson, Parry Jayne, Sheila Greenfield, Tom Sorrell, Sarah Damery (University of Birmingham)

■ There is scientific agreement that an influenza pandemic is not only possible in the near future but probable. In all affected countries, normal life could face severe economic and social disruption which could last from weeks to months. Effective risk communication will be essential not only to provide advice, information and reassurance, but also to encourage individuals to take personal preventative actions and to support the required national response and contingency measures. The latter may raise difficult ethical issues and choices, and require unpopular measures with differential social impact. In most countries planning for an influenza pandemic stresses the importance of 'education' and 'communication' before, during and after an outbreak. But as yet pre-pandemic communication has been low key.

In this paper we will draw in part upon a recently completed survey of healthcare workers in the UK which sought to ascertain their likely response to a pandemic outbreak. While the results relate to a workforce who might be expected to be relatively well informed of the implications of a pandemic, in practice the data and comments generated serve to prompt many questions about current levels of understanding amongst the general public. The paper will briefly review the results and discuss the implications for, and barriers to, effective communication with the general public at this crucial time, prior to a pandemic, when interest in and receptiveness to key messages may be low but a genuine opportunity to embed information and encourage discussion amongst the public is possible.

Alimentary zoonoses infection risk analysis in the selected region of the Czech Republic

Frantisek Bozek, Pavla Krejcova, Jiri Dvorak (University of Defence)

■ The paper deals with the risks of selected zoonoses of alimentary origin in the South-Moravian region of the Czech Republic from 2003 to 2008. Individual and qualitative social risks of diseases caused by individual types of zoonoses were assessed. The risk analysis was also carried out in relation to the state average. Infections of bacterial origin were chosen because of their pathogenicity, the speed of spreading and high frequency of occurrence.

Listeriosis is one of the most serious bacterial infections as far as its impacts are concerned. Campylobacteriosis had the highest frequency of occurrence. Parasitic diseases were chosen for their complicated evolutionary cycle and unclear detection. Toxoplasmosis is the most frequent disease on the other hand trichinoses have had zero incidences. Viral infections were chosen for their epidemic occurrence and the dangerous character of the diseases. The highest number of infected people was recorded in case of hepatitis A.

The outcomes have proved that the situation in the area of infections caused by chosen zoonoses is quite positive in the region. The risk of transmission of most zoonoses is successfully minimized thanks to the co-operation of state bodies and also the increased awareness of population. The case study on the zoonoses infections risk analysis will become a basis for setting priorities of implementing countermeasures aimed at a further reduction of risks.

Images of Amplification: organizational communication of zoonotic risk and the Social Amplification of Risk

Dominic Duckett, Jerry Busby (Lancaster University Management School)

■ This study into zoonoses, for example 'bird flu' investigates how organizations reason about this category of risk. Traditional SARF (Kasperson, Renn et al. 1988) deploys an electronic metaphor of signals and receivers, amplification and attenuation, to explain the dynamics of increasing or decreasing social concerns about risks. SARF is criticized for naively implying a 'true' or 'real' signal strength (Rayner 1988). We ally to this critique and develop a relational model of amplification where organizational actors depict others amplifying or 'hyping' while seeing themselves as custodians of truth. We qualitatively explore the images of amplification that organizational actors hold about other actors through focus groups and interviews. Our evidence, canvassed from UK regulators including the Department of Environment Food and Rural Affairs (Defra), and the Food Standards Agency (FSA), shows that interests and roles shape images of amplification. An organization may hold multiple images for the different audiences it communicates with. Defra, for example, may want farmers to be more precautionary in terms of biosecurity through highlighting risk yet at the same time seek to avoid the collapse of public confidence in a food product by projecting reassurance. This targeted communication of risk is a complex web of attenuations and amplifications resulting from different interests, goals and responsibilities both within and between organizations, and a reflexive response to images of risk we think the other holds in relation to our own images of risk. This radical SARF interpretation is an explicit rejection of 'true signal strength' locating amplification within a constructed and contested arena.

The Adoption of Systems Approaches in Swedish Municipal Risk and Vulnerability Analyses

Henrik Hassel (Department of Fire Safety Engineering and Systems Safety, Lund University)

■ Municipal risk and vulnerability analyses (RVA) are a cornerstone of the Swedish emergency management system. Their purpose is primarily to develop knowledge about risks and vulnerabilities which then should be used as a basis for prevention and preparedness activities. The geographic regions, which these analyses are performed with respect to, can be described as complex socio-technical systems; and in order to properly understand and make effective changes in such complex systems, adoption of a systems approach is frequently advocated. The systems approach can roughly be described as a particular way of looking at the world which especially acknowledges the need for studying systems as wholes instead of their parts in isolation. The aim of the present paper is to study the RVA processes in a number of Swedish municipalities in order to investigate whether, or to what extent, systems approaches are adopted (regardless of whether a systems approach is referred to explicitly or not). In order to achieve this aim a framework consisting of a number of basic characteristics of the systems approach are suggested – based on literature reviews. Using the framework as a point of departure and conducting interviews and document studies, systematic analyses of the municipal RVA processes are performed in order to gain insight into whether systems approaches are adopted. The results of the analyses can help improving the RVA processes in the studied municipalities. In addition, indications of more general issues associated with the municipal RVAs could also be identified which may help improving the general quality of RVAs performed within the Swedish emergency management system.

Identifying and ranking hazards in municipal risk- and vulnerability analysis

Martin Bjarke, Göran Bengtsson, Johan Holmqvist (Sweco)

■ Municipal risk- and vulnerability analysis Sweco has developed a systematic tool to identify patterns of vulnerability of a municipality and to rank potential hazards and damage of society values on the same scale. The tool sets a standard to combine potential threats and society values using Hierarchical Holographic Modelling (HHM) and to organize threats in groups of common function in a matrix. The same matrix contains data from analyses of interruptions of support to society of e.g. water, electricity, and health care. The default

ranking of threats and society values based on the HHM is complemented by ranking based also on the number of people and the economic turnover of each value. The ranking list (top-ten of potential threats and damaged society values in a municipality) can be used to prioritize among candidate threats and values for quantitative vulnerability analyses.

Climate change or not? Policy lessons for flooding in Norwegian municipalities

Ilan Kelman, Trude Rauken (Center for International Climate and Environmental Research – Oslo (CICERO))

■ Even though municipalities in Norway have dealt with floods for decades or longer, with varying degrees of success, recent discourse has highlighted and framed the local flood problem in the context of climate change. Framing floods as a climate change topic, rather than a more expansive view of disaster risk reduction, has both advantages and disadvantages. These are explored through qualitative interviews and surveys with flood-related decision makers across several Norwegian municipalities, using written surveys sent to the mayors and environmental officers of all municipalities as well as in-depth interviews with individuals from selected locations.

The results are then compared with observations and experience from non-Norwegian municipalities around the world. Three sectors are chosen to illustrate the consequences for policy formulation. Moss, Norway is compared with Boulder, Colorado regarding the connections between floods and drinking water supply. Åmot, Norway and Cambridge, England exemplify the effects of flooding on cultural heritage. Flisa, Norway and Toronto, Ontario have parallels regarding the use of structural defences for flood risk reduction. The policy implications are that framing flood risk reduction as a climate change problem has detrimental implications for long-term sustainability of measures undertaken. Instead, climate change should be seen as one disaster amongst many, or as one contributor amongst many to flood disasters, in order to ensure that lessons from the past are used in the present in order to improve the future under any climate change scenarios.

Institutionalised risks: An analysis of rail transport of hazardous materials and urban planning

Vincent van der Vlies (Radboud University Nijmegen)

■ In the Netherlands the debate on industrial risks has intensified over the past decade. Due to a number of near misses, people are becoming more aware of the risks regarding the storage, transport and production of hazardous materials. Due to this awareness, an

institutional framework has been implemented by the Dutch government to prevent new cases. This paper presents the conclusions of a study conducted to analyse the functioning of the present safety policy regarding rail transport of hazardous materials. We found that there are a number of large disadvantages to the present institutional framework and that the goals set by the Dutch government are not reached. These disadvantages include that local authorities often cannot build in their own city centres due to the transport of hazardous materials and that the implemented risk standards are in many cases exceeded with factors of up to ninety times. This paper also presents an empirically tested alternative institutional framework. We will argue that this alternative framework does more justice to the safety goals of the Dutch government than the present framework. Also, we will argue that this framework makes it possible for local authorities to build more but with less risks.

Keywords: Rail transport, hazardous materials, urban planning, institutions.

D2 Risk identification, emerging risks

Safety investments in infrastructure projects – comparison between Swedish railway tunnel projects

Peter Lundman (The National Rail Administration, Sweden), Alexander Wilhelmsson (Lund University)

■ During the next decade, new underground infrastructure investments (tunnels and stations) at the amount of 40-45 billion SEK are planned under the auspices of Banverket – the Swedish National Railway Administration. Due to new safety guidelines there has been an increased emphasis on safety considerations during the last decade for this type of investments, which has also been pointed out as a cause of cost overruns and delays.

In Sweden, much of the details regarding safety issues in tunnel projects are carried out on the municipal level with only minor support from central authorities. As a consequence, there is a concern whether differences in the level of safety between different projects can be found. Moreover, there is a lack of knowledge regarding possible differences in the safety design process between projects. This paper presents new insights on the topic, obtained from interviews and data collection from six recently built or ongoing projects in Sweden, including 28 out of approximately 32 railway tunnels during the time period.

It can be concluded that comprehensive efforts with respect to tunnel safety have been

carried out in each studied tunnel project and that safety issues have gained high priority from the early stage in each project.

For all the investigated projects the results indicate that concerned parties, especially the municipality and the fire brigade, have been involved from an early stage of the project. It can also be concluded that the co-operation between the parties within each project in general is considered to function satisfactory. On the whole, no major differences in the level of safety can be found between the studied projects. However, the detailed design of several safety measures vary a lot between different projects. This might be explained by the limited degree of learning and sharing of experience, leading to an inefficient use of knowledge gained from other projects. It is therefore argued to be of crucial importance that lessons learned are compiled and generalized on a national basis.

The Safety and Security of Underground Hubs as an Emerging Risks Representative

Anders Lönnermark, Haukur Ingason (SP Technical Research Institute of Sweden)

■ Application: In December 2008, the EU-project “Early Recognition, Monitoring and Integrated Management of Emerging, New Technology Related Risks (iNTeg-Risk)” started. It focuses on the problem of emerging risks, i.e. the identification of risks that might emerge through the use of future applications. To ensure acceptance of technologies and products within EU there is a need of finding an agreed way to deal with emerging risks. The main objective of iNTeg-Risk is to improve the management of safety related to emerging risks.

Selected case studies will be used to reach the iNTeg-Risk vision of a new concept for integrated management of industrial safety. It will be based on a unified set of methods for risk management and a new common language. The case studies, called Emerging Risks Representative (industrial) Applications (ERRA), will include both technology development and risk methodology development. The work on each selected ERRA should lead to the development of reference solutions, reference documents, methods, and tools. One such ERRA deals with the Safety and Security of underground hubs with interconnected transportation services and shopping centres. In the paper the ERRA on underground hubs is presented together with a description of the included activities and the application of the Emerging Risk Management Framework (ERMF) and the International Risk Governance Council (IRGC) framework. Objects to be analysed are for example different fire loads, escape routes or air supply ducts.

Key words: emerging risks; risk management of safety; risk methodology development; technology development; underground hubs

Planning and preparing for technological change and future risks to the critical functions of society using co-evolutionary scenarios and participatory methodology

Henrik Carlsen (FOI - Swedish Defence Research Agency, Division of Defence Analysis), Linda Johansson (KTH - Royal Institute of Technology, Department of Philosophy and the History of Technology), Per Wikman-Svahn (FOI - Swedish Defence Research Agency, Division of Defence Analysis)

■ How does technological change influence future risks to critical infrastructure, or more generally, the critical functions of society? As the set of critical functions of society is not fixed, but changes over time depending on both technological and societal developments, preparation and planning for future technologies and critical infrastructure is a very hard task indeed. The dynamic nature of the problem is here used as a basis for a methodological framework that aims to provide decision-guidance on the effects of future technologies to critical functions of society.

Our proposed methodological framework is built on two cornerstones, the first being the development of co-evolutionary scenarios. Here, the consequences of future technologies are explored by describing the evolution of concrete technological artefacts in different relevant, plausible and challenging future societies. This models the co-evolutionary process between a technological artefact and society (the introduction of a new artefact creates new demands on the development of next generation of the technology etc). The second cornerstone of the framework is the utilisation of a participatory approach of different stakeholders. The participatory setting is used to further explore the different societal contexts and to find possible decision-nodes. Here, the focus is on creating a well-informed discussion on future “what-if scenarios” in which the participants hypothetically look back at a previous decision in the light of a possible development after the decision. The proposed methodology is exemplified using the case of the future deployment of autonomous systems (e.g. robotics) in society. These systems have the potential of raising several ethical issues in relation to the implementation of critical functions of society. One key issue is related to the question of responsibility. If a critical function of society – which is in some way dependent on an autonomous – fails to deliver its services, in what way should responsibility then be divided? What is the responsibility of the engineer, the user and – perhaps – the system itself?

Keywords: Emerging technologies; critical functions of society; co-evolutionary scenarios; autonomous systems.

Risk and ubiquitous computing in the workplace

Jerry Busby, Katharina Kinder, Linden Ball (Lancaster University Management School)

■ Weiser’s (1988) concept of ‘ubiquitous computing’ introduced the idea of highly distributed computational devices that disappeared into the artefacts of everyday life. Technologies of this kind have emerged in various forms, including some aimed at managing workplace risks. For example, devices can be incorporated in vibrating machinery that sense the proximity of operators – and detect or even prevent excessive exposure to vibration. This manages both a physical risk to operators, and the risk to the employer of litigation or prosecution. It thus echoes ideas about risk replacing dangers (Luhmann, 1993): workplace ailments are no longer an ‘occupational hazard’ but things that arise from organizational decisions; and it points to the significance of the secondary risks that arise from failures to be seen to manage primary risks (Power, 2004). We undertook an empirical study of several ubiquitous technologies in a highway construction firm, using qualitative methods to examine workers’ and managers’ experiences. This gave evidence of a complex relationship between the ubiquity of technology and the ubiquity of risk. Ubiquitous technology was sometimes protective – for example when workers were wrongly accused of malpractice – but at other times threatening – for example when subjecting workers to new kinds of control. In both cases it was the way in which the technology constrained the ability of actors to ‘make things up’ that was important. Moreover, a technology was only ever ubiquitous with respect to a certain group: for example operators of vibrating machinery, not their supervisors or managers. It therefore naturally tended to reinforce the separation between groups, and the notion that their risk interests were different.

D3 Public risk perception

Environmental-Health risk characterisation in six European countries

Ric van Poll, Jutta Köhler, Jeroen Devilee (National Institute for Public Health and the Environment, RIVM)

■ Traditionally risks are characterised by probability of occurrence, severity of health effects or extent of damage. Risk assessments only rarely take into account people’s risk perceptions. The main aim of this project is to quantify residents’ risk perception of several environmental and health risks and to do so in a European perspective. Moreover, other factors that may

influence the risk perception of the public are studied: the way of coping with environmental and health risks, the behaviour of the respondents and their attitude towards risk policy and policymakers. From each of six countries (England, Slovakia, Finland, Spain, Netherlands, and Flanders (B)) we invited 1000 respondents to participate. Residents' risk perceptions on nine different risks were assessed: air pollution, sea level rise, corrosive cleaning agents, tanning, dampness, polluted tap water, nuclear waste, alcohol consumption, pesticides in food. By means of an internet questionnaire residents answered several questions for these risks: extend of concern, policy priority, specific risk aspects (e.g.: involuntariness, equity, dread, trust), relevant behaviour (e.g.: car use washing vegetables before use, only drinking bottled water) and coping options. Preliminary analysis showed that respondents are most concerned about air pollution, 'number of people' and 'extend of effects' are relevant risk characters to residents too and for different risks different risk profiles, in terms of risk characteristics, are applicable.

National, international or global threats – who fears what? Societal risk perceptions in Sweden 2004 and 2008

Susanna Öhman, Anna Olofsson, Saman Rashid (Mid Sweden University)

■ The aim of this paper is to investigate if there are differences between population groups in their perceptions of three dimensions of societal risks: National, international and global (cf. Beck 1992). Hence, this study focuses on the heterogeneity factors gender, ethnicity and sexual orientation in relation to societal risk perception, rather than personal risk perception, which is a development of earlier risk perception studies (Slovic 2000). However, this paper does not only identify if, and which, these kinds of risk perceptions differ, but also analyses the underlying causal factors and their role in understanding sociocultural heterogeneity and risk.

The analyses were made with data from two Swedish national surveys conducted as a postal questionnaire during autumn 2004 and 2008. Each dataset used in the analyses is composed of two representative samples of the Swedish population: One national random sample, and a random sample of people living in three residential areas with a relatively large population of people with foreign background.

The findings confirm earlier research in so far that there are differences in societal risk perceptions between the different groups. However, the differences are not general, that is, even though there are differences between e.g. native people and people with foreign backgrounds, there are examples of risk perception categories and behaviours that do not differ

as well. The main conclusions are that heterogeneity factors such as gender, ethnicity and sexual orientation are important to understand people's reactions to risks but underlying factors are more important to explain these perceptions.

Perceptions of risk and safety among the Swedish population

Marcus Börjesson, Ann Enander (Swedish National Defence College)

■ Measures to promote safety among the public can be evaluated from two different perspectives. One concerns willingness to act safely and take safety measures, and the degree to which these increase people's actual safety. Another concerns the degree to which such measures affect people's perceptions of personal safety and protection. While perceptions of risk and factors affecting these have been the subject of considerable research, the factors affecting perceptions of personal safety and security have been less studied. Furthermore, some research findings indicate that acting safely does not necessarily lead to increased sense of security. The purpose of this paper is to examine more closely relationships between perceived risk, actual safety measures and sense of safety and protection. Data from a previous questionnaire study (2008) were used. The sample consisted of 7198 people among the Swedish population. Measures included different aspects of security such as worries about accidents, insecurity during home and leisure time, perceived safety protection as well as measures of perceived risk and actual safety measures. Preliminary results indicate for example that a high degree of safety measures does not necessarily lead to higher perceived security and protection. Three different safety profiles have been identified within the sample. This paper further examines how these profiles are related to different patterns of relations regarding security, perceived protection and safety measures. These results should have implications for information interventions directed to different groups of people.

How to prepare for, respond to and recover from an earthquake? Seismic risk perception in the Azores

Isabel Rego, Ana Palos, Ana Arrozo (University of the Azores)

■ Throughout the Azores' history damaging earthquakes have caused considerable physical and human losses in the archipelago. Knowing the important role that seismic risk perception can play on decisions made on earthquake risk mitigation a study (TOPOI METUS. Social cosmographies of danger. Risk perception of natural hazards) was carried out to address the Azoreans understanding of seismic risk profile, patrimonial and economic vulnerability to that risk, and risk management. Such knowledge can contribute to improve the

communication of risk messages and, at a more global level, inform civil defence policies and their implementation. Based on data produced along thirty in-depth extensive interviews conducted in five of the nine islands of the archipelago, this presentation focuses on findings of perceptions regarding dimensions of risk management (i.e. information and actions taken before a crisis, and during the response and recovery phases of a disaster situation). Particular attention is given to communication aspects such as “Who do people trust?” and “What forms, strategies, and means of communication do people value most?” Preliminary results seem to point out to a generalized sense of not needing more information in order to be better prepared to face crises and to the inexistence of a culture of precaution towards major disasters. The rationales underlying those perspectives are discussed.

D4 Financial and economic consequences

Preferences for lives, injuries and age

Henrik Jaldell (Karlstad University), Fredrik Carlsson (Göteborg University), Dinky Daruvala (Karlstad University)

■ From a public decision making perspective one of the more difficult questions is whether the estimation of benefits from risk reducing projects should be influenced by factors such as age groups and risk domains. For example, should a project that saves the lives of elderly people be assigned the same benefit value in cost-benefit analyses as one that saves the same number of children’s lives, or should the values be differentiated? We design a choice experiment in which subjects are required to make six pair-wise choices where the characteristics of each choice are accident type (fire and traffic), number of people saved from fatality (four levels), number of people saved from severe injury (three levels) and age of the people saved (10-, 40- and 70-year old). The stated social marginal rate of substitution (SMRS) is estimated between for example saving the life of children compared to elderly. We find that saving the life of one 40-year old is equivalent to saving 1.43 10-year olds from dying in traffic or fire accidents. Likewise, saving the life of one 70-year old is equivalent to saving 3.31 10-year olds from dying. The SMRS between saving a life and avoiding a serious injury is between 3.2 and 3.8 for the different age groups, thus one saved life is equivalent to avoiding around 3.5 seriously injured, which is significantly lower than the officially used value of 6 by the Swedish Road Administration.

Assessing risk-cost of Flooding

Lars Rosén, Johan Nimmermark, Mats Andreasson (Sweco Environment AB and Chalmers, Civil and Environmental Engineering)

■ In Sweden, during the last decades, there has been an increase in establishment of housing close to water. Combined with the increase in heavy rainfall and more fluctuating water levels a rise in the amount of flooding with harmful effects has been noted. The cost for a flooding in an urbanized area can be substantial. To deal with this issue preventive measures are needed. Since the available economic resources are limited a Cost-Benefit analysis (CBA) of possible alternatives is an important tool for facilitating a sound prioritization of resources.

In this paper, we present a new method for calculating and comparing the costs and benefits of different prevention alternatives, thus giving decision makers a powerful tool to help select the most cost-effective solution. An example of application of the model is shown for the river Mölndalsån, located in the communities of HARRYDA, Mölndal and Gothenburg. Uncertainties on cost-estimates are often substantial. The model therefore includes an uncertainty analysis, where cost-estimations are represented by statistical distributions. Monte-Carlo analysis is used for calculating resulting uncertainty distributions of each alternative.

The outcome of the CBA is, of course, dependant on the quality of the data. Sensitivity analysis is performed to identify factors that provide most uncertainties to the CBA outcome. Finally, the different alternatives can be compared and the economically soundest alternative can be selected. This paper shows how the presented method can be used for providing decision support for achieving the highest risk reduction from available economic resources.

Towards an Impact Assessment of Telematics-based Vehicle Insurances

Tobias Ippisch (University of St. Gallen - Institute of Technology Management)

■ Today’s motor insurance business is characterized by harsh competition in many European countries. Premium erosions, increasingly disloyal customers, and persistently high claims costs in third part liability render this business less and less attractive to insurers. New business models allowing for differentiation and eluding price competition therefore receive a warm welcome.

One approach having emerged in recent years is telematics-based insurance (also known as “Pay-as-you-Drive”), which employs GPS and GSM technology for distance-based pricing and innovative add-on services. Although corresponding policies were designed to attract

low-risk drivers and reduce claims costs, high technology investments and lacking impact valuations caused promising pilots and products to be cancelled. This contribution outlines a joint research project of academia and practice for quantifying the real impact of telematics-based motor coverages. As a starting point, basic technological concepts are shown and a comprehensive overview of pilot projects and existent policies making use of telematics technology is given.

In the research project, both insurance-related (client observables, claims data) and telematics data (GPS-based driving records) on more than 1,500 clients are analyzed to identify characteristics of subscribers to the new premium schemes. Consideration will also be given to answering whether motorists change their driving behavior upon installation of the telematics device using time series analysis. Initial results will be discussed and areas for further research are shown that are tackled as the research project progresses. The work closes with recommendations for insurance managers wanting to implement an own telematics-based insurance product.

E1 Improving risk communication

Risk communication: The Avandia case – a pilot study

Ragnar Löfstedt (King's college London)

■ On the 21st May 2007, The New England Journal of Medicine published Steven Nissen's and Kathy Wolski's article entitled "Effect of Rosiglitazone on the risk of myocardial infarction and death from cardiovascular causes" (Nissen and Wolski 2007). The publication of the article had immediate ramifications. The producer of Rosiglitazone (under the trademark Avandia), Glaxo Smith Klein (GSK), saw its share price fall 8 per cent on the day of the publication, and it led to front page headlines in national newspapers in Europe and North America.

This article evaluates the risk communication strategies of the various actors involved in the Avandia case from the time of the Nissen and Wolski article to the present day. The evaluation is based on a content analysis of a number of US and UK newspapers from the period January 2007 to May 2008, interviews with GSK staff, drug regulators (EMEA, MHRA, US FDA), journalists at the Wall Street Journal (WSJ) and the Financial Times (FT), and advisors to US politicians (Congressional staffers).

Environmental health risk communication in the Netherlands

Jutta Koehler, Jeroen Devilee, Ric Van Poll (RIVM (National Institute for Public Health and the Environment of The Netherlands))

■ The Dutch National Institute for Public Health and the Environment (RIVM), a governmental research institute, provides information on environmental and health risks. The primary contractors' information demands are served well. It was hypothesized however, that the risk information available from the RIVM does not always correspond to the desires and requirements of other parties concerned. It might be that – to a certain extent – an information gap exists.

This explorative study focuses on the information demand and supply with regard to four different risks: flooding by rivers, air pollution, food related risks and the risk of having overweight. For each risk the information demand of professionals (policy makers, scientists, municipal health services, media, NGO's) and the public was examined. Moreover the information supply by different RIVM-channels of communication was examined. The professionals' perceptions and requirements concerning risk information were identified in interviews. The public was approached by focus group discussions. The professionals were selected on the basis of the RIVM network, whereas the participants of the focus groups were selected randomly. The public appeared to be quite unfamiliar with the institute and its information sources. Policy makers mainly appreciated personal contacts in order to keep up to date on risk topics, whereas NGOs and fellow researchers judged the institute's website and reports to be more relevant. Press releases appeared to add little to satisfying the information demand.

The most important finding is that the majority of the parties would like to get involved more often and in an earlier stage of RIVM-research. This means that proactive communication is appreciated. As a consequence the institute should try to increase the amount of two-way risk communication with different target groups.

Improving risk communication: ethical considerations and practical suggestions from the case of bse

Peter Modin (KTH (Royal Institute of Technology, Stockholm))

■ Ethical aspects of risk communication are introduced; it is argued that in addition to minimal ethical requirements on risk communication (e.g. telling the truth and acting accordance with one's professional responsibility) there exists a class of weaker ethical requirements that result in supererogatory acts when abided by. Some such ethical requirements are discussed and illustrated by means of an analysis of the BSE-vCJD ("mad cow" disease)

crisis. A chronological overview of pertinent events during the crisis is given, and the risk management effort is then analysed and a number of important mistakes related to risk communication are summarised and discussed in some detail. In particular, the roles of uncertainty, risk perception and trust are examined, and conclusions are drawn concerning how those and other relevant factors might be dealt with more successfully in future (particularly food-related) risk events. It is argued that it is necessary to pay respect to ethical as well as practical considerations if one is to accomplish good risk communication.

E2 Public health risks

Health risk arising from air pollution by particulate matters

Josef Navratil (University of Defence), Vladimir Adamec (Transport Research Centre), Josef Kellner (University of Defence), Frantisek Bozek

■ Health risk assessment in this paper is focused on effects of particulate matters (PM) that concentrations in the air gradually increase and human population is permanently exposed by inhalation of polluted air. Toxicity effects of PM based on physical properties can cause damage of pulmonary tissue leading up to the pulmonary fibrosis, overloading of heart and cardiovascular diseases. Genotoxic effects are dependent on PM chemical composition because many organic and inorganic compounds are adsorbed on their surface.

The case study is focused on health risk assessment due to exposure of air particulate matters PM₁₀ in Brno region. Health effects represent the occurrence of bronchitis among children and total mortality. Assessment of this effects is based on calculation of odds ratio OR and relative risk RR. There are used factors for the assessment like annual average concentration of PM₁₀ and tabulated regression coefficient of value 0,02629 in calculation of OR and maximum daily concentration of PM₁₀ and tabulated regression coefficient of value 0,0012 in calculation of RR.

The worst situation of bronchitis occurrence among children is in Brno-centre, where 9.6 % of children could have this disease per year caused by measured PM₁₀ concentration. Health risk assessment indicates relatively high loading of inhabitants living near chosen monitoring stations in Brno region.

Exposure to contaminated sediments at a public bathing place

Tomas Öberg, Monika Filipsson, Marianne Lindström, Pasi Peltola (University of Kalmar)

■ More and more time is spent on recreational activities, but few risk assessments focus specifically on these situations and exposure factor data are often scarce. To assess exposure to contaminants at a public bathing place in an urban environment, we have compiled literature data, conducted observation studies, and analyzed water and sediment samples. The levels of anthropogenic contaminants are high in urban environments and traffic frequently plays an important role.

In this study, to characterize variability and uncertainty, the deterministic exposure calculations for metal pollutants were supplemented by a probability bounds analysis for the polycyclic aromatic hydrocarbons (PAH). The results from these calculations show that oral intake is the major exposure route for metals, while skin absorption, with present assumptions, is more important for the PAH. The presently measured levels of contaminants, at this public bathing place, cannot be anticipated to cause any significant adverse influence on public health.

Risk values for lumbar spine in humans

Chandraekhar Putcha (California State University, Fullerton)

■ This interdisciplinary research paper deals specifically with quantification of risk for lumbar spine in the general area of biomechanics. Risk (R) is defined as, $R = \text{Actual force in lumbar spine} / \text{Capacity of lumbar spine}$. The actual forces in lumbar spine and associated guy wires are calculated using the well known McGill model.

The McGill model consists of 3 equivalent members – one member represents the lumbar spine and the other two represent the guy wires. The guywires are made of muscle and tendons while the lumbar spine has the properties of bone. The force in lumbar spine is equal to P (the normal force from the ground to human foot) from principles of statics. Using the principles of matrix methods of structural analysis, it can be shown that the force in the lumbar spine is about 0.6 P. The capacity of the lumbar spine is calculated based on the information available in literature using the properties of muscle and tendon. Using this information, the risk factor is calculated for lumbar spine in humans. A specific example of a human body (lumbar spine) is used to calculate the value of risk. The calculated risk value in this paper gives a general idea of risk for the specific data used.

This method needs to be applied for more available data before any relevant conclusions can be drawn. However, the risk analysis approach used will be very useful for Physicists

treating patients with back pain. This study will also form basis for further study for academicians and researchers to apply this model for other available data for human beings.

E3 Riskperception

Public Awareness and Perceptions of the Health Risks of Indoor Radon

Wouter Poortinga, Karin Bronstering, Simon Lannon, Nick Pidgeon (Cardiff University)

■ Radon is a naturally occurring radioactive gas found in certain rocks and soils (e.g., granite), which may be harmful for people's health. Radon gas is now recognised to be the second largest cause of lung cancer in the UK after smoking. Since the mid-1980s the UK Government has been running a number of centralized campaigns to inform people about the health risks of radon. However, this centralised approach only led to a small number of affected households in England taking remedial action. In the late 1990s it was therefore decided to take a more locally-directed approach with local authorities acting as the public face of the campaign. In this presentation we will present preliminary findings of a population-based survey of people's awareness and perceptions of the risks of radon (n=1578). The interviews were conducted in radon affected areas of 15 local authorities.

The survey is part of a project that attempts to link people's attitudes and behaviours to the geography of radon occurrence in the area, the history of radon testing initiatives, as well as the socio-economic context. More specifically, the project examines whether (a) public awareness and perceptions of the risks of radon vary according to exposure, (b) local radon awareness and testing campaigns improve people's radon-related perceptions, awareness, and testing behaviour, and (c) the effectiveness of local radon policy and communication initiatives is mediated by social factors, such as social capital and trust.

Impact of Knowledge and Voluntary Precautionary Recommendations on Risk Perception of Mobile Communication

Marie-Eve Cousin (ETH Zurich, Institute for Environmental Decisions (IED), Consumer Behavior)

■ The health risks of mobile communication radiation are a subject of controversy. Due to existing uncertainties, several countries have applied the precautionary principle for base station emissions. In this context, the question arises as to whether it would be reasonable

to provide voluntary precautionary recommendations for cell phone usage, or would this provision only increase people's health concerns in an inappropriate way. We conducted an experimental study using a sample of Swiss citizens (N=408). Three different versions of a newly developed booklet, which focused on common misconceptions in regard to mobile communication, were tested.

The experimental design addressed questions of the potential effects of knowledge, voluntary precautionary recommendations and addresser on the public's health concerns. Participants' perceptions were measured three times: immediately before and after the reading of the booklet, and two weeks later. The results showed that the reading of the booklets increased participants' knowledge considerably and led to different perceptual changes. Measurements showed that, in regard to cell phones, health concerns increased after the reading of the booklet and stayed at a higher level even after two weeks. The negative perception of base stations, in contrast, tended to decrease. Neither the addresser of the booklets nor the omission of precautionary recommendations had significant effects on people's health concerns.

Provision of specific precautionary recommendations enhanced reader's willingness to adopt the recommendations in their cell phone handling as well as their effective behavior reported two weeks later. People with higher health concerns were particularly willing to adopt voluntary precautionary behavior.

Reflexivity, expectations and metaphors about health harms when living in a high industrial risk environment

Josep Espluga (Universitat Autònoma de Barcelona – Institute of Government and Public Policies), Ana Prades (CIEMAT – Sociotechnical Research Centre), Tom Horlick-Jones (University of Cardiff - School of Social Sciences), Jordi Farré (Universitat Rovira i Virgili/Communication Studies), Jan Gonzalo (Universitat Rovira i Virgili/Communication Studies)

■ In the absence of expert information people elaborate their expectations on risks for health basing themselves on direct and indirect daily experiences, as well as perceptions and folk knowledge learned through their daily interactions with other people and through the media. These perceptions are socially transmitted through the use of examples and metaphors generated collectively.

In the present text the way as populations exposed to petrochemical risks (two samples in Spain and one in UK), express their possible damages to health is analysed. Focus groups have been carried out, and questionnaire surveys as well.

The results show how people perceive themselves exposed to these risks, as well as how they attempt not to make it too evident in their conversations. This circumstance favours the appearance of peculiar conversational formulas, full of reflexivity, allowing them indirectly to talk about themselves. We focus the analysis on the way in which people build their expectancies on health effects, as well as on the factors that prevent them from talking directly about these damages.

As conclusion it is deduced that these people are in a very dependent status on the institutional context generated by the presence of the petrochemical industries, which prevents them from expressing their uneasiness in a clear and direct way.

After all these years: reflections on a decade of risk perception and risk communication research

Tom Horlick-Jones (Cardiff University School of Social Sciences, Cardiff University), Ana Prades (CIEMAT, Barcelona)

■ The practical demands of communicating information about risk have formed an abiding challenge to our collaborative research over an extended period. In this paper we reflect upon the importance of risk communication in many areas of policy and practice, as diverse as emergency planning and health communication, and including many of the leading issues of the day. We recognise that institutional attempts to inform and influence lay behaviour in such areas are predicated upon a variety of models of how people make sense of risk-related issues.

Many such models are based upon a cognitive information-processing metaphor, and have an underlying instrumental nature that assumes recipients would behave responsibly if only they knew the facts. We discuss alternative, sociological, approaches to risk perception that have developed over the last decade, in which resulting lay behaviours are recognised as being embedded within a matrix of everyday associations, preferred ways of life, trust relations, economic constraints and emotional commitments. We draw particular attention to the relevance of the notion of thick description in seeking to investigate the nature of practical reasoning about risk issues. We illustrate some of these developments in ways of understanding processes of risk perception by revisiting, and re-analysing, a particularly rich ten year-old corpus of largely unpublished comparative UK and Spanish data, generated by citizens living in communities geographically close to potentially hazardous industrial facilities.

Similarity or probability in risk assessment of invasive species

Ulrika Sahlin (Lund University)

■ Management of introduced invasive species should rely on risk analysis. Which species that is potentially invasive, and what consequences that follow a biological invasion, are uncertain risks. Risk management of invasive species recognizes and faces these uncertain risks, but a discussion of the underlying theory of decision making is seldom heard.

Based on examples of semi-quantitative scoring systems, decision trees, and statistical models used to in risk analysis of invasive species, I challenge the common expected utility approach to decision-making with the case-based decision theory. The latter approach base decisions on earlier experience of similar cases, and has been suggested to be more suitable for uncertain risks. In the light of how risk assessment of invasive species is undertaken today, I ask which decision theory that is most appropriate for these types of problems. In the light of adopting a case-based decision theory, I especially discuss a well established predictor of risk – “historical invasiveness”, and the use of expert opinions in existing assessments of invasive species.

Multiple threats to species – co-occurrence of non-indigenous species with other threats

Helena Berglund (Lund University)

■ The causes of species declines and extinctions are often multi-factorial, and for particular species, the different kinds of threats are often well known. For example, insular bird species may simultaneously be exposed to habitat alteration, overexploitation, and non-indigenous species (NIS). Here we test whether the threat from NIS co-occur randomly with other threats. We used the IUCN red list to test the assumption of random co-occurrence of NIS and nine other major threats listed in the database (Habitat loss, Harvesting, Accidental mortality, Persecution, Pollution, Natural disasters, Changes in native species dynamics, Intrinsic factors and Human disturbance).

Natural disaster had the strongest association with the threat from NIS and this was the case on both islands and mainland countries. When testing the association of threats with specifically NIS predators, the strongest association was with threat from native predators, indicating that similarity in mode of action affects co-occurrences between threats. Intrinsic

factors, e.g. inbreeding problems, had random co-occurrence with the threat from NIS except on islands and with NIS predators for which we found a disassociation with intrinsic factors. Association or disassociation between threats can depend on correlated exposures or sensitivity to the threats or that the presence of one threat increases or decreases the sensitivity to another. Additional information about magnitude and timing of exposure to the different threats could give insights into if different threats against global biodiversity act in synergism or have additive effects when they co-occur.

Technology for Rapid Identification of Highly Pathogenic Viruses

Ida-Maria Sintorn and Heather Marshall-Heyman (Vironova AB), Kejll-Olof Hedlund and Ali Mirazimi (Centre for Microbiological Preparedness, Swedish Institute for Infectious Disease Control), Gustaf Kylberg (Centre for Image Analysis, Uppsala University)

■ The Swedish Emergency Management Centre, Swedish Defense Materiel Administration, Swedish Agency for Innovative Systems, have invested 9.5 MSEK in a project with the aim to develop a technology for rapid identification of highly pathogenic viruses. The project is a collaboration between Vironova AB, The Swedish Institute for Infectious Disease Control (SMI) and the Centre for Image Analysis (CBA) at Uppsala University.

Combining Transmission Electron Microscopy with automated image analysis, the technology allows for objective, user independent, rapid detection and identification of virus particles in samples from humans or animals. Simple and fast methods for inactivating (1h), preparing (15-20 min) and imaging samples are developed at the BSL 4 lab at SMI. Algorithms and software for automatic detection and identification of viruses in TEM images are developed at CBA and Vironova. Viruses currently being incorporated into the system include Lassa, Crimean Congo Hemorrhagic Fever, Rift Valley Fever, Parapox and Ebola. Examples of other viruses planned for investigation are Hanta, Dengue, West Nile and Marburg.

Once complete the technology will identify viral content within minutes from taking a digital picture of the sample. The easy and safe analysis procedure makes this technology suitable for use in emergency situations. It is an open-view method, able to detect all species of viruses present in a sample without the need for probes. Similar software, proprietary to Vironova and marketed through Olympus, has successfully been used to detect and classify 4 types of gastroenteric viruses in fecal samples.

Prioritising the unusual: one explanation for adverse events?

Chris Bennett (Kings Centre for Risk Management, School of Social Science and Public Policy)

■ Between July 2007 and June 2008, nearly 600,000 adverse events involving hospital patients were recorded in the UK. This paper focuses on the contribution made by the perceptions of risk of hospital staff to the aetiology of adverse events involving patients, using data from an ongoing qualitative study of NHS ward staff in an acute hospital.

One theme emerging from the data already collected is that staff do not always find it easy to weigh severity of consequence against immediacy of threat when deciding how to prioritise action. Specifically, the data suggest that faced with two potential hazards to patient safety, one routine and one unexpected and perceived to require an urgent response, consideration of the relative severity of the threats posed may often be secondary to the perceived need for action, even when the unexpected hazard poses a lesser threat. Such predispositions may well contribute to the large number of incidents involving failure of routine procedures designed to protect patients from harm. For instance, administration of medicines, a routine but demanding task with a high potential for error could potentially be interrupted and chances for mistakes increased by the perceived need to respond to a patient's bell.

The paper examines a number of examples of such incidents and considers the extent to which structural and organisational factors such as inadequate staffing levels, as well as individual differences in risk perception, may contribute to the choices made by staff and to the high incidence of adverse events in hospitals.

What kinds of activities have an effect on the public trust toward organizations?

Motoko Kosugi (Socio-economic Research Center, CRIEPI)

■ In Recent years, scandals frequently occurred in public and private organizations have seriously ruined the public trust. Losing the public trust has a severe impact on the survival of the organization and, in some cases, can even result in a bankruptcy. This study aims at drawing out the factors that lead to a public trust against public and private institutes. Conducted in October 2008 with 3711 respondents, our internet survey requires each respondent to evaluate the activities assigned to enhance the trust in five business types: the civil services, the press and communications, the electric power ut-

ilities, the automobile manufacturers and the food makers. The results from our survey assert that respondents put the most trustworthiness on the automobile manufacturers, followed by the electric power utilities as well as the press and communications. The food makers gain the least trustworthiness. According to the statistical analysis, the factors that are considered having the most impact on their decision are revealed to be (1) performance, (2) compliance with laws and regulations, and (3) disclosure. Here, “performance” implying the ability of corporations to accomplish a high quality assurance conforms to the “intentions” and “competence” shown by the studies on interpersonal trust. Although “compliance” seems to be a fundamental obligation for every corporation, a perception on compliance level has a strong correlation with the trust in the corporation. Our finding provides indispensable knowledge that will be beneficial for those organizations striving to retain or to recover the public trust.

Cultural differences and their potential risks to collaborative engineering design

Joan Harvey (School of Psychology), Ron Jamieson, Kim Pearce, John Philipson (Newcastle University)

- Engineers working collaboratively face a variety of communications issues to deal with, especially if they come from different disciplines within engineering. If we add different countries to that collaborative process, then language, culture, traditions etc all figure as well. The risks of collaboration failing and projects collapsing are increased as the situation becomes more difficult to understand. This study involved qualitative interviews plus a quantitative questionnaire survey of engineers working collaboratively in the UK and China. The questionnaires were translated into Chinese and were administered in 2008. Preliminary analysis so far shows very different attitudes to deadlines and time perception and also more predictable differences in areas such as connections, perseverance with problems, thrift etc. There are also differences appearing in how people respond to communications issues.

The Inadequacy of an ordinary organization

Aida Alvinus, Erna Danielsson, Gerry Larsson (Swedish National Defence College)

- When a disaster strikes, bureaucracy tends to become dysfunctional and hindering demands for rapid operative actions. Federal agencies and response organizations are apt to act independently and without coordination between each other. Key to an effective collaboration appears to be that response organizations need to interact and coordinate with each other, horizontal and vertical, before a disaster strikes. According to previous studies,

improved collaboration between organizations can be attained by predisaster links or ties among agencies. The study focuses on interactions between official rescue organisations. The aim was to gain a deeper understanding of how new functions in hierarchical organizations take place during a stressful mission. The analysis of the interview material indicates the existence of two overall types of links: vertical links that facilitate communication and leadership between different hierarchical levels, and horizontal links that make communication and collaboration easier between operators at the same hierarchical level. Vertical as well as horizontal links can be planned or spontaneous, depending on the actual situation and its specific demands. The links can either be accepted or rejected depending on trust from the environment. Results show that, the management of contradictory needs for structure and flexibility becomes easier when link functions/roles, especially the spontaneous, arise in the formal hierarchy during a disaster. This appears to be possible only when governmental organizations and agencies are required to optimize coordination and communication during large scale disasters. Links are suggested to function at their best during situations characterised by restraining factors such as geographic distance, the accident’s scope and lack of accident experience occurs.

F1 Risk communication, policy and rhetoric

Historical perspective: Risks relieved and risks generated by the 1834 Poor Law Act in England

J. E. Agnew (Royal Free Hospital, London)

- After much agonising, the UK Parliament, in 1834, passed a new Poor Law aimed to diminish state aid to ‘paupers’, save those admitted to quasi-penal institutions - the ‘Union workhouses’. 300 of these large ‘prisons’ were rapidly built in 5 years. Parliamentary records, contemporary newspapers and official reports reveal strong awareness of risk driving the legislators’ fears and actions. Preceding years had demonstrated seemingly inexorable increases in the cost of poverty relief. Fear of popular dissension and riot was strong. The assessment advanced was that new large institutions could provide bare minimum support for very poor people but deter vast numbers of others from seeking state aid. An, inadequately predicted, risk was how processes of the Act’s implementation would generate enormous opposition across political and social divides. Additionally, communication failed about proper separa-

tion of children and the elderly infirm from the able-bodied unemployed. The new institutions' terror-inducing bleakness communicated such an unpalatable message - coupled with well-publicised instances of inhumane behaviour within them - that, in retrospect, fierce opposition was unsurprising. The 'new Poor Law' is a striking early example of legislation aimed at managing risks within society. It did reduce costs but - to this day - illustrates harm stemming from lack of a shared vocabulary for risk debate between proponents and opponents, from hasty implementation, from the dreadful imagery of prison-workhouses and from 'blanket legislation' almost indiscriminately affecting all poor people in need.

The risk/no-risk rhetoric of environmental impact assessments (EIA): the case of offshore wind farms in Sweden

Hervé Corvellec (Department of service management, Lund University), Åsa Boholm (School of Public Administration, University of Gothenburg)

■ Risk is a key topic in the communication between developers of infrastructure projects, permit-granting authorities, and civil society. The nature of risk communication is contested among academics, however. Whereas some scholars conceive of risk communication as a matter of effectively communicating expert knowledge on factual matters to the public, others emphasise the role of symbolic construction and rhetoric.

This article analyses how wind farm developers rhetorically construct risks in relation to the environmental impact assessment (EIA) for a large offshore wind farm project. Our analysis is inspired by the New Rhetoric, the theory of argumentation developed by Perelman and Olbrechts-Tyteca (*Traité de l'argumentation - la nouvelle rhétorique*, Brussels: Éditions des presses de l'université de Bruxelles, 1958). We suggest that the EIA adopt a dual argumentative strategy. The report associates numerous risks with the project by identifying and cataloguing them; however, these risks are also disconnected from the project by being described as nonexistent, negligible, or manageable. We discuss some implications of considering EIAs, not as accounts of reality, but as loci of production for this reality. (Paper printed in *Local Environment* Vol. 13, No. 7, 627-640)

Conjoint analysis as a decision tool

Stina Alriksson (University of Kalmar)

■ Conjoint analysis has been used extensively in marketing, transportation and healthcare for the past 50 years. In this study, conjoint analysis is combined with multivariate data analysis methods in order to elicit stakeholder preferences and to present the results to the

stakeholders through the multivariate data analysis method of partial least squares regression. Conjoint analysis combined with partial least squares regression enables presentation of results at an individual level. The benefit of individual level results are that they can be used to initiate a dialogue between an industry and its stakeholders, as well as between different stakeholder groups.

The presentation mode also allows the researcher to find segments of respondents that think alike, although perhaps from different groups. To test the method, four environmental objectives of Swedish steel industry were used; reduced use of non-renewable energy, reduced use of nonrenewable resources, decreased emission of carbon dioxide and weight reduction of products. Six stakeholder groups participated in the study, and the results showed that a decreased emission of carbon dioxide was the environmental objective that most participants prioritised highest. Lowest priority was given to weight reduction of products. Conjoint analysis combined with multivariate data analysis methods such as partial least squares regression, principal component analysis and cluster analysis has been verified as an effective method for eliciting stakeholder preferences on industry-wide issues.

F2 Food risks, perceptions and behaviour

Information seeking on everyday risks: food risks versus industrial risks

Margôt Kuttuschreuter, Anna Krause, Ellen Ter Huurne (Psychology & Communication of Health & Risk, University of Twente)

■ Models to describe the conditions in which people will engage in information seeking behaviour, and the factors that determine this behaviour, are being put forward. The presentation will compare the individual's information seeking strategies regarding two different types of risk; a food risk and risks associated with industrial use of hazardous materials. In recent years, in Germany improperly manufactured meat products have been introduced into the food chain ("Gammelfleisch"). These products which are hard to recognize by the consumer, form a threat to the individuals health. This scandal has received much media attention.

To compare information seeking behaviour and its determinants in the case of hazardous materials and "Gammelfleisch", a survey has been performed among residents of Germany (n= 161). Subjects were questioned regarding their information seeking behaviour, infor-

mation sufficiency, affective response, informational subjective norms, risk perception and involvement. It was found that the subjects reacted differently to both types of risks. Risk perception and involvement were found to be higher for “Gammelfleisch” than for hazardous materials. Nevertheless, individuals were more satisfied with their level of knowledge and less inclined to search for information in the case of Gammelfleisch. Regression analysis showed that, for both risks, informational subjective norms and affective response were the most important determinants of information seeking behaviour. We applied structural equation modelling to test the relationships between the variables. Results will be presented and consequences for risk communication will be discussed.

Risk perceptions of farmed fish and fish farming in seven European countries

Anne Katrin Schlag (King’s Centre for Risk Management, King’s College London)

■ Fish consumption is estimated to increase. As such, more and more seafood will be the product of aquacultural activities. Thus in addition to the scientific issues, there is an urgent need to understand public perceptions of fish farming and farmed fish in order to be able to communicate effectively about the related risks and benefits. Nevertheless, to date, there is a lack of social scientific studies on aquaculture. Hence the overall aim of the present research is an in-depth exploration of lay risk perceptions which may be able to provide some implications for future risk communications. This paper summarizes the initial results of 28 focus group discussions conducted in the capitals of seven European countries: France, Germany, Greece, Italy, Spain, Norway and the UK. Focus groups were conducted in February and March 2009 and data was analyzed in-depth with the qualitative software Atlas/ti. Results show notable knowledge divergences between countries and already highlight a broad range of cross-cultural and social differences, indicating the challenges that lie ahead for developing effective risk communication strategies about aquaculture.

Producing an effective health communication campaign to prevent salmonellosis infection

Barbara Tiozzo (Istituto Zooprofilattico Sperimentale delle Venezie), Silvia Mari (University of Milano - Bicocca), Paolo Magaùda (University of Padova), Valeria Arzenton (Observa, Science in Society), Claudio Mantovani (Istituto Zooprofilattico Sperimentale delle Venezie), Dora Capozza (Università degli Studi di Padova), Federico Neresini (Observa, Science in Society), Licia Ravarotto (Istituto Zooprofilattico Sperimentale delle Venezie)

■ Communication campaigns have been found to be effective in promoting more adequate,

healthier lifestyles. If organized and implemented according to communication principles, they can influence consumers’ attitude, knowledge and behaviour towards health topics. Since there are few studies concerning risk perception and communication in the field of health risks from foodborne pathogens, this study sought to test the above hypothesis by carrying out a health communication campaign on food risk related to salmonellosis. People may become infected by this foodborne disease through inadequate behaviour during the domestic preparation and consumption of meals.

The aim of the campaign was to build knowledge and awareness about the disease and to change people’s attitudes and risky eating behaviour. It was developed in three specific steps: explorative analysis (focus groups) to assess consumers’ perception of food risks and to define the target and message media of the campaign; campaign design and implementation; evaluation of the campaign outcome and methodology used (telephone interviews).

The campaign was launched in June 2007. It addressed over 60,000 families living in the Veneto Region (North East Italy), who received by mail at home a flyer and a leaflet with a sliding insert, used as tools to present the key messages. According to the telephone interviews, 62.9 % of people who received the materials also read them and provided a higher percentage of correct answers. This demonstrates that the communication campaign increased knowledge about salmonellosis and changed behaviours and practices.

F3 Public perception & involvement, energy & power issues

The limits of ‘upstream’ public engagement: citizens’ panels and deliberation over hydrogen energy technologies

Rob Flynn (Institute for Social, Cultural & Policy Research, University of Salford), Miriam Ricci, Paul Bellaby (ISCPR (University of Salford))

■ Recently, in debates about science and technology innovation, and risk assessment, the importance of involving citizens ‘upstream’ - at the earliest stages of research and development - has been acknowledged. It is widely recognised that in embryonic or new technologies, public perceptions of risk play a crucial role in whether such technologies are accepted and adopted. In a number of different policy areas, various techniques have been used to facilitate ‘deliberation’ and ‘public engagement’, including focus groups, consensus conferences, citizens’ panels and citizens’ juries. This paper presents qualitative evidence from

case-studies of citizens' panels from two parts of the UK about public awareness of, and attitudes to, hydrogen energy technologies. Hydrogen as an energy carrier (and the so-called 'hydrogen economy') has been promoted as a possible radical solution to the crisis over fossil-fuels.

However, there are major uncertainties about the feasibility and safety of hydrogen production, storage and distribution, and about its consumer applications. Findings from a set of citizens' panels – involving meetings between citizens and experts debating hydrogen energy – are presented. It is argued that while citizens display significant degrees of ambivalence, they pose fundamental 'whole-system' questions about future hydrogen technologies, while also indicating their disinterest and even scepticism about 'upstream' engagement. Alternative explanations for these views are presented and assessed.

Risks of Energy Decline: A Crisis Unfolding?

Kathryn Mearns, Euan Mearns

■ There is a growing literature on how the public perceives the risks associated with climate change but little appears to be known about how the public perceives the risks associated with energy decline. Current estimates project that oil production will likely peak before 2015, followed by natural gas in 2030 and coal by 2050. The implications for our economies and lifestyles are alarming and heralds major problems for the OECD and emerging economies, as they struggle to access adequate energy supplies and adjust to significantly higher energy costs.

Ironically, the solutions to anthropogenic global warming and security of energy supply are much the same but the emphasis is different. The global warming argument is that abundant fossil fuels should not be burned in order to reduce CO₂ emissions. The energy decline argument is that we will be forced to use less fossil fuel derived energy and urgently need to expand alternative energy sources, e.g. wind, tidal and nuclear, and to use all our energy resources more efficiently. It is proposed that the energy decline arguments will carry more weight than the climate change arguments since these can be perceived as a personal rather than a global risk and therefore more likely to influence behaviour.

This paper calls for more attention to be focused on people's perceived risks of fossil fuel energy decline and the need for effective risk communication campaigns to educate politicians and the general public about energy decline and how best to bring about changes in attitudes and behaviour.

Nuclear objects risk perception and their siting

Marko Polic (Department of Psychology, University of Ljubljana), Drago Kos (Faculty of Social Sciences, University of Ljubljana), Nadja Zeleznik (ARAO)

■ Due to energy crisis in Slovenia discussion on new nuclear power plant is opened. On the other hand, search for location of low and intermediate radioactive waste (LILW) facility is not yet finished. On the base of focus groups discussions and public opinion polls an assessment is made of factors influencing acceptability of such objects in the country and/or local community. While focus groups were focused mainly on the siting process itself, and factors influencing it, the scope of opinion polls were wider, covering a number of aspects, from knowledge, perceived risk and fear, to trust, role of local partnerships, compensation, etc.

The polls concerning LILW repository siting (with occasional question changes) were regularly conducted for a number of years now, the last one on December 2008. It appeared that knowledge is not the most important influencing factor, but that the attitudes are more emotionally based, while involvement in local partnership appeared as mediating factor.

F4 Risk management, individual, local & societal levels

Discourses on municipal protection and safety work in relation to the "Civil Protection Act against Accidents"

Birgitta Johansson-Hidén (Centrum för tjänsteforskning, Karlstads universitet)

■ The research seeks to 1) demonstrate the possibility of studying the discussions of politicians and staff groups using analysis of verbal interaction, and 2) to describe how a new law will be perceived, translated, and acquire significance. The "Civil Protection Act against Accidents" in Sweden, stipulates management by objectives, risk analysis work, political prioritizations, and cross-sectoral work on the municipal level, entailing a new challenge for the municipalities and the rescue service. Sixteen groups from four hierarchical levels within municipalities took part.

The result shows that attitudes regarding the ambitions of the law could be formulated in to two main discourses with certain common standpoints, Discourse I and Discourse II. Discourse I was mainly rooted in current reality and critical as regards the new Act, while Discourse II was more rooted in the ambitions of the upcoming Act. Discourse I was especially represented in the municipality's senior political management and on the rescue service's

lowest hierarchical level. Discourse II occurred on the intermediate level of the municipal hierarchy, i.e. within the rescue service's political management and on the management level of the rescue service. The change in the discourses which was brought about by the Act coming into force in 2004, and thereby the requirement that municipalities formulate plans of action for both the rescue services and preventive safety and protection work, will be followed up in longitudinal research being carried out until 2009.

Societal risk and safety management work at local governmental level in Sweden

Anna Johansson, Ulrika Postgård (Dep. of Health and Environmental Sciences, Division of Public Health Sciences, Karlstad University)

■ The necessity of a holistic outlook in risk and safety management processes has been a commonly expressed feature in many public policies and regulations since the beginning of the 1980s. Guiding principles for archiving this has often stressed the importance of increased collaborations between different managing sectors in the management process. An improved accident and injury preventive and safety promotive perspective has also been emphasized. The aim of the empirical analysis in this study is to explore the organisational structure for the management of risk and safety issues at the local governmental level in Sweden.

The overall objective for the study is to identify the municipalities' need of state support and development in this area. The analysis is based on a review of three focus-groups interviews with municipal officials/civil servants from different municipal sectors (n=12) in different types of Swedish municipalities. The analysis showed that the risk and safety management at the municipal level constitutes of four main pillars: rescue service, preventive measures in different sectors, management of extraordinary events (crises) and internal protection of municipal property.

Furthermore, two different kinds of work processes are identified: one municipal comprehensive approach based on a holistic view and several sectors divided approaches rooted in the division of task between municipal sectors. Several ambitions to develop future management approaches are also identified, but also several difficulties and lacks of measures to establish these kinds of work-processes. A research agenda for this area will be discussed at the conference.

Local Government safety promotion

Lars Karlsson (School of Public Administration, University of Gothenburg)

■ Local Government safety promotion and injury prevention concerns the health and well being of the citizens of the local community. As a policy area it raises questions about what the local authorities can do to prevent or at least reduce the risks of harm to citizens. Taking into account its high relevance for welfare democracy it is surprising that the area of safety promotion and injury prevention has not awoken more interest among policy researchers. Arguably, the lack of research has led to an inadequate and simplistic understanding of how policy processes in this area actually work. According to a simplistic understanding, the policy process is seen to be both linear and rationalistic in the sense that all steps in the process is undertaken with the purpose of actually reaching explicit policy goals. This is however seldom the case in real life.

The paper discusses policy theories in the area of safety promotion and injury prevention, in the light of research findings from other policy areas, like education and environmental policies. Insights from these other policy areas show that actors in the policy process do not always act as rationalistic and goal-oriented as is assumed in the simplistic model. In many instances actions are symbolical in accordance with norms that the actors assume to be appropriate in a particular context.

G1 Risk management, policy, environment & transport systems

Appraisal of environmental health risks

Jeroen Devilee, Ric Van Poll, Jutta Köhler (RIVM (National Institute for public Health and the Environment of The Netherlands))

■ Decision making about environmental health risks is a complex process. Policy makers confronted with this task have to tackle various problems. Not the least of these is that the information needed to make informed decisions is inadequate or even missing. Another point is that the Government has to decide at which risks it should aim the policy options it has at its disposal. This implies that it has to set priorities in the approach of environmental health risks. Consequently, difficult trade-offs between diverse environmental risks like Legionella, radon and sleep disturbance have to be made. In a reaction to the complexity of making judgments about environmental health issues several countries have started so-called

action programs that are aimed at facilitating the decision making process by structuring it. As a result in the Netherlands the National Institute for Public Health and the Environment developed the Appraisal Framework Health and Environment. This instrument describes all relevant aspects of a single environmental health problem and facilitates the comparison of different environmental health problems. The Appraisal Framework was criticized by the Health Council of the Netherlands as the comparison of environmental health risks with the help of the instrument is still a very complex process. It was recommended to elaborate the Appraisal Framework with the aid of Multi Criteria Analysis and other methods that can support decisions. In this paper we describe the MCA-approach that has been developed at the Dutch National Institute for Public Health and the Environment to meet the criticism. In particular we present a means to assess relevant risk characteristics, a weighing procedure and an aggregation technique. Preliminary results with expert panels will be presented.

Decision making on risk in railway planning

Åsa Boholm (School of Public Administration, University of Gothenburg)

■ Land use planning in cases of e.g. transportation infrastructure facilities, energy plants, waste disposal facilities, or mining enterprises actualises a multitude of prospected consequences. Planning must take into account an array of intended outcomes, unwanted side-effects, risks and uncertainties. To make the picture even more complicated, negative effects or benefits to society associated with a project, including risks to humans and to the natural environment, are seldom understood and prioritized according to one single frame of reference. This paper addresses the multidimensional contexts of decision making in land-use planning by focusing on a case of Swedish railway planning under the government authority of the National Rail Administration. According to the Rail Building Act and the Environmental Code consultation with municipalities, stakeholders, the county administrative board, other authorities, and private stakeholders, is mandatory in the planning of a new railway line. A new rail way line raises numerous risks issues including material as well as immaterial values at stake: such as private property or technical constructions, or a beautiful landscape view.

Using empirical data from participant observation at railway planning meetings this paper addresses the organisational context of decision making on risk. The analysis focuses on organisational responses to uncertainty, the role of experts in risk identification and assessment, and the administrative production of responsibility and accountability. Findings from this research suggest that risk as an organizational topic assembles an administrative logic

of efficiency and a practical rationality of managing co-operative and coordinated action among specialized private and public expert competencies and interests.

The implication of active governance issue networks for risk management in a road planning project

Vicki Johansson (University of Gothenburg)

■ During the last decenniums has theories of governance more and more often been used in order to describe and analyze changing power relations between actors involved in the policymaking process. Compared to officials in a “traditional public administration”, bureaucrats operating and managing governance networks can be expected to perform their tasks differently. One hypothesis that has been put forward is that public officials in a governance setting apply other methods and strategies than bureaucrats in traditional bureaucracies and, that their discretion as a consequence is higher.

This paper builds on a case study of a public road planning project. It addresses risk management practice within the project and how this practice is affected when a “powerful” governance issue network is activated. During the preparation of the final design plan, the project received changed instructions emanating from the issue network. Second to this instruction an experimental road lane should be included in the final design plan. The main tentative conclusion is that issue networks affect the public planning and risk management processes as well as public officials’ discretion. But contrary to the hypothesis, co-workers in road planning projects seem to be losing – not gaining – influence over the processes. The result stresses the importance of problematizing how risk management can be guaranteed in situations where the responsible (i.e public bureaucrats on street-level) for risk management lose authority and discretion.

The immanence of risk to managerial practice

Herve Corvellec (Department of service management, Lund University)

■ Title: The immanence of risk to managerial practice Abstract: The claim put forward in this paper is that risk assessment techniques provide sophisticated ways to identify and estimate hazards, but eschew the fact that there is no risk unless something of value is considered to be at stake; and in organization, what is valuable follows from managerial practice. A case study of Swedish regional public transportation administration serves as an explorative illustration of this claim. The study illustrates how risk definitions do not primarily proceed from hazards that are exterior to the organization, but connect back to what managers consi-

der being valuable in and for their organizational practice. A practice immanent approach to risk is proposed, together with some implications for risk management research and practice, for example that risk is permanently re-invented by managerial practice.

G2 Reliability, communication & organizations

Organizational factors in complex systems – the challenges in the maritime sector

Jens-Uwe Schröder (World Maritime University), Kevin T. Ghirxi (Malta Maritime Authority)

■ Human Factors (HF) and especially organizational factors as important source of risks in maritime operations have been taken into consideration relatively late in the maritime sector. It was not until the end of the 1980s that the International Maritime Organization (IMO) provided guidance how HF should be investigated more systematically. While significant progress was made on a number of issues related to HF and the organizational influences a number of important questions can still not be answered today. Among these “white areas” are individual performance shaping factors and how they are influenced by organizational conditions in complex systems.

A recent review of fires in engine rooms on board merchant vessels shows that organizational factors have not often been mentioned as contributing to these accidents. This leads to two questions. Are organizational factors overestimated or is it just difficult to investigate them given current guidelines provided are insufficient or the administrative constraints in which investigators work prevent them from investigating these accidents in a more detailed way? The consequences are, however, quite negative. The maritime sector seems to be tired of detailed studies of the HF and adopts other ways of looking at the maritime risks by focusing on alternative indirect parameters. The suggested paper attempts to provide an overview about the different discussions and will also reflect if systemic views on complex systems may help to overcome current dilemmas in accident investigation and risk assessment.

High reliability organization in Malaysian food manufacturing supply chains

Chee Sing Kong, Jerry Busby (Department of Management Science, LUMS,UK)

■ This paper investigates how food manufacturing processes in Malaysia seek high reliability. The aim was to look at an industry and a cultural setting that had not been explored

before in studies of high reliability organizations (for example Roberts, 1990). Moreover, several recent scandals such as those of Chinese milk contaminated by melamine, Guar gum contaminated by PCBs, and chilli powder contaminated by the Sudan 1 dye, illustrate how vulnerable food manufacturing and supply chains can be.

The study involved 60 unstructured interviews with actors in Malaysian food manufacturers, food retailers, consumer associations and government agencies. Using grounded analysis, we found a number of themes that have not strongly figured in previous theories of high reliability organization. For example, consumers are part of the reliable system, not least because they can be harmed by foodstuffs containing legitimate but potentially hazardous ingredients. We also found that the meaning of reliability was a very broad one – encompassing not just the avoidance of physically harmful contamination but also the avoidance of culturally unacceptable processes such as violations of halal requirements. Our conclusion is that HRO theory needs to be significantly expanded to incorporate these issues. Current concepts such as that of collective mindfulness (Weick et al, 1999; Weick and Sutcliffe, 2001) need to be supplemented with concepts that apply to networks of organizations extending across multiple cultures, involving different interpretations of reliability, and involving more groups of actors in attaining reliability.

How institutional contexts and communications flows affect conditions for risk expertise

Henrik Merckelsen (Copenhagen Business School, Department of International Culture and Communication Studies)

■ This case study seeks to explain the conditions for the experts’ rational risk perception by analyzing the institutional contexts and communications flows in the network of actors that constitute a field of food safety expertise. Drawing on the Social Amplification of Risk Framework (SARF) and with methodological inspiration from Actor-Network Theory (ANT) the study highlight the contextual factors that affect risk reporting from the lowest organizational level (where risks occur) to the highest organizational level (where risk expertise is situated). The risk reporting device in question is the self reporting tool developed in the Danish division of the multinational food service provider Compass Group PLC. Observations were made in 27 canteens in the private and public sector, and 54 interviews were conducted with the kitchen staff.

Research findings: Food risks were usually dealt with locally with no subsequent reporting. Risks were almost only reported in one of two conditions: 1) When irregularities were dis-

covered and prevention measures were implemented before risk exposure. 2) Detection of infectious diseases among canteen guests. What characterizes these two conditions is that the risk has either been 1) eliminated by prevention measures, or 2) has ceased to exist because the negative outcome is no longer merely potential.

The paper concludes by suggesting that the preconditions for the expert's rationality in this case may rather be a lack of risk specific knowledge due to poor risk reporting than a superior level of risk knowledge.

An investigation into regulation decision making using agent based simulation

Gareth Davies (Cranfield University), Graham Kendall (University of Nottingham), Emma Soane (London School of Economics), Jiawei Li (University of Nottingham), Simon Pollard (Cranfield University)

■ Risk regulation has grown rapidly as a component of government decision making. Advantages offered are numerous and well documented. Many of these risk decisions are based on scientific evidence and knowledge, yet, the process of brokering is poorly understood. This research attempts to empirically model the influence individual personality and power has on this process and decisions made. Semi-structured interviews were carried out with experts from three regulatory decisions: nuclear waste disposal, the disposal of avian influenza infected animal carcasses and salt intake.

The logical sequence in which these decisions were made was mapped out within three separate agent-based simulation models. Development of such an artificial environment has permitted us to vary components of the decision making environment and of the agents themselves in order to attain a far greater depth of understanding of how group decisions are arrived at. Then drawing upon insights contained within personality and power literature, combined with evidence-based theory, the influence individuals have on the resolution of uncertainty is empirically demonstrated.

Hence, addressing the current gap-in-knowledge regarding the influence personality and power has on the confidence building exercise that characterizes risk-based regulatory decisions.

Analysis of the benefices of the “new approach” to improve the control of major accident hazards

Olivier Salvi (INERIS)

■ The Seveso II Directive (96/82/EC) on the control of major accident hazards defines a number of requirements for the operators of industrial sites using a certain amount of dangerous substances. In particular, the operators of chemical, petrochemical, storage and warehouses, metal refining industries, where the amount of dangerous substances is exceeding the thresholds laid down in annex 1 of the directive have to define a major accident prevention policy, and for the upper tiers to establish a safety report, implement a safety management system and define an internal emergency plan. These requirements aim at preventing major accidents and mitigating their consequences, for the benefit of society and the environment.

However, non uniform implementation of these requirements in the various Member States can create significant market distortions within the European Union, and if the requirements in Europe compared to other parts of the world are too strict and the benefits of these requirements not obvious, then the competitiveness of the industry can be affected. Several recent projects and initiatives like the ARAMIS and SHAPE-RISK projects, or the survey performed by OECD on the Use of Safety Reports or Equivalent Documents in the Control of Major Accident Hazards as well as the work of the European Technology Platform on Industrial Safety (ETPIS) have pointed out some possible improvements regarding the methods and tools used to control major accident hazards. In addition, the need for harmonisation has been pointed out, especially in a Europe with the single market. At the same time, the “New Approach” The “New Approach”, defined in a Council Resolution of May 1985, represents an innovative way of technical harmonisation. It introduces a clear separation of responsibilities between the EU legislator and the European standards bodies like CEN in the legal EU framework. The model of the “New Approach” is very attractive to reach convergence if not harmonis

Visualization of risk uncertainties in case of future climate risks – the case hydropower plant in Finland

Riitta Molarius, Nina Wessberg, Jaana Keränen, Jari Schabel (VTT Technical Research Centre of Finland)

■ Climate change imposes new risks with high uncertainty. There is a lack of practicable advice and methods how to manage these new emerging risks. Hence, the new risk assessment methods for identifying and assessing the risk are needed. It is challenging to describe the descriptive uncertainty (uncertainty of scenarios) and measurement uncertainty (uncertainty of harmful event) to decision makers who have to make investment decisions. In some cases changes can also be opportunities. This paper presents a procedure on how to analyse and prioritise future climate risks in practice. The use of procedure requires networking of natural scientists (hydrologists, biologists, meteorologists etc) and risk analysers; therefore the process should be directed and documented well. The main idea of the procedure is to use four fold tables to visualise the two uncertainties. With the help of this visualisation decision makers will be able to decide what kind of adaptation operations they should enforce. In this paper we focus on developing the visualisation of the risk identification and assessment process. In the study we intend to integrate the climate scenarios and technical risk assessment traditions in order to achieve a practical method for reporting climate change risk assessment in hydro power plants. The paper describes the development and the tools of the risk assessment process. Finnish hydropower company Kemijoki Ltd was used as a pilot case in our study. The study is a part of the Nordic Energy Research funded Climate and Energy Systems (CES) project.

A framework for comparing the governance of environmental risks in the Baltic Sea

Michael Gilek, Elinor Andrén, Magnus Boström, Monica Hammer, Björn Hassler, Anna Maria Jönsson, Mikael Karlsson, Mikael Lönn, Sara Söderström (Södertörn University, Sweden)

■ Despite decades of substantial efforts by multiple actors on local, national, European and international levels to counteract negative environmental trends in the Baltic Sea, major disturbances to important ecosystem properties still exist. It is hence necessary to develop an interdisciplinary and integrated scientific basis for improving governance, assessment and communication of environmental risks. Therefore, the RISKGOV project aims at improving our understanding of the structures and processes that shape the governance of envi-

ronmental risks in the Baltic Sea as well as at identifying conditions and opportunities that could improve risk governance and thereby promote sustainable development.

The analysis is based on a comparative case study approach where five important environmental risk areas (i.e. eutrophication, fisheries, biodiversity impacts, chemical pollution, and maritime transportations) are compared in terms of (i) governance structures, (ii) risk assessment and risk management interactions and (iii) stakeholder communication processes. In order to ensure comparability over cases, a unified analytical framework will be developed by which crucial topics such as multi-level decision-making, institutional interaction, stakeholder involvement and communication, problem framing, risk assessment – risk management interactions, and treatment of uncertainties and complexities will be addressed. We will in this presentation present and discuss major similarities and differences in the governance of the studied Baltic Sea environmental risks in relation to risk evaluation criteria such as extent of damage, probability of occurrence, uncertainty and potential of mobilisation.

Keywords: environmental risk governance, risk assessment, risk management, stakeholder communication, ecosystem approach.

G4 Risk and the media

Risk relationships and causal complexity in media reporting: a Swedish case study

Max Boholm (Center for Public Sector Research, University of Gothenburg)

■ The study addresses the textual representation of risk in news media. The analytical framework is influenced by several theoretical perspectives, such as the social construction of risk, the mental models approach to risk communication, media frames analysis, cognitive linguistics and philosophy on causality. The content of news paper articles on risk in the Göta älv valley, south west Sweden, covering a period from 1994-2007, has been coded and analysed.

Categories used for coding are based on the assumption that descriptions of risk in news paper stories are characterisations from a certain view point where a risk object, an object at risk and a causal explanation for the risk are identified. Main results suggest that (i) a certain phenomenon (e.g. shipping) is not fixed as a risk; in one characterisation it is described as a risk, but in another characterisations it is described as an object at risk or a causal condition

for a risk; (ii) media content for specific risk issues over an extended period of time, represent risks as deriving from complex systems of causal conditions. These results are discussed with reference to theoretical assumptions and findings in the research area of risk and media.

Natural disasters: Given risks and potential risks posed by markt-oriented disaster coverage (A longitudinal study of the reporting and portrayal of flood in the Swiss press)

Helena Zemp (University of Zurich, IPMZ Institute of Mass Communication Science and Media Research)

■ Most of what we know about “natural” disasters comes from modern mass reporting. The media also play a key role in risk communication and management of natural hazards. By informing and warning the citizenry, they decisively influence the perception of these phenomena, and the individual and collective cognitive and emotional responses to them. Reflecting the actual public’s concern about natural hazards in many European countries, we have to take into account, that we have witnessed an unprecedented change in the media system over the last decades. Journalistic practices are increasingly shaped by economic competition. This has a profound impact on what is considered newsworthy and how news is presented. From the journalistic point of view a natural disaster has all the ingredients for the perfect media event, e.g. news values like novelty, negativity, dread, personalization or visualization. However, a market-oriented coverage may significantly alter disaster and risk communication.

This paper is based upon a case study showing the changes in press coverage of 9 flood events of equal magnitude within Switzerland between 1910 and 2005. The results provide new insights into the routines of news media during natural disasters, specifically their topic selection and presentation. With regard to the overall goal of risk reduction, risk management and the planning of how to deal with present and future disasters must incorporate the media as well as unintended effects of their news coverage. This paper concludes with suggestions for the successful adaptation of risk communication to these circumstances.

Healthy eating in the media: A balanced diet?

Gillian Hawkes, Julie Houghton, Ione Wright, Gene Rowe (Institute of Food Research)

■ There are many health risks associated with not eating a balanced diet, including conditions that arise because of vitamin and mineral deficiencies and those associated with over-consumption of fat, sugar and salt. The expression “balanced diet” is a common theme

for healthy eating behaviour internationally and is a common phrase in health promotion. However, little research has been conducted on how individuals think about eating a “balanced diet” in everyday life and the research that has been done suggests that the concept of “balance” is polysemous.

The news media is an important arena for the presentation of information around food and health from a variety of sources and acts as a conduit for the translation of medical advice to the public. How is the concept of a “balanced diet” presented in the media? Content analysis was carried out for four UK newspapers: two tabloids and two broadsheets for a three month period (January-March 2008).

The newspapers were chosen on the basis of sales figures. Initial results suggest that there are differences between the different newspapers (in particular, between broadsheet and tabloid) in the sources of information (e.g. science vs. celebrities) and also in the emphasis placed on weight loss as the primary goal of healthy eating (in the tabloids) compared to the prevention of diseases or promotion of long-term health (in the broadsheets). Implications of these results for understanding risk perception and the effectiveness of risk communication are discussed.

POSTER PRESENTATIONS

Lower bounds of discount rates for investment subjects

Sven-Eric Andersson (Management consultant)

■ An agent faced with an investment option is by textbooks advised to discount the expected net cash flow to the time of investing. There is disagreement on how to select discount rates though. This can be detrimental to the quality of investment decisions at all levels in society. A human individual might not apply the same discount rate as the management of a major corporation. Agents can have different time preferences. We analyze these by applying the

theory for living systems (such as groups, organizations, societies). Discounting is a way of considering future risks according to classical interest rate theories. There is a recent analytical formulation of causes for subjective discounting. We apply it to the concept of living systems for modeling subjective discount rates. We define an investment subject as a living system capable of stating whether one of two consumptions is not preferred to the other. We analyze decision situations where the future consumption is non-tradable and derive lower bounds for subjective discount rates. Numerical examples are given.

CARER – Center for advanced research in emergency response

Anders Rüter, Sanne Johan, Rebecca Stenberg, Arne Jönsson, Kent Lindqvist (Linköping university)

■ Center for advanced research in emergency response, CARER, was formed in collaboration between Linköping University (LiU) and the Swedish rescue services agency. The aim is to consolidate and strengthen the existing research at LiU within the risk, response and rescue areas. Work within CARER is primarily research and education concerning the ability of the society to respond in the event of accidents. These accidents include everything from every day accidents to extra ordinary events and crises, on a local, national and global level. The concept of response includes traditional resources like ambulances and fire and rescue resources, but also other resources in the society including the individual. The possibilities and challenges of combining different kinds of response resources and response systems are important issues. The area is by nature cross disciplinary, which is reflected by CARER's organization that stretches over three faculties (Arts & Sciences, Health and Science & Engineering) and six departments. CARER is still in a formative stage and the poster will describe the organization and purpose of the center, as well as some of the recently launched projects.

Stakeholder knowledge of food chain risk

Angela Cassidy (Intstitute of Food Research), John Maule (Leeds University Business School)

■ This paper will report on recent research investigating differential understandings of food chain risk amongst a range of UK stakeholders in food and food production, including food scientists and risk regulators; farmers; NGO workers and food campaigners; food industry representatives; and members of community groups. We were interested in comparing how these stakeholder groups understood risk and risk management across the food chain, with a view to ultimately improving the ways in which these risks are communicated. An innovative visual research method, known as 'fuzzy felt', was used to elicit focus group discussions of food risk by asking participants to produce an image of the food chain. We found that this method successfully supported group exploration of the complex issues at hand amongst participants with different levels of familiarity with food production. The images produced were analysed alongside transcripts of group discussions, in order to show how participants conceptualise the food chain, where and what the risks are, and how these risks should be managed. The research has found that the complexity and scope of stakeholder knowledge

of food chain risks is variable and solidly grounded in social, political, economic and ethical contexts. Furthermore, we found wide variation in stakeholders' concepts of 'risk' itself, and striking differences in awareness of how food risks are managed and regulated. By creating a situation where participants themselves can set the agenda on risk, this research highlights the potential shortcomings of traditional, 'expert-led', risk communication approaches.

Risk-related perceptions among military personnel preparing for an international mission

Yvonne Friman, Camilla Kylin, Susanne Hede, Ann Enander (Swedish National Defence College)

■ During the last decade the Swedish Armed Forces (SAF) has shifted focus from their traditional task of national territorial defence to an increased involvement in international peacekeeping and peace enforcement efforts. These tasks can entail exposure to new uncertainties and risks, highlighting the need to evaluate and develop preparation and training before international missions. However, relatively little research has been found focusing on how risk and safety issues are perceived and communicated in relevant military contexts. Risk perceptions and communication were here studied in the context of the first Nordic Battle Group who after the time of deployment were sent to Kosovo on the 18:th mission from Sweden.

The aim was to develop knowledge about how military staff apprehend and estimate risks in preparation for an international mission. The study is based on interviews with 19 informants comprising both soldiers and higher level officers. Data analysis was based on a grounded theory approach. Three main types of risks were discussed by the informants: mission-specific hazards, environmental hazards and lifestyle related hazards. A model was developed describing factors influencing how risks in relation to missions are perceived. A number of paradoxes and dilemmas were identified, for example the diverse view of security regulations in training at home and in action on the actual mission.

An empirical study of insurance-related mobile phone applications

Tobias Ippisch, Stephan von Watzdorf (University of St. Gallen - Institute of Technology Management)

■ With a high level of competition being prevalent in today's insurance business, insurers are looking for ways to differentiate from competitors and to stop premium erosions. In this context, mobile phones come to the fore, whose multi-faceted applications increasingly

address insurance interests. However, insurers today are still hesitant in offering such applications to their clients, as little is known about these services per se, their implementation costs, and their acceptance amongst customers.

In our research, we present the results of an empirical survey amongst 2000 clients on insurance-related-mobile phone applications. From 21 possible services that were identified together with health and property insurers, five promising applications were analyzed in detail in a consumer survey in Germany, Austria, and Switzerland. The Technology Acceptance Model (TAM), well-known in Information Systems Research, provided the conceptual basis for conducting the study. Our findings show which applications are perceived as most interesting amongst interviewees and what their potential for increasing customer loyalty would be. We illustrate to which clients new mobile services especially apply and how their attitude towards the applications is influencing their intention to use. Additionally, we study the moderating role of insurance involvement, trust towards insurers, innovativeness, and general risk awareness onto that relationship. In the discussion section, it will be outlined to which insurance companies such mobile services especially apply and which implementations have found their way into practice already. We conclude with recommendations for further research on insurance-related mobile phone applications.

On the role of novel, pervasive technologies in the insurance business: Flash in the pan or new enlightenment?

Tobias Ippisch, Albrecht Bereuter (University of St. Gallen – Institute of Technology Management)

■ In recent years, insurers' innovation efforts have primarily aimed at reducing operating costs by IT-system integration and steady process improvement. Also by tapping new distribution channels, innovation has taken place for many European insurance companies. More recently, though, innovation efforts have focused on insurance products themselves to differentiate from competitors in the price-competing market environments. One interesting option for product innovation thereby emerges from new technologies, whose continuous miniaturization and network integration entails a more fine-grained view onto insured objects and enables new business models.

The following research discusses the role of such new, pervasive technologies in the insurance business. It is shown how advances in sensing, communication, and localization technologies can contribute to better risk assessment and management. Further, it is illustrated how such technologies can be used to create risk awareness on an individual level. We

support our findings by a survey amongst more than 40 decision makers in the insurance industry and consolidate the impact of new technologies into ten projected developments.

In detail, we argue for the impact of persuasive technologies on data granularity per se, customer interaction, product design, and the establishment of new value creation networks. Additionally, we differentiate the technology impact by the different classes of insurance business and give examples where new pervasive technologies are in use already today. In the discussion section, we give recommendations to insurance companies wanting to differentiate from their competitors by means of new technologies and name possibilities for further research.

What does the wind look like? How pro-wind and wind-sceptic groups use pictures to communicate their respective viewpoints

Christopher Jones, Herman Elgueta, J. Richard Eiser (University of Sheffield)

■ In light of the risks posed by climate change and an increasing reliance on energy imports, the UK Government has set in place ambitious targets of increasing the country's renewable energy capacity. Wind turbines are at present one of the most technologically and economically viable of the renewable options and, as such, are a popular choice for energy companies (Loring, 2007). However, although typically the public have a positive view of wind power (i.e. 70-80% supports its use, BWEA, 2005), wind projects are often opposed locally. The controversy surrounding local wind development has led to the emergence of numerous local, regional and national campaign groups of both a pro-wind and wind-sceptical nature within the UK (Devine-Wright & Devine-Wright, 2006). These groups are shown to be making increasing use of the Internet in order to disseminate information supporting their position and communicate with their fellow community members.

This poster discusses the findings of a content analysis performed on the picture content of a selection of local, regional and national pro-wind and wind-sceptic websites and energy company websites in the UK. Each image was coded for both manifest and latent content. It was predicted that because pictures would be carefully selected by those compiling the websites that there would be visible differences in the content of the images incorporated. For example, it was expected that whilst wind-sceptic websites would more readily incorporate images highlighting the risks associated with wind farms, pro-wind websites would more readily incorporate images depicting the utility of wind.

Beyond Micro-Perception: the Effect of Macro-Structural Factors on Acceptance of Nuclear Power Station

Kim Geun-sik (Institute of Governmental Studies, Korea University)

■ The psychometric paradigm dominates the explanation of social acceptance and risk perception about nuclear power facilities. Based on the model of men, 'cognitive miser', the paradigm has oriented to the theoretical generalization. However, this perspective have lacked in neglecting the macro-structure factors in explaining the acceptance of risk objects. Our studies try to show the impacts of macro-structural variables, such as historical, cultural, economic and social factors, on the acceptance of nuclear power station in Korea. In Korea, there are four nuclear power stations in Kori site and six ones in Yeonggwang site. However, two local residents had shown the different attitude toward the acceptance of nuclear power stations. We assumed that such contrasting attitudes are caused by not only micro-cognitive variables such as risk and benefit perception but also macro-structural variables such as economic, social and cultural factors.

By analyzing the quantitative survey data (samples of 254 residents in Yeonggwang and 336 ones in Kori) and qualitative historical records, we will show the significant impacts of macro-structural variables on two local residents' contrasting attitude toward acceptance of nuclear power station.

Specification of Stigma Structure and Determinants in Risk Judgment of Nuclear Objects

Seoyong Kim, Ju-yong Jung (Department of Public Administration, Ajou University)

■ Recently there are too many researches to analyze the role of stigma and image in risk judgment process. A lot of empirical risk researches show that not only rational thinking but also the emotional feeling or image take the key role in risk judgments. This concept of stigma based on emotional feeling also well applies to the judgment of nuclear objects, such as nuclear power stations, nuclear energies and nuclear power companies. Negative stigma influences the increase of the risk perception of nuclear objects and decrease in social acceptance of them. Although the present studies have given the insight to risk researches, they show the lack in more specification and elaboration of stigma. Therefore, our studies will specify the stigma structure and analyze its determinants.

First, we divide the stigma as dependent variables into three attributes, i.e., degree of stigma, kind of stigma and consistence in stigma judgments. Next, by setting up the socio-demographic variables, trust, perceived risk and benefits as independent variables, we find

out their impact on the judgment of stigma. Based on empirical survey data, our research will show that there are varying relations between kind, degree, consistence of stigma and its determinants. It implies that there needs the diversity in management of risk stigma.

How safe are we at work in the hospital? Perceived occupational risk among nurses in an Azorean hospital

Carolina Maia, Luis Silva (Hospital Divino Espirito Santo)

■ Risk has been the object of extensive research in the last decades and studies on occupational risk constitute an important section in that domain. Based on the assumption that public perception of risk is driving policy as much as technological and scientific risk assessments, the present study aims at surveying nurses' perceptions of occupational risk factors. Carried out at the largest public hospital in the archipelago of the Azores, the research focused on how nurses (N= 376) understood several dimensions of occupational risk (profile, severity, controllability, and systems' vulnerability) and nurses' reported behavior in occupational risk situations. Data was collected through a multi-type item questionnaire and was analyzed using standard statistical techniques.

Results indicate that nurses have a good knowledge about occupational risk and perceive their profession as very risky, particularly when compared with other occupations. Infections and stress were considered the negative outcomes more likely to occur in their occupation. Nurses showed considerable knowledge about measures to minimize their occupational risk and reported having partly or totally changed their behavior as a consequence of working accidents. Some demographic and professional variables were found to be associated to nurses' perception of occupational risk: perception of physical risk was affected by gender; perception of mechanical risk was different for nurses who worked in more than one service; perception of biological risk was affected by age and working experience; behavior towards chemical and psycho-social risks was affected by the occurrence of accidents, and behavior towards physical risks was affected by age.

Carbon Capture and Storage: local attitudes towards a new type of power generation

Barry Orr, J. Richard Eiser (University Of Sheffield)

■ CCS (Carbon Capture and Storage) has been publicly touted as an intermediary solution to problems of security of energy supply, and carbon dioxide (CO²) emissions linked to climate change. CCS technology aims to capture CO² from burning combustible fuels, storing it underground. A quantitative survey based study (N = 176) examined attitudes of

a population close to a planned CCS coal-fired power station, scheduled for completion by 2013. This will be based near the city of Doncaster, UK.

This station aims to be the first in Britain (and Europe) to be CCS ready. Results indicated broadly positive attitudes towards CCS; both generally, and specifically towards the proposed power station. 58% of participants supported the station, with male respondents in areas linked with traditional coal production most in favour. Perceived benefits of CCS technology were however strongest in terms of local employment and security of supply. Participants' general attitude towards an energy technology, rather than its perceived potential to mitigate climate change, were however strongly linked to perceptions of which energy technologies should be used in the UK in future.

While CCS support then appears substantial, sections of the public appear to view CCS benefits primarily in terms of employment and energy production. For future CCS developments, publicity and persuasion of the benefits of CCS at local and personal levels, rather than solely for mitigating climate change, may be required to support CCS technology becoming widespread in future.

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