The Nordic Chapter of SRA Europe and Lund University Centre of Risk Assessment and Management (LUCRAM) invites you to participate in the 1st Nordic Chapter Risk Conference on the theme:

The Future of Risk Analysis in the Nordic Countries

Keynotes: David Gee • Åsa Boholm • Tomas Öberg • Terje Aven • Johannes Persson • Ragnar Löfstedt

Where: **Elite Hotel, Ideon Lund, Sweden**

When: **16-17 November**

Time: **Lunch-to-Lunch**

Information and registration visit
www.lucram.lu.se/event/nordic-chapter-risk-conference

Sessions themes: Risk and responsibility • Framing risk • Risk perception • Quantifying risk and uncertainty • Managing evidence • Complex risk governance • Improving risk management by learning • Critical infrastructure protection • Improved response, recovery and safety • Climate change adaptation • Poster session with mingle

SP

The Swedish Research Council Formas
Committed to excellence in research for sustainable development

Nordic Chapter Risk Conference - program

	Monday November 16th				
10.30	Registration desk opens	@ Lobby of Elite Hotel, Ideon			
11.00	Lunch				
11.50	Conference opening	@ Conference room Elite Hotel, Ideon			
12.00	Keynotes:		Johannes Persson		
			Åsa Boholm		
13.00	Parallel sessions	**Room**		**ID**	Chair
		TERA	Risk and responsibility	**I**	Marja Ylönen
		GIGA	Managing variation in quality of evidence	**F**	Niklas Vareman
		MEGA	Climate change adaptation	**G**	Kristina Blennow
		MICRO	Improving risk management by learning from incidents and practices	**D**	Kerstin Eriksson
14.30	Break with coffee	@ Lobby of Elite Hotel, Ideon			
15.00	Keynotes:	@ TERA Elite Hotel, Ideon			
			Tomas Öberg		
			Terje Aven		
16.00	Parallel sessions	**Room**			
		TERA	Framing risk in theory and practice	**E**	Johannes Persson
		GIGA	The complex governance of risk	**C**	Åsa Knaggård
		MEGA	Critical infrastructure protection: methods, challenges and prospects	**A**	Henrik Hassel
		MICRO	Quantifying risk	**J**	Igor Kozine
18.00 - 20.00	Poster session with food and drinks	@ Pufendorf Institute, Biskopsgatan 3. See map			
	Tuesday November 17th				
9.00	Parallel sessions	**Room**		**ID**	Chair
		TERA	Public health and risk perception	**H**	Daniel Slunge
		GIGA	Risk governance in a globalized, yet bordered world	**K**	Aiste Balzekiene
		MEGA	Quantifying risk and uncertainty	**L**	Ullrika Sahlin
		MICRO	Organisational capabilities for improved response, recovery and safety	**B**	Alexander Cedergren
10.30	Break with coffee	@ Lobby of Elite Hotel, Ideon			
11.00	Keynotes:	@ Conference room Elite Hotel, Ideon			
			David Gee		
			Ragnar Löfstedt		
	Panel discussion		Theme: The future of risk analysis in the Nordic countries		
	Conference closure				
12.30	Lunch	@ Lobby of Elite Hotel, Ideon			
13.00	Business meeting Nordic Chapter	@ GIGA Elite Hotel, Ideon			

Business meeting for Nordic Chapter SRA Europe

Tuesday 13 – ca 14.30 in room GIGA, Elite Hotel Ideon, Lund, Sweden.

We welcome SRA members and non-members to a Business meeting of the SRA-E: Nordic chapter.

The purpose of the meeting is to elect members of the Board and to discuss ongoing and future activities to bring together individuals and organisations interested in risk assessment, risk management and risk communication in Europe.

Send a mail to Riskconf2015@lucram.lu.se if you would like to join via a link!

Welcome to share your ideas and competence.

Ullrika Sahlin President of SRA-E: NORDIC interim Board

The objectives of the SRA-E: NORDIC are:

- To promote risk research and knowledge and understanding of risk analysis techniques within the Nordic and Baltic countries. The Nordic and Baltic countries includes: Denmark (incl. Greenland), Estonia, Faroe Islands, Finland, Iceland, Latvia, Lithuania, Norway, and Sweden.
- To identify and address specifically Nordic and Baltic issues in the field of risk, to promote debate, and to impress upon decision-makers the usefulness of risk research, critical analyses and risk analysis in dealing with such issues.
- To act as a focal point for communication with risk researchers and analysts in other parts of the world.
- To facilitate exchanges of information and opinion between professionals in industry, government, universities, research institutes, and consultancies, with the aim of furthering research and improving the practical application of risk analysis and risk management.
- To convene and promote scientific and educational meetings on risk research, risk analysis and risk management in the Nordic countries.

Keynotes

Science and Proven Experience

Johannes Persson, Professor in Philosophy at Lund University, Sweden

Risk Management in Practice: Lessons and Findings

Åsa Boholm, Professor in social anthropology at Gothenburg University, Sweden

Socio-economic analysis in chemicals risk management

***Tomas* Öberg**, European CHemical Agency (ECHA), Finland

What is risk science?

Terje Aven, Professor in Risk Analysis and Safety Management at the University of Stavanger, Norway

How can Risk Assessment embrace the real world of Multiple Stressors, Accumulative Harm, and the Dearth of Data?

David Gee, Visiting Fellow, Institute of Environment, Health and Societies, Brunel University, Retired Senior Adviser on Science, Policy, Emerging Issues, European Environment Agency, Denmark

Risk risk tradeoffs: What should we do in Europe?

Ragnar Löfstedt, Professor of Risk Management and Director of King's Centre for Risk Management, King's College Londond, UK

I Risk and responsibility – Room TERA, Monday 13 – 14.30

Responsibilisation or empowerment: Reflections on the notion of resilience

Johan Bergström, Division for Risk Management and Societal Safety Lund University

Risk and Resilience

Marja Ylönen, Technical research Centre of Finland (VTT)

Citizen valuations for better risk decisions

Erik Persson, Swedish University of Agricultural Sciences (SLU), Alnarp, Sweden and Umeå University, Sweden, **Dario Cianciarulo**, SLU, Sweden, **Kristina Blennow**, SLU, Sweden

Towards collaborative governance arrangements for climate change adaptation: Tracing citizen–municipality interactions
Ebba Brink, PhD student at Lund University Centre for Sustainability Studies (LUCSUS)

G Climate change adaptation – Room MEGA, Monday 13 – 14.30

The EU Floods Directive in Sweden: keys for successful implementation in terms of sustainable flood risk management procedures
Beatrice Hedelin, Centre of Climate and Safety, Karlstad University, Sweden.

Addressing Climate Change in Coastal Areas in South Sweden - Risk Perception, Knowledge, and Coastal Management in Ystad Municipality
Andrea Morf, **Madeleine Prutzer**, School of Global Studies, University of Gothenburg, Sweden

Proactive flood response using complementary early warning information

Erik Persson, Karlstad University, Centre for Climate and Safety, Karlstad, Sweden.

Understanding risk for effective risk communication
Kristina Blennow, Dept. of Landscape Architecture, Planning and Management, SLU, Alnarp, **Johannes Persson**, Dept. of Philosophy, Lund University, Sweden, **Annika Wallin**, Cognitive Science, Lund University, **Niklas Vareman**, Medical Ethics, Lund University, **Erik Persson**, Dept. of Landscape Architecture, Planning and Management, SLU, Alnarp, and Dept. of Philosophy, Umeå University

F Managing variation in quality of evidence – Room GIGA, Monday 13 – 14.30

Quality of evidence in GRADE
Sten Anttila, Swedish Agency for Health Technology Assessment and Assessment of Social Services (SBU), Sweden, **Johannes Persson**, Dept. of Philosophy, Lund University, **Niklas Vareman**, Medical Ethics, Lund University, **Nils-Eric Sahlin**, Medical Ethics, Lund University.

The challenge of assessing risk for pollinators of pesticide exposure in real landscapes
Maj Rundlöf, Dept. of Biology, Lund University, **Lina Herbertsson**, Centre for Environmental and Climate Research, Lund University, **Henrik G. Smith**, Dept. of Biology and Centre for Environmental and Climate Research, Lund University.

What do we need to be confident? - A comparison between the confidence concepts used by the IPCC and by GRADE
Niklas Vareman, Medical Ethics, Lund University.

Dealing with an alien crayfish under sparse information and ambiguity
Ullrika Sahlin, Centre for Environmental and Climate Research, Lund University, and **Matthias C. M. Troffaes**, Durham University.

D Improving risk management by learning from incidents and practices – Room MICRO, Monday 13 – 14.30

Exploring the raison d'etre of an incident reporting system in an elementary school
Christina Mauléon, Borås University and Gothenburg Research Institute, **Maria Spante**, University West

The implementing problems of theoretical models of risk management in urban planning Stockholm County
Mateusz Sosnowski, County Administrative Board in Stockholm.

Failure to learn after accidents – the lamentable situation in Denmark
Frank Huess Hedlund, COWI, Denmark

How to Make the Right Security Decision Concerning Staff Members Abroad in a Upcoming Situation - a case study of "Quality and Tabloid" Media's Risk Communication
Per Gustafson, Dept. of Design Science, Lund University

C The complex governance of risk – Room GIGA, Monday 16 – 17.30

Evaluation of road tunnel fire safety and risk
Jonatan Gehandler, SP Technical Research Institute of Sweden.

Risk governance of critical infrastructures
Alexander Cedergren, Division of Risk Management and Societal Safety, Lund University, **Jonas Johansson**, Division of Industrial Electrical Engineering and Automation, Lund University, **Linn Svegrup**, Division of Risk Management and Societal Safety, Lund University, **Henrik Hassel**, Division of Risk Management and Societal Safety, Lund University, **Björn Arvidsson**, Division of Risk Management and Societal Safety, Lund University.

Can prescriptive and performance-based risk management coexist?
Nijs Jan Duijm, DTU Management Engineering, Denmark

Risk, uncertainty and robust decision-making
Åsa Knaggård, Lund University, Sweden

E Framing risk in theory and practice – Room TERA, Monday 16 – 17.30

Connecting dots - in pursuit of a holistic risk picture
Peter Månsson, Division of Risk Management and Societal Safety, Lund University

Risk association: Towards a theoretically informed framework for the analysis of risk in discourse
Max Boholm, Gothenburg Research Institute, University of Gothenburg.

The influence of political polarization on public risk perceptions and support for climate mitigation policy
Stefan Linde, Luleå University of Technology.

How can the usefulness of capability assessments be improved?
Hanna Lindbom, Henrik Tehler, Tove Frykmer, Christian Uhr, Division of Risk Management and Societal Safety, Lund University.

A Critical infrastructure protection: methods, challenges and prospects – Room MEGA, Monday 16 – 17.30

Empirical data for cascading effects in critical infrastructures
Björn Arvidsson, Division of Risk Management and Societal Safety, Lund University, **Jonas Johansson**, Division of Industrial Electrical Engineering and Automation, Lund University, **Henrik Hassel**, Division of Risk Management and Societal Safety, Lund University, **Alexander Cedergren**, Division of Risk Management and Societal Safety, Lund University, **Linn Svegrup**, Division of Risk Management and Societal Safety, Lund University.

Modelling and simulation of interdependent critical infrastructures
Linn Svegrup, Division of Risk Management and Societal Safety, Lund University, **Jonas Johansson**, Division of Industrial Electical Engineering and Automation, Lund University, **Henrik Hassel**, Division of Risk Management and Societal Safety, Lund University, **Alexander Cedergren**, Division of Risk Management and Societal Safety, Lund University**, Björn Arvidsson**, Division of Risk Management and Societal Safety, Lund University.

Critical Infrastructures – Concepts and five challenges from a risk perspective on interdependencies
Jonas Johansson, Division of Industrial Electical Engineering and Automation, Lund University, **Henrik Hassel**, Division of Risk Management and Societal Safety, Lund University, **Alexander Cedergren**, Division of Risk Management and Societal Safety, Lund University, **Linn Svegrup**, Division of Risk Management and Societal Safety, Lund University, **Björn Arvidsson**, Division of Risk Management and Societal Safety, Lund University, **Finn Landegren**, Division of Industrial Electrical Engineering and Automation, Lund Universtity.

Capturing interdependencies between critical societal functions
Henrik Hassel, Division of Risk Management and Societal Safety, Lund University, **Jonas Johansson**, Division of Industrial Electrical Engineering and Automation, Lund University, **Alexander Cedergren**, Division of Risk Management and Societal Safety, Lund University, **Linn Svegrup**, Division of Risk Management and Societal Safety, Lund University, **Björn Arvidsson**, Division of Risk Management and Societal Safety, Lund University.

J Quantifying risk – Room MICRO, Monday 16 – 17.30

What is the risk of dying when exposed to a landslide?
Tonje Grahn, Karlstad University, Sweden

Managing soil natural capital: An effective strategy for mitigating future agricultural risks
Rong-Gang Cong, Centre for Environmental and Climate Research (CEC), Lund University, **Katarina Hedlund**, CEC and Dept. of Biology, Lund University, **Hans Andersson**, Dept. of Economics, Swedish University of Agricultural Sciences, Uppsala, Sweden, **Mark Brady**, CEC and AgriFood Economics Centre, Dept. of Economics, Swedish University of Agricultural Sciences, Lund, Sweden.

The Risk Thermometer - A tool for risk comparison
Sand S., Bjerselius R, Busk L, Eneroth H, Sanner Färnstrand J, Lindqvist L., Swedish National Food Agency, Uppsala, Sweden.

H Public health and risk perception – Room TERA, Tuesday 9 – 10.30

Drinking water risk management. Municipal challenges: a Swedish case study
Åsa Boholm, GRi & School of Global Studies, University of Gothenburg, **Madeleine Prutzer**, School of Global Studies, University of Gothenburg, **Anna Bendz**, Dept. of Political Science, University of Gothenburg.

Risk Perceptions, Protective Behaviour and Tick-borne Diseases
Daniel Slunge and **Anders Boman**, Dept. of Economics, University of Gothenburg.

Linking land use in agricultural landscapes to Lyme borreliosis infection risk and underlying host-parasite networks
Dagmar Clough, Lund University.

The Effects of Precautionary Messages about Electromagnetic Fields from Mobile Phones and Base Stations revisited: The Role of Recipient Characteristics
Christoph Boehmert, Department of Science Communication, Karlsruhe Institute of Technology, Germany and School of Psychology, University of Wollongong, Australia, **Peter M. Wiedemann**, University of Wollongong, Australia, Jonathan Pye, University of Sydney and University of Wollongong, Australia
Rodney J. Croft, Australian Centre for Electromagnetic Bioeffects Research, University of Wollongong, Australia

K Risk governance in a globalized, yet bordered world – Room GIGA, Tuesday 9 – 10.30

New Breeding Techniques and the Risk of Innovation
Artem Anyshchenko, Centre for Public Regulation and Administration, Faculty of Law, University of Copenhagen

Supply Chain Risk Management
Ulf Paulsson, School of Economics and Management, Lund University

Risk Communication: Role of Public Participation in Regulation of Biotechnology in China and the EU
Wen Xiang, Faculty of Law, University of Copenhagen.

A failure of the European Neighbourhood Policy as an effect of an inadequate risk management strategy
Anna Moraczewska, Maria Curie-Sklodowska University, Dept. of International Relations, Lublin, Poland.

B Organisational capabilities for improved response, recovery and safety – Room MICRO, Tuesday 9 – 10.30

Safety Culture Assessment using Mixed Methods – A Case Study
Sandra Hobenboom, Consultant, Safety, DNV GL-Oil & Gas. Norway.

Safety margins, recovery and resilience of electric distribution systems
Finn Landegren, Jonas Johansson & Olof Samuelsson, Division of Industrial Electrical Engineering and Automation, Lund University, Lund, Sweden.

Improving Conditions In Inter Organizational Collaboration In Crisis Response Management & Practice
Roshni Pramanik, Division of Risk Management and Societal Safety, Faculty of Engineering, Lund University, Sweden.

L Quantifying risk and uncertainty – Room MEGA, Tuesday 9 – 10.30

Risks under non fault conditions created by function limitations
Tord Wullt, Consultant within quality, dependability and safety.

Unforeseen Accidents: Improving Risk Management Practices and Predictability
Taylor R. and Kozine I., Technical University of Denmark

The risk with overestimating the risk – the example of metal exposure via drinking water around contaminated glass works sites
Augustsson A., Uddh Söderberg T., Linné University, Kalmar, Sweden.

Exploring risk-risk trade-offs between pesticide use, ecosystem services enhancement and farmers profits using one measure of uncertainty
Cecilia Olsson, Yann Clough, Henrik Smith, Mark Brady, Ullrika Sahlin, Centre for Environmental and Climate Research, Lund University.

Poster session – Pufendorf Institute, Classicum, Biskopsgatan 3, Monday 18 – 20

Rationale for risk evaluation
Jonatan Gehandler, SP Technical Research institute of Sweden

Global system error and solution
Christer Nylander, private person.

The variability in bioconcentration factors and the importance of these in probabilistic risk assessments
Terese Uddh Söderberg, Department of Biology and Environmental Science, Linnaeus University

Synthesis analysis for future burned area for Europe under "business as usual" scenarios
Minchaou Wu, **Jan Blanke**, Department of Physical Geography and Ecosystem Science, LU, **Ullrika Sahlin**, CEC LU.

Using precise and imprecise probabilities to communicate unreliability in complex assessments exemplified on the use of QSARs to fill the algae data gaps in LCAs of plastic additives
Julia Grönholdt Palm, CEC LU, **Tomas Rydberg**, **Magnus Rahmberg**, **Hanna Andersson**, IVL, **Ullrika Sahlin**, CEC LU.

Development of Quality Assessment Tool to Gauge Fire Response Activities of Emergency Personnel in Denmark
Jennifer E. Lynette, Metropolitan Unversity College Copenhagen Denmark

Organised behaviour in the Swedish fire and rescue service – a case study
Tove Frykmer, Lund University

A risk analysis approach for pollution response fleet management in the Northern Baltic
Floris Goerlandt, Aalto University, School of Engineering, Finland.

ZOFORISK: Rapid risk assessment and communication during zoonotic events that concern more than one authority in the health risk area
Karin Nyberg, Christian Ebbersten, Linda Hallenberg, Jonas Hardenstam, Cecilia Hultén, Sara Johansson, Ingrid Nilsson, Åsa Svanström and **Kaisa Sörén**. Livsmedelsverket, Folkhälsomyndigheten, SVA.

Utilising visual risk communication to alert hospital staff to potential hazards to patient safety in routinely collected data: a visually compelling fluid balance bar chart
Chris Bennet, Kings Centre for Risk Management, Kings College, London.

Generalized Methodology for Socio-technical Risks Governance: Concept of Interdisciplinary Risk – Laboratory
Balzekiene, A., Gaule E., Jasinevicius R., Meskauskas Z., Petrauskas V., Zolubiene E. Kaunas University of Technology, Lithuania

Risk perception measurement in studies testing communications of precautionary or protective measures
Christoph Boehmert, Karlsruhe Institute of Technology, Department of Science Communication.

Vulnerability analysis of interdependent critical infrastructures: Case study of the Swedish national power transmission and railway system.
Linn Svegrup and **Jonas Johansson**, Lund University.

Empirical data for cascading effects in critical infrastructures (Challenge 4)

Björn Arvidsson[A], Jonas Johansson[B], Henrik Hassel[A], Alexander Cedergren[A] & Linn Svegrup[A]

[A]*Division of Risk Management and Societal Safety, Lund University, Lund, Sweden*
[B]*Division of Industrial Electrical Engineering and Automation, Lund University, Lund, Sweden*

Lund University Centre for Critical Infrastructure Protection Research (CenCIP)
Lund University Centre for Risk Assessment and Management (LUCRAM)

ABSTRACT

Collecting valid empirical data is a challenging task in many areas of research, and specifically in the newly developing research area of cascading effects between critical infrastructures and critical societal functions in catastrophes and crises. Two approaches are to use primary data from interviews or secondary data from reports and news articles. Both approaches have their values and disadvantages, interview studies for example tends to give more detailed information about a case at the cost of the time and effort that needs to be put in to gather the data. Making use of written accounts facilitates research of a larger amount of cases, but generally lacks in detail. Also, a trend among incident investigation reports, which are valuable and commonly available sources of information, is that they focus primarily on the events leading up to the incident and very seldom on the cascading effects following the event, a problem as little information is available e.g. to increase our understanding of interdependencies. Some of the challenges are specific to one of the approaches while some are valid for both, such as accessibility: not all reports are easily accessible and likewise not all persons are easily accessible for interviews and there is a rather narrow window of opportunity for interviews following a catastrophe or crisis. Another is the challenge is to determine which data that is interesting and worth collecting. The presentation will explore and compare some of the difficulties encountered during data gathering, using the two approaches: interviews and written accounts. The Malmö floods incident in 2014 will serve as an example case regarding gathering empirical data of cascading effects.

Modelling and simulation of interdependent critical infrastructures (Challenge 2)

Linn Svegrup[A], Jonas Johansson[B], Henrik Hassel[A], Alexander Cedergren[A] & Björn Arvidsson[A]

[A]*Division of Risk Management and Societal Safety, Lund University, Lund, Sweden*
[B]*Division of Industrial Electrical Engineering and Automation, Lund University, Lund, Sweden*

Lund University Centre for Critical Infrastructure Protection Research (CenCIP)
Lund University Centre for Risk Assessment and Management (LUCRAM)

ABSTRACT

One major challenge in critical infrastructure research is to construct and develop models that can account for the effect of interdependencies. Critical infrastructures are highly interdependent and disruptions are likely to cascade from directly affected infrastructures indirectly through interdependencies to other infrastructures. Identifying vulnerabilities in these system-of-systems of technical infrastructures is hence fundamental for proactive risk management. If only accounting for the direct consequences when analysing critical infrastructures, the total consequences can potentially be severely underestimated. Here a modelling approach for interdependent technical infrastructures is demonstrated, where technical infrastructures are divided into two parts, a structural and a functional part. The structural part describes the interconnections of the system's physical components and is represented as nodes (e.g. stations in the railway system and buses in the power system) and edges (e.g. railway tracks and high voltage power lines). The functional part describes the flow in the infrastructure (e.g. the movement of trains and the flow of power) and how the system reacts to strains. Each infrastructure and its direct dependencies to other infrastructures are modelled according to this modelling approach and then merged into a system-of-systems model enabling vulnerability analyses from a system-of-systems perspective. Based on this modelling approach, a case study of the interdependent Swedish national power system and the Swedish national railway system and their interdependencies is presented, both functional dependencies and geographical dependencies in the form of co-located components are included in the model. Several types of vulnerability analyses are investigated and discussed, e.g. a mutual geographical vulnerability analysis to investigate areas that are vulnerable to disruptions, taking into account consequences in both the power and the railway system. The results from the vulnerability analyses can facilitate risk governance processes and help guide decisions regarding proactive risk and vulnerability reducing measures from a system-of-system perspective.

Critical Infrastructures – Concepts and five challenges from a risk perspective on interdependencies

Jonas Johansson[A], Henrik Hassel[B], Alexander Cedergren[B], Linn Svegrup[B], Björn Arvidsson[B] & Finn Landegren[A]

[A]*Division of Industrial Electrical Engineering and Automation, Lund University, Lund, Sweden*
[B]*Division of Risk Management and Societal Safety, Lund University, Lund, Sweden*

Lund University Centre for Critical Infrastructure Protection Research (CenCIP)
Lund University Centre for Risk Assessment and Management (LUCRAM)

ABSTRACT

Critical infrastructures and societal functions, such as electricity, transportation, telecommunication, and health care, constitute the backbone of a modern society. Widespread disruption of infrastructure services often leads to large-scale societal impacts. Hence the development and implementation of proactive risk and vulnerability methods and actions are fundamental. However, there exist several research challenges for a holistic understanding and method development in this field. Here an introduction and overview of five of the major challenges is given, focusing on interdependencies. The first challenge relates to understanding and capturing how societal functions, such as healthcare and emergency response, depend upon each other and on technical infrastructures, how failures can cascade between these systems, and how to estimate the societal consequences that arise. These societal functions tend to also depend heavily on critical technical infrastructures, such as telecommunication and electricity supply, which in themselves are highly interdependent, leading to the second challenge, how to model and simulate interdependent critical infrastructures. The third challenge relates to the Socio-Technical nature of critical infrastructures, as the operation of these infrastructures constitute an interrelationship between the physical infrastructure and response organizations in the event of failures - more specifically how to quantitatively estimate resilience and safety margins of technical infrastructures. An overarching challenge, the fourth challenge, is to gain valid empirical data to understand and assess interdependencies of real-life societal functions and critical infrastructures and the cascading effects that can arise. As these societal functions and critical infrastructures are owned and operated by a multitude of actors, both public and private, there is a need to go beyond the traditional risk approach and take a risk governance perspective, constituting the last challenge. The above mentioned challenges will be treated in more depth and exemplified in the consecutive presentations given in the targeted conference session on critical infrastructure research.

Capturing interdependencies between critical societal functions (Challenge 1)

Henrik Hassel[A], Jonas Johansson[B], Alexander Cedergren[A], Linn Svegrup[A] & Björn Arvidsson[A]

[A]*Division of Risk Management and Societal Safety, Lund University, Lund, Sweden*
[B]*Division of Industrial Electrical Engineering and Automation, Lund University, Lund, Sweden*

Lund University Centre for Critical Infrastructure Protection Research (CenCIP)
Lund University Centre for Risk Assessment and Management (LUCRAM)

ABSTRACT

A modern society is increasingly dependent on continuous operation of critical societal functions providing services that are required for both the everyday functioning of society as well as for effective crisis response and recovery. These critical societal functions, spanning from power and telecommunication to food supply and health care systems, are also becoming increasingly interdependent which typically increase effectiveness but at the same time also enable disruptions to spread across system and geographical borders. Being able to understand interdependencies and foresee how disruptions may spread across critical societal functions, so called cascading effects, is crucial in order to e.g. set risk management policies that are appropriate from a systems and societal perspective. The importance has started to be realized in many countries. In Sweden, for example, identification of critical societal functions and interdependencies is stipulated in the legislation concerning risk and vulnerability assessments for public authorities, county administration boards and municipalities. Given the complexity of these systems and the numerous and multifaceted interdependencies that exist between them, for example in terms of different time scales, geographical scales, etc., it is a very challenging task and methods are needed to support this work. It is clear, though, that there is not a single best way to model cascading effects in order to understand the implications of interdependencies on the societal consequences of disruptions. Rather, there are several complementing approaches. In the conference presentation a couple of approaches will be introduced and briefly described, such as empirical approaches, workshop-based approaches, flow-based approaches and input-output based approaches. Finally, some ideas of how to further develop the research field of modelling cascading effects will be presented.

Safety margins, restoration and resilience of electric distribution systems (Challenge 3)

Finn Landegren, Jonas Johansson & Olof Samuelsson

Division of Industrial Electrical Engineering and Automation, Lund University, Lund, Sweden

Lund University Centre for Critical Infrastructure Protection Research (CenCIP)
Lund University Centre for Risk Assessment and Management (LUCRAM)

ABSTRACT

Modern society is becoming increasingly dependent on a continuous supply of electricity. In order to maintain the safety and security of society and its citizens it is therefore necessary that electricity networks are resilient towards disruptions, whether caused by natural disasters, sinister attacks or other. Margin and sensitivity are two crucial aspects of the resilience concept which have, so far, been subject to little research of their quantification. Here a simulation based method is presented that enables quantitative assessment of margin and sensitivity of electricity networks with respect to repair system resources. The simulation model used to represent this socio-technical system explicitly takes into account both the electricity network (technical)and the repair teams and repair materiel necessary for restoring the system (socio). The method is demonstrated for a municipal power distribution system in Sweden, which is subjected to both normal disturbances and disturbances beyond normal operation. An overall conclusion from the case study is that the suggested method gives an overview of the electricity distribution system's margin and sensitivity with respect to repair system resources. This information can form the basis for decisions concerning appropriate amount of resources to enable safe operations. While the applicability of the method has been proved only for electricity networks it will be a topic for future research to apply the method to other types of critical technical infrastructures, e.g. communication networks, transportation systems and water distribution systems.

B. Organisational capabilities for improved response, recovery and safety

Safety Culture Assessment using Mixed Methods – A Case Study

Sandra Hobenboom, Consultant, Safety, DNV GL-Oil & Gas. Norway

A mature safety culture makes an organisation less vulnerable to incidents and hazards (Antonsen, 2009). Therefore, establishing a mature safety culture can reduce the likelihood that accidents occur in an organization. Safety culture is the elements or parts of organizational culture that influence the organizational members' attitude, beliefs, perceptions, and behaviours, which have an impact on the level of safety in the organization (Schein, 2006).

For safety culture to reach the highest level of maturity (Parker, Lawrie, & Hudson, 2006), it must influence all the members of an organization. Safety is a dynamic entity that is constantly changing and progressing. To improve a safety culture, first a firm understanding is needed of the status of the current safety culture. Also, concrete and measureable goals for the desired safety culture and a safety culture framework for the organisation need to be developed. Once this is in place a strategy can be made to target the organisation's safety culture. This strategy will then need to be implemented, monitored with repeated measures of the safety culture, and adjusted where necessary. Taking such a systematic approach to safety is considered critical in ensuring that the system will provide a continuous cycle of improvement (Pidgeon & O'Leary, 2000; Pidgeon, 1991). However, changing attitudes and behaviour is not a "quick fix", it is a process that takes time.

In a case study a safety culture assessment mixed methods (Listyowardojo et. al, 2014) was applied for a large international organisation that works within several industries. The systematic approach that was taken in the assessment and the subsequent steps will be outlined (e.g. identification of measures and strategy, implementation, monitoring, adjustment, sustain, and re-assessment). Furthermore the benefits and challenges of the applied method will be discussed and recommendations for improvement and further work will be made.

References

Antonsen, S., Safety culture: theory, method and improvement. 2009: Ashgate Farnham.

Listyowardojo, T.A.L., Stephen; Turk, Eva; Ray-Sannerud, Bobbie; Vallevik, Vibeke; Lyons, Melinda; Pytte, Morten. Mixed methods: Improving assessment of safety culture in healthcare. 2014; Available from: https://www.dnvgl.com/Images/DNVGL%20PosPaper%20Safety%20Culture_tcm8-12633.pdf.

Parker, D., M. Lawrie, and P. Hudson, A framework for understanding the development of organisational safety culture. Safety Science, 2006. 44(6): p. 551-562.

Pidgeon, N. and M. O'Leary, Man-made disasters: why technology and organizations (sometimes) fail. Safety Science, 2000. **34**(1): p. 15-30.

Pidgeon, N.F., Safety culture and risk management in organizations. Journal of cross-cultural psychology, 1991. **22**(1): p. 129-140.

Schein, E.H., Organizational culture and leadership. Vol. 356. 2006: John Wiley & Sons.

B. Organisational capabilities for improved response, recovery and safety

ABSTRACT

This study aims to explore conditions to improve collaborative behaviour between organizations in context of crisis response management. Beginning with an explorative approach, this study first identified challenges arising in inter organizational coollaboration through systematic reviews of international scientific literature and interviews. Further the study identified two factors relevant in context of crisis response management that are possible to be influenced through some kind of intervention. Quantitative studies were designed in controlled experimental settings to investigate the effect of changing those two factors. 111 crisis management professionals in decision making roles belonging to most commonly identified organizations in crisis response were engaged in the experiments, namely the police, fire and rescue services, Swedish Defense Forces and Swedish Civil Contingencies Agency. Experiments were conducted to test the effect of changing the two factors, namely familiarity and expectation of future cooperation on the extent of utilizing resources from other organizations and similarly the extent of contribution of resources to other organizations. Resource sharing or resource pooling, being the most common and necessary feature of inter organizational collaboration, it makes sense that these two aspects of collaboration namely, extent of utlizing resources and extent of contribution of resources when influenced, have the potential to improve collaboration between organizations. Findings of the study indicate that by changing familiarity and expectation of future cooperation the extent of utilizing resources and the extent of contributing resources can be influenced. By increasing familiarity, long term commitments, knowledge on capabilities and equipment of other actors in crisis response, extent of utilization and contrbution of resouces also become higher. In other words, organizations collaborate better between them under conditions of increased familiarity and long term commitments. The study also discusses the premise where these conditions help organizations adapt to changed conditions in crises thereby organize an overall improved response to crises.

WORD COUNT: 302.

TITLE:

Improving Conditions In Inter Organizational Collaboration In Crisis Response Management & Practice.

AUTHOR:

Roshni Pramanik

AFFILIATION:

Division of Risk Management and Societal Safety, Faculty of Engineering, Lund University, Sweden.

LUCRAM: Lund University Centre for Risk Assessment and Management.

Evaluation of road tunnel fire safety and risk

Jonatan Gehandler
SP Technical Research Institute of Sweden
Box 857, SE-501 15 Borås, Sweden
E-mail: jonatan.gehandler@sp.se

The theme of this conference presentation is the evaluation of road tunnel fire safety and risk, taking into consideration both technical and contextual factors. Two common approaches to fire safety design are deterministic and probabilistic design, distinguished by the ethical thought patterns deontology and utilitarianism. Key factors for a road tunnel fire safety decision are identified as follows. Strike a balance between safety, cost and availability. Ensure fair risk and benefit distribution which is an argument for that resources should rather be used above ground on disadvantaged groups such as non-motorized road users. Ensure high perceived safety level so that drivers feel in control, which increase safety and the freedom of movement for tunnel and road users. Aim at vision zero which calls for a probabilistic approach where the utility is maximized on the road network and society at large, in particular for normal sized traffic incidents as they are generally accepted. Take measures to avoid catastrophic fires which speak in favour of a cautionary and deterministic approach.

For most fire scenarios, a uni-directional tunnel with sufficient longitudinal ventilation along the traffic flow, the system will fail safely in the event of fire. From an ethical perspective the residual risk must be judged as acceptable and a deterministic and cautionary approach cannot be legitimate. A probabilistic approach maximizing the utility may be legitimate although there are ethical reasons (fairness) for using resources on non-motorized road users above ground rather than in tunnels. The key ethical factor for a cautionary and deterministic approach to road tunnel fire safety concerns aversion towards catastrophic accidents which mainly can be expected for bi-directional tunnels. For several reasons (freedom of movement, avoidance costs and safety), deterministic and cautionary targets should be set to achieve a high perceived safety level for all road tunnels.

Risk governance of critical infrastructures (challenge 5)

Alexander Cedergren[A], Jonas Johansson[B], Linn Svegrup[A], Henrik Hassel[A] & Björn Arvidsson[A]

[A]*Division of Risk Management and Societal Safety, Lund University, Lund, Sweden*
[B]*Division of Industrial Electrical Engineering and Automation, Lund University, Lund, Sweden*

Lund University Centre for Critical Infrastructure Protection Research (CenCIP)
Lund University Centre for Risk Assessment and Management (LUCRAM)

During the last decades many of our critical infrastructure systems have become more closely connected to each other. While this increased interconnectedness has resulted in greater efficiency, it has also introduced new vulnerabilities. In parallel with this development, the operation and management of many critical infrastructures has become divided between a larger set of stakeholders, resulting in a dispersion of responsibility. In this institutionally fragmented setting, traditional risk management tools are not always suitable to deal with risks in a feasible manner, which gives rise to substantial challenges to efforts aiming at protection of critical infrastructure systems. The presentation outlines and exemplifies a number of key challenges facing risk governance of critical infrastructure systems in settings involving multiple stakeholders (public as well as private) where no single stakeholder has the superior authority or overview to make and implement holistic risk-reducing decisions. These challenges include problems related to stakeholders' diverse framings of risk, communication challenges, problems related to sub-contracting and cross-scale interactions.

C The complex governance of risk

Can prescriptive and performance-based risk management coexist?

Nijs Jan Duijm, DTU Management Engineering, nidu@dtu.dk

Abstract

This presentation deals with the possible conflict between the application of prescriptive standards and regulations and performance-based risk acceptance criteria.

Prescriptive standards and regulation provide instructions how to solve specific engineering problems; based on experience or by applying safety factors, the solution that is based on those standards I implicitly accepted to be "sufficiently safe", or in order words, the residual risk is considered to be negligible.

Performance-based standards and regulations set an explicit risk criterion and leave it to the engineer/designer to demonstrate that the chosen solution meets the criterion.

Performance-based approaches have been promoted over the last decades because they promote and enable innovative solutions. It is the back bone of the European Commission's legislative framework for creating the EU's single market, known as the "New Approach", and recognizable through the well-known CE mark.

However, prescriptive standards are much easier to apply, especially when conventional solutions are appropriate. Many of the European harmonized standards, even under the "New Approach" umbrella, are therefore prescriptive. And this is no problem, as long as there are no conflicts between the to approaches.

However, conflicts may arise, and in this presentation I will give two examples.

The first example deals with the use of a harmonized standard in a situation where the regulator uses an explicit risk acceptance criterion. The second example deals with a situation where European Commission regulation within the same legislation applies prescriptive and performance based criteria.

The first example deals with cooling installations based on ammonia, as used in slaughter houses and diaries. Many of these facilities are close to residential areas for historical reasons, and formerly used CFC as the refrigerant. The Danish authorities, in an attempt to control major hazards in residential areas, extended the "Seveso" rules to cover ammonia facilities containing more than 5 ton of ammonia when less than 200 m apart from residences. The authorities responsible for safety of the residence require demonstration that certain levels of individual (locational) risk are not exceeded. Operators however, refer to the EN 378 series of harmonized standards, and that their installations have been approved by the national occupational safety authorities in accordance to this standard. Three conclusions could be drawn from this exercise:

1. The EN-378 standards do not include an explicit risk criterion, and therefore it cannot be used to a show compliance with a quantified risk criterion;
2. Traditional technical process risk analysis showed that an installation built and operated in accordance to the standards may violate the risk criteria for residential areas , and

3. Standards that are directed to controlling occupational safety (such as EN 378) may not deal with risk to third parties (residents) in an appropriate way, because the residual risk is not negligible for the exposed part of the population as compared to normally applied risk criteria.

The second example deals with the European Commission's regulation on railway safety and common safety methods for risk assessment (CSM-RA). In this regulation the Commission recommends three principles for risk acceptance: "Use of codes of practice"; "use of a reference system"; and "explicit risk estimation and evaluation". In this presentation we will focus on the first and last principle. In general, whenever possible, the operator will try to refer to a code of practice to demonstrate that some hazard is properly controlled. Those codes do not (normally) include an explicit safety level: if built and constructed according to the codes, the residual risk is considered negligible. Only if it is not possible to use an existing code or standard (e.g. because an innovative solution is chosen), use will be made of the principle "explicit risk estimation and evaluation". To apply this principle some explicit risk criterion is required (and the regulator provides some criteria for some type of systems). Now the problem appears especially in cases where the majority of elements in a system can be designed and constructed according to codes of practice, but there are some issues or deviations in the design, that are not covered or fail to comply with those codes. An explicit analysis is than required, and e.g. additional safeguards implemented. However, if the safety-level of the code of practice in itself is not known, what requirements have to be put to the additional safeguards to ensure that the chosen solution is equally safe, or slightly safer, than the "full" implementation of the code?

C The complex governance of risk

Risk, uncertainty and robust decision-making

Åsa Knaggård, Lund University, Sweden

A common approach to deal with decision-making under uncertainty is risk management. I argue that when it comes to climate change adaptation the focus on risk might prevent policy-makers from realizing the complexities involved in decisions. Robust decision-making takes uncertainty as point of departure, rather than as something that can be decreased and managed. By focusing on uncertainties it provides a way to work with them. Decisions taken have to establish policies that will work, almost regardless of the development. Decision-making is then not about finding the best solution, but about finding solutions that are acceptable in a broad range of situations. Robust decision-making in the context of climate change adaptation implies that policy-makers have to see decision-making as an iterative process where a decision needs to be revisited regularly as more knowledge becomes available. It also means that exit-strategies need to be envisioned, in the case of safety margins being too low. Another way to incorporate robustness into policy-making is to focus on multiple and flexible solutions. In the presentation I will discuss how robust decision-making can be used in a context of uncertainty and why policy-makers need to think beyond risk.

D Improving risk management by learning from incidents and practices

Exploring the raison d'etre of an incident reporting system in an elementary school.

Christina Mauléon, PhD Borås University & Gothenburg Research Institute	Maria Spante, PhD University West

The purpose of this paper is to investigate the raison d'étre of the use of an incident reporting system in a Swedish primary school and through the lens of situated risk (Boholm, 2003; 2009) problematize what outcomes such a use may generate in terms of children's safety.

In Swedish schools there exists today, through legislation, a zero tolerance level of both physical and psychological abuse of children and as such are all schools required to act when such incidents occur. The main purpose of this legislation is to maintain children's safety in schools. In order to meet the requirements of taking action many schools have implement incident reporting systems into which they report such incidents and accidents.

However little is known about what consequences the use of such systems have in practice. In our case study we explore how legislation regarding children's safety in schools, is translated into the implementation and use of an incident reporting system in a Swedish primary school and what consequences this has on children's safety. We claim that there exists a need to gain more knowledge about what unintended consequences the use of such systems have on children as we find that in some situations this use may, in practice, be opposed to children's safety.

D Improving risk management by learning from incidents and practices

The implementing problems of theoretical models of risk manegment in urban planning, Stockholm County

Mateusz Sosnowski,
MSc Risk Management and Safety Engineering, BSc Fire Protection Engineering
wroking at County Administrative Board in Stockholm

26 september 2015

Abstract - Oral presentation LUCRAM conference 2015

Dense populated areas in Sweden are facing problems with a scarceness of houses and bigger cities are expanding in a fast pace. In Sweden the municipalities are responsible for the planning and have to consider many aspects, two of these are the risk for peoplet's health and safety and, the risk for accidents. The county administrative board can overrule and cancel a plan if it is not considered to meet the regulation, inter alia, from these aspects. Due to the fast exploitation risk aspects are becoming the new challenge.

The biggest risk factor that is discussed for the moment is the risk for accidents involving transport of dangerous goods or bigger industry plants that inhabit a risk of chemical accidents (Seveso) that could potentially kill people if e.g houses are put to close.

In Sweden the building code is more performance based rather than prescriptive based, this means that itt's not regulated on how to calculate risk levels or how to decide and evaluate if levels are acceptable. There are some models developed to estimate the risk level for individual and societal risk, manily the so-called *VTI method*[1]. These were developed at mid 1990 and were not intended to be used this long and in the way it ended up being used. The same goes for suggestions made on risk criteria by Det Norske Veritas[2]. These criteria were set only as suggestions and never decided on by national agenesis, but are now widely used as *best practice*.

The lack of clear rules on how to calculate risk together with questionable models opens up for a vast diversity on how to calculate and estimate the risk

[1] Väg- och transportforskningsinstitutet, 1994, *Konsekvensanalys av olika olyckscenarier vid transport av farligt gods på väg och järnväg* VTI-rapport 387:1-8

[2] Davidsson Göran, Lindgren Mats, Mett Liane, 1997, *Värdering av risk* FoU rapport, Statens Räddningsverk

levels, resulting in an even bigger variety of results. Everyone is trying to adapt the ingoing parameters and/or data according to the best knowledge found that suits the understanding of the purpose for the analysis. On top of this, there is an obvious bias depending on who is making the analysis or who is commissioning it. For politicians and urban planners that are not risk experts these effects makes it hard to *trust* and implement the results, especially when similar conditions should give the same result.

The questions that need to be answered are;

1. are we using the right measures for risk to evaluate adequacy of urban planning?
2. how should we work for a better understanding of risk aspects for politicians and layman that ultimately decide on how to expand and protect our cities?

The time has come to develop a more suitable way of estimating and evaluation mitigation measures that are more adequate to todayt's knowledge and the same time *user friendly* in a modern flora of regulations and codes.

D Improving risk management by learning from incidents and practices

Failure to learn after accidents – the lamentable situation in Denmark

Frank Huess Hedlund

Environment, Health and Safety, Denmark

Failure to learn after accidents – the lamentable situation in Denmark

Learning from own – and better, other people's – past accidents and misfortune is an ancient accident prevention strategy. The benefits of such learning are obvious. What is not so obvious, however, is how to make this seemingly simple and straightforward idea work in practice.

This presentation presents evidence in support of the view that such learning processes appear to be impeded, dysfunctional or entirely absent in Denmark. Two Danish accident cases in which major learning opportunities were foregone will be presented. The first case relates to a wood pellet facility, a sustainable renewable energy project, which experienced a devastating dust explosion. The accident was insufficiently investigated and root cause issues relating to principles of inherent safety were not identified. As a result, a repeat explosion took place eight years later. The case offers a text book example of the truism that if accidents are not investigated, and root causes not identified, accidents recur.

The second case relates to power plant which experienced a serious leak of ammonia that endangered employees and the nearby community. The facility had a large storage tank of anhydrous ammonia - a liquefied toxic gas stored under pressure. Ammonia was present because of environmental concerns: flue gas NO_X reduction by means of Selective Catalytic Reduction (SCR) technology requires injection of ammonia into the smokestack. Principles of inherent safety were ignored, presumably because of overly optimistic assessments of the ability to control risks with add-on safety systems. Interestingly, the accidental release took place when a preventive test of the safety systems - arising out of genuine concerns for high levels of safety - went wrong. In fact, the safety systems themselves caused the accident.

In both cases, significant sector-relevant learning opportunities were foregone. Indeed, the cases have slipped into oblivion. There is no useful information in open sources that could potentially prevent repeat occurrences elsewhere. Learning is absent.

How to Make the Right Security Decision Concerning Staff Members Abroad in a Upcoming Situation

- a case study of "Quality and Tabloid" Media's Risk Communication

Per Gustafson
Department of Design Science
Lund University, Lund, SWEDEN
per.gustafson@bygg.lu.se

ABSTRACT

23 November 2010. North Korea attacks its southern neighbour with grenades and kills four soldiers. In the media, this was the start of speculations about an upcoming war and also the start of making the right security decisions concerning staff members abroad.

Managers and their security advisers need to be informed with the right facts, to make the right decisions concerning staff members abroad. The media's depiction of conflicts has a great impact on security decisions and the measures that must be implemented in organizations with many employees on the move abroad in terms of their repatriation. In the initial stage, the media's representation of the facts may be all that is available. Consequently, a great deal of pre-understanding is needed to interpret media messages with caution. A case study is presented of the media coverage of this incident. It shows how some media exhaust all possibilities in their efforts to "get the scoop". This risk communication generated by the media is described in the framework of Breck's (2002) Information Model and Arena Model.

Different types of media will handle the story differently. Compared with an official version, the story in the Arena Model will appear enormous, but in the Information Model ignorable.

According to the Information Model, the media write in a mature and restrained manner in which the information must contain facts and an accurate and objective description of the risks. But many newspapers are more interested in writing in the Arena Model style. The reason can be the daily need to hunt for news, which is a must for a media that bases its production on the sale of single copies. This makes it difficult to rely on the content when it comes to making the right security decision.

REFERENCES

Allan, Stuart (2002) *Media, Risk and Science*, Open University Press, Buckingham, UK.

Breck, Thomas (2002) *Riskkommunikation - dialog om det osäkra*, Natur och Kultur, Stockholm, Sweden.

Hultén, Lars J. (1993) *Journalistikens villkor*, Natur och Kultur, Stockholm, Sweden.

Jarlbro, Gunilla (KBM:s temaserie, 2004:1) *Krisjournalistik eller journalistik i kris? En forskningsöversikt om medier, risker och kriser*, http://www.msb.se

Linell, Per (1987) *Människans språk*, Liber, Malmö, Sweden.

E. Framing risk in theory and practise

Connecting dots - in pursuit of a holistic risk picture

Abstract: Contemporary disaster risk management systems are focused on all-hazard and whole-of-society approaches. This requires an exchange of risk information between stakeholders across administrative and sectorial borders. Exchanging information is not enough however. Holistic decision-making requires an integration of the assembled data, where the possibility of synthesizing the information depends on the homogeneity and comprehensiveness of the data itself.

This presentation covers a recently concluded study concerning disparities with which Swedish authorities communicate risk information to each other. The study is based on a content analysis of more than 120 reports from risk and vulnerability assessments of authorities at all administrative levels as well as 45 interviews with officials who are involved in the realization of such assessments. The study shows that the authorities vary greatly regarding how similar terms and information is interpreted, coded and categorized. We argue that this has an extremely detrimental effect on the ability to integrate risk information, resulting in less useful bases for decisions and, thus, in a less efficient disaster risk management system. Nevertheless, we see signs of reduced discrepancies connected to recent regulatory changes.

In addition, the presentation renders account of two ongoing studies; one of which seeks to establish which type of risk descriptions that are most conducive for the possibility of synthesizing information. The second study aims at mapping barriers – and ways to overcome these – connected with each of the steps involved in synthesizing risk information (i.e. identifying, obtaining, analyzing and synthesizing risk information as well as communicating the results and providing feedback to external stakeholders). The presenter reveals some preliminary findings of these studies and looks forward to share ideas with the participants at the conference.

E. Framing risk in theory and practise

Risk association: Towards a theoretically informed framework for the analysis of risk in discourse

Max Boholm

Gothenburg Research Institute (GRI), University of Gothenburg

PO. Box 603; SE-405 30 Göteborg, Sweden; Phone: +4631 786 5624; e-mail: max.boholm@gu.se

The presentation addresses a fundamental feature of risk discourse, namely risk association, which is defined as the process whereby some agent establishes a connection between something *x* and the notion of risk. In addition, risk association can be defined as the result of such a process, i.e. an established connection between *x* and risk. A special case of risk association is when *x* is linked to harmful properties and thus is represented *as a risk*. Although fundamental to any analysis of socio-cognitive attention to risks, the process of risk association is often taken for granted in risk research. A layered model of risk association is presented taking linguistic practices, i.e. the use of words, as point of departure. Accordingly, there are central and more peripheral means of risk associations. Central means include the morpheme 'risk'. More peripheral levels of risk association are close synonyms and antonyms of risk (e.g., 'hazard', 'danger', 'safety' and 'security'), and other related words (e.g., 'crisis', 'protection', and 'threat'). For illustration, the model is applied on an empirical example: instructions of Swedish government agencies. The example clearly shows how the exact vocabulary considered for operationalization in analysis has important consequences for which conclusions that follow with respect to the extent that government agencies are associated with risk.

Keywords: semantic field, the concept of risk, government agency, risk communication

E. Framing risk in theory and practise

Abstract for "The Future of Risk Analysis in the Nordic Countries"

Stefan Linde

Luleå University of Technology

The influence of political polarization on public risk perceptions and support for climate mitigation policy

Over the past couple of decades, an increasing amount of research has shown how risk perceptions are central to peoples' willingness to engage in the mitigation of climate change. People that perceive climate change as posing a high degree of risk are more likely to support government climate mitigation policies, and to engage in actions with the same end, even if it means taking on personal costs. Pubic risk perceptions are as such instrumental to the possibilities of effectively implementing climate mitigation policies. But like any individual attitude, public risk perceptions are not only based in factual knowledge or personal experience, but is also formed by the information retrieved from the surrounding political context. Information from political parties, NGO:s, lobby groups, media, and other sources help individuals structure, interpret, and put issues into a context. Given that the effects of climate change, for many, still are both temporally and spatially distant, such information should be especially important to public attitudes towards climate change. Furthermore, as climate change continues to be a highly politicized issue in many contexts, partisan communication could prove even more decisive. In this presentation I will discuss the impacts of political polarization on public risk perceptions and how this relationship in turn shapes public willingness to support climate mitigation policies. I will present results from a comparative public opinion survey (N=8514) collected in two Nordic countries (Sweden and Norway) and two countries in Oceania (Australia and New Zealand) during spring 2015.

Key words: Risk perceptions, political polarization, policy support, climate change

E. Framing risk in theory and practise

How can the usefulness of capability assessments be improved?

Authors: Hanna Lindbom, Henrik Tehler, Tove Frykmer, Christian Uhr

Abstract

Capability assessments are used in disaster risk management to facilitate decision-making regarding capability increasing measures. Recent studies suggest that a) the conceptual and the methodological basis for capability assessments are unclear, b) the practical usefulness of the assessments as a basis for decision making have also been questioned, and c) two important factors that might determine the usefulness of a capability assessment are (1) the extent to which they include descriptions of the *resources* available for dealing with a disruptive events, and (2) the extent to which they include descriptions of how well the actor in question is judged to be *able to accomplish a specific task* in the case of a disruptive event. In an experimental study we investigated the extent to which these two factors influence the perceived usefulness for decision-making of hypothetical capability assessments.

The experiment was conducted using professional rescue services personnel, who in their work make decisions about if and how capability should be increased. The scenario used to construct the hypothetical capability assessments was a forest fire. We employed a fully crossed, 2 RESOURCES (yes/no) x 2 TASK (yes/no), between-subject design leading to four experimental conditions. The most limited in terms of information available was a capability assessment containing no information about available resources or judgments concerning the rescue services ability to extinguish the fire. The most informative condition involved both sources of information.

The results show that both factors contributed to the perceived usefulness of the capability assessments. Many capability assessments performed in Sweden often include limited information related to the two factors. Therefore, to improve the usefulness of capability assessments we argue that it is reasonable to increase the amount of information concerning available resources and judgments regarding the extent to which important tasks (e.g. evacuation, rescue operations) can be completed.

F. Managing variation in quality of evidence

Quality of evidence in GRADE

Sten Anttila (www.sbu.se ; www.vbe.lu.se) & Niklas Vareman (www.vbe.lu.se)

Oral presentation at The Future of Risk Analysis in the Nordic Countries

An integral part of a risk assessment is, quite naturally, an analysis of the extent and quality of evidence on which the assessment will rest. Within the evidence-based movement there are several frameworks for rating evidence. One of these is GRADE (Grading of Recommendations Assessment, Development, and Evaluation), which is a framework for rating quality of evidence and strength of recommendations in medicine. The ultimate aim of GRADE is to provide standardized clinical practice guidelines that address alternative management options. Many important organizations in healthcare from all over the world participate in the GRADE network, including WHO, Cochrane, AHRQ, and NICE. In an effort to ensure that GRADE is not compromised a number of guideline articles have been published by the GRADE working group in the *Journal of Clinical Epidemiology* (JCE).

According to GRADE quality of evidence "…reflect the extent of our confidence that the estimates of the effect are correct" and the estimate is correct to the degree in which the "…true effect lies close to that of the estimated effect".

Randomized controlled trials (RCTs) are initially assumed to have the highest level of evidence, while non-randomized studies (NRS) are taken to have a lower level. Subsequently the initial rating is changed for any of eight specific reasons. Five reasons are given for rating down: (1) study limitations, (2) inconsistency, (3) indirectness, (4) imprecision, or (5) publication bias. There are three reasons for rating up primarily in connection with NRS: (1) the magnitude of effect, (2) the dose-response gradient, or (3) the fact that all plausible confounding would either reduce the demonstrated effect or increase the effect if no effect was observed. The final quality rating for each outcome is high, moderate, low, or very low.

The quality of evidence is affected by imprecision when (1) retrospective statistical power is not sufficient (unless the sample size is very large), or when (2) a 95% confidence interval covers "no effect" or some other critical margins such as "non-inferiority margin". This understanding of imprecision entails awkward possibilities. It is possible that an unbiased estimate $\hat{\theta}_1$ can be considered to be more "imprecise" than another unbiased estimate $\hat{\theta}_2$ even when $\hat{\theta}_1$ is more efficient than $\hat{\theta}_2$. This is the case when $\hat{\theta}_1$ covers "no effect" and/or some "critical margins" while $\hat{\theta}_2$ do not. The result based on $\hat{\theta}_1$ may then get lower quality rate than the result based on the less efficient $\hat{\theta}_2$.

The *purpose* of our presentations is to demonstrate this awkward possibility and discuss some ways to resolve the problem. One way is to define quality of evidence as the extent in which a result is "conclusive" and rely of the approach offered within the framework of CONSORT-statement regarding non-inferiority. We will exemplify our discussion with folic acid and mandatory fortification.

F. Managing variation in quality of evidence

THE CHALLENGE OF ASSESSING RISK FOR POLLINATORS OF PESTICIDE EXPOSURE IN REAL LANDSCAPES

Maj Rundlöf[1], *Lina Herbertsson*[2] *& Henrik G. Smith*[1,2]

[1] *Lund University, Department of Biology*
[2] *Lund University, Centre for Environmental and Climate Research*

Recent declines of pollinators have been suggested to be at least partly linked to the use of pesticides in agriculture. Risk-assessment of pesticides normally involve laboratory studies, which for pollinators mostly have been carried out on managed honey bees. This approach may not capture sublethal effects from pesticides, affecting e.g. foraging behaviour and thus fitness. In a unique randomised, controlled landscape scale study, we tested how field exposure to the neonicotinoid clothianidin affected bee fitness. 16 oilseed rape fields were randomly assigned as clothianidin treated or control field. By each field we placed six equally sized honey bee (*Apis mellifera*) colonies, six commercially reared bumble bee (*Bombus terrestris*) colonies and three nest boxes with a total of 27 pupae of the solitary bee *Osmia bicornis*. Among other things, we monitored colony development for honey bees and bumble bees, wild bee densities in fields and surrounding field borders and reproduction of bumble bees and solitary bees. The effects on bee fitness differed strongly among the three study species. Whereas bumble bees and solitary bees were strongly affected we found no evidence for similar effects on honey bees. The study reveals how realistic exposure to clothianidin via a treated crop can affect bees that are foraging in agricultural landscapes. In our study we demonstrate that it is possible and important to provide high quality evidence to support environmental risk assessment of pesticide effects on wild organisms in real landscapes.

F. Managing variation in quality of evidence

What do we need to be confident?

A comparison between the confidence concepts used by the IPCC and by GRADE.

Niklas Vareman
Post doc.
Dep. of Medical Ethics
Lund University

Abstract:

What confidence to put in a proposition regarding risks depends on the amount, quality and precision of relevant evidence. This is implicit in risk assessment and explicitly forms the basis of evidence-based decision making. One may ask, though, how appraisal of evidence generates confidence, and if appraisal of evidence is all it takes to decide on what confidence to have in a proposition, or event.
I will mention two different views of what constitutes confidence: the one used by the GRADE-framework for evidence evaluation and the one used by the IPCC in their reports on findings related to climate change. The IPCC has a two-dimensional view of confidence: it is in part based on evidence but in part also based on agreement. In this presentation I will analyse this agreement part of confidence and discuss of what use it could, if any, be to a system such as GRADE.

F. Managing variation in quality of evidence

Dealing with alien crayfish under sparse information and ambiguity

Ullrika Sahlin and Matthias C. M. Troffaes

October 5, 2015

Abstract

The northernmost discovery of Marmorkrebs in the world, and the first one in natural waters in Scandinavia, were made in November 2012 in the river Märstaån in Sweden (Bohman and Edsman, 2013). Marmorkreb is an unwanted alien species in Sweden. It is forbidden to import, move and hold Marmorkrebs in Sweden, and there were concerns that Marmokrebs could spread diseases into the third largest lake in Sweden. To avoid future impacts it was necessary to respond quickly and take appropriate actions to control or eradicate the alien crayfish. A review (Bohman and Edsman, 2013) identified a number of actions: inform only, mechanical removal, add poison, or increase pH. Every action comes with attributes such as cost, efficiency, and environmental impact.

However, at the time of decision, little was known about the status of the crayfish. Additionally, decision makers were not even certain about their preferences between different environmental outcomes. Decision problems facing such severe uncertainty are common in risk analysis, and the need to deal with this alien crayfish serves as an example of decision making under weak knowledge.

In the paper, we investigate the use of imprecise probabilities to deal with sparse information and value ambiguity. More specifically, the risk analysis is based on a Bayesian model designed to test whether the alien crayfish is present or not, with a set of priors to reflect severe epistemic uncertainty. Next, we construct a multi-attribute utility function where each attribute is weighed according to the decision maker's values. Ambiguity is reflected by using intervals on the weights. Finally, we integrate everything into a formal robust Bayesian decision analysis, where the decision maker needs to act upon the lower and upper expected utility for each action.

Bohman, P. and Edsman, L. (2013). Marmorkräftan i Märstaån. Riskanalys och åtgärdsförslag. (English title: Marmorkrebs in River Märstaån. Risk assessment and action proposals.) Aqua reports 2013:17. Sveriges lantbruksuniversitet, Drottningholm. 110 s.

G Climate change adaptation

The EU Floods Directive in Sweden: keys for successful implementation in terms of sustainable flood risk management procedures

This presentation concerns the implementation of the EU Floods Directive in Sweden. The question here centres on the possibilities promoted by the directive for sustainable flood risk management, with an emphasis on integrated and participatory management forms. Key persons at national, super-regional, regional and local scales are interviewed, using a set of criteria for sustainable river basin management as a theoretical framework. The study shows that work in this area is guided by a wide array of values, and that the involved experts provide a broad knowledge basis for this work. The need for better coordination between authorities, pieces of legislation and policy fields however remains critical while the merits of participatory planning approaches are not yet sufficiently utilised. One of the primary tasks here is to develop a shared understanding of the formal context and roles of the process while also developing forms for effective collaboration both within the new administration and between the administration and other key actors, most importantly the municipalities. The case of Sweden can provide useful insights into this process for other member states.

Author: Beatrice Hedelin, Centre of Climate and Safety, Karlstad University, Sweden

G Climate change adaptation

Addressing Climate Change in Coastal Areas in South Sweden - Risk Perception, Knowledge, and Coastal Management in Ystad Municipality

Corresponding author: Andrea Morf, School of Global Studies, University of Gothenburg, (andrea.morf@globalstudies.gu.se)
Co-author: Madeleine Prutzer, School of Global Studies, University of Gothenburg, (madeleine.prutzer@globalstudies.gu.se)

Keywords:
Climate change, natural hazards, risk perception, knowledge, risk management, municipal coastal planning

Abstract:
This paper analyses public servants' and politicians' perceptions of problems, risks and knowledge on climate change (CC) connected with natural hazards on the coast of Ystad municipality in the context of municipal planning and management of the seashore. Ystad and the region of Scania in southern Sweden are already today highly affected by climate and weather related natural hazards. The sandy seashore of Ystad is erosion prone and has since decades been experimentation site for various types of shoreline management. The shoreline is highly attractive for recreation, featuring camping areas, summer cottages, forest, conservation areas, but also an international harbour and the expanding town of Ystad with its medieval centre and high cultural values. Behind the shoreline lies Sweden's most fertile agricultural land and important drinking water resources. Public, administrative and political awareness of coastal erosion as climate related hazard is relatively high in Scania. Moreover, there are further, so far less "prominent" problems related to weather and water. What to do about them can be controversial. Comparing the views of municipal and regional level decision makers on climate related risks and knowledge about them, we have found interesting gaps of understanding and interaction in relation to risk as concept and CC-related problems. This includes both practice related knowledge gaps, discrepancies of views between sectors and levels, and gaps in organisation structures and responsibilities. With our study we want to contribute to the broader debate on Swedish management of CC and to scientific discourses on risk perception and management.

G Climate change adaptation

Proactive flood response using complementary early warning information

Erik Persson

Karlstad University, Centre for Climate and Safety, Karlstad, Sweden.
E-mail: erik.persson@kau.se

This presentation is based on a qualitative comparative case study about early warnings for floods in a Swedish context. The study is in the final stages towards being submitted.

In Sweden, 18 municipalities have been assessed by the Swedish Civil Contingencies Agency to have potential significant flood risk, as per the EU Directive 2007/60/EC on the assessment and management of flood risks. The aim of the study was to investigate how these municipalities gather and use early warning information from official (SMHI) and unofficial sources to facilitate decision-making for proactive flood response. By comparing the municipalities, the potential of a complementary set of warning sources, as well as which factors are necessary for utilisation, were investigated.

The study showed that receiving warning information from a complementary set of sources can give the municipalities more perspectives and therefore a more complete picture of a situation; more time to prepare; better opportunities to assess probabilities; information independency; and a better opportunity to act appropriately, in proportion to what the flood risk demands. At the same time it is challenging, as it demands a deeper analysis, more communication within the organisation as well as with the different sources and other organisations.

The study also showed that municipalities need to have financial and organisational resources and know-how in order to enable two-way communication within the official warning system, which is often needed in order to tap into the full potential of the system. Gaining access to warning information from unofficial sources depends even more on resources, personal relationships and informal networks. Such resources are not evenly distributed among municipalities, and a lack of systematisation of access to warning information stands in the way of the flood response potential.

G Climate change adaptation

Understanding risk for effective risk communication

Kristina Blennow[1], Johannes Persson[2], Annika Wallin[3], Niklas Vareman[4], Erik Persson[1,5]

1. Dept. of Landscape Architecture, Planning and Management, Swedish University of Agricultural Sciences, Alnarp
2. Dept. of Philosophy, Lund University, Sweden
3. Cognitive Science, Lund University, Sweden
4. Medical Ethics, Lund University
5. Dept. of Philosophy, Umeå University

Adaptation decisions and spatial planning practices, and the information they are based on, crucially determine benefits and risks to the society (e.g. Blennow and Persson 2013). Studies have shown perceptions of risk to be decisive in responding to climate change (e.g. Blennow and Persson 2009; Blennow et al. 2012). How then to communicate climate change risk? Based on recent results of studies on forest-owner adaptation to climate change across Europe (Blennow et al. 2012), an approach to risk communication that is effective as well as ethically sound (Blennow et al. 2014) is presented and exemplified. Knowledge of heuristics and mutual information on both beliefs and desires are important in the proposed risk communication approach. Such knowledge provides an opportunity for relevant information exchange, so that gaps in personal knowledge maps (Persson 2004) can be filled in and effective risk communication can be promoted.

References

Blennow K and Persson E (2013) Risk Management in Forestry and Societal Impacts. In B Gardiner, A Schuck, … K Blennow & B Nicoll (Eds.) Living with Storm Damage to Forests. What Science Can Tell Us 3, European Forest Institute. pp. 72-79.

Blennow K, Persson J (2009) Climate change: motivation for taking measure to adapt. Global Environmental Change, 19:100–104.

Blennow K, Persson J, Tomé M, Hanewinkel M (2012) Climate change: believing and seeing implies adapting. PLOS ONE, 7(11):e50181.

Blennow K, Persson J, Wallin A, Vareman N, Persson E (2014) Understanding risk in forest ecosystem services: implications for effective risk management, communication and planning. Forestry, 87:219-228.

Persson J (2004) Riskkommunikation och tillit. In Miljö och hållbar utveckling: samhällsvetenskapliga perspektiv från en lundahorisont. Wickenberg P et al. (Eds.), Studentlitt., Lund, pp.65–84.

H Public health and risk perception

SRA Nordic Chapter, Lund, November 2015

Title: Drinking water risk management. Municipal challenges: a Swedish case study

Authors:

Åsa Boholm, GRi & School of Global Studies, University of Gothenburg

Madeleine Prutzer, School of Global Studies, University of Gothenburg

Anna Bendz, Department of Political Science, University of Gothenburg

Abstract

In Sweden, the provision of safe drinking water and the control of its quality is a responsibility of local municipal authorities. According to the constitution, municipalities have considerable autonomy regarding the organization of provisioning of services and public functions, often regulated by national legislation.

Located in western Sweden, Göta Älv is the drinking water supply for 700.000 people in several municipalities. The study focuses on how politicians and public officials in these municipalities perceive risks to drinking water in a scenario of climate change. Based on interviews, the study identifies challenges to future provisioning of safe drinking water recognized by municipal actors. Salient risk issues include effects of extreme weather events (especially flooding); inadequate capacity to treat waste water; contamination of the water catchment (chemicals, virus, bacteria, microorganisms); technical shortcomings in the treatment processes at the water works; and infrastructure failure (e.g. by pipelines in a state of disrepair).

Another risk is political. It relates not to climatological, biological and technical dimensions but to the inherent institutional logic of politics, where politicians compete for election to represent their voters, and fulfill the "will of the people". Citizens are mainly understood both to have a low level of knowledge about how drinking water is produced and distributed and to take for granted that the municipality delivers this service at a relative low cost. Political actions to discuss raised fees for drinking water (to make investments to secure better management) have hard to win support. Political prioritizations within the municipality tend to favour investment in areas generally understood to be more important (child care, schools, elderly care, roads etc). This case therefore illustrates a non-typical case of risk vs. risk trade-of between political risk (loss of public support and re-election) and health risk due to failure of drinking water service production.

H Public health and risk perception

Risk Perceptions, Protective Behaviour and Tick-borne Diseases

Daniel Slunge and Anders Boman*

Abstract

With climate change, the regions where ticks can be found, and consequently where there is a risk of contracting tick-borne diseases such as Lyme Borreliosis (LB) and tick-borne encephalitis (TBE), is growing. Based on survey responses from 1500 randomly selected respondents in Sweden we analyse risk perceptions and associated protective behaviour.

We analyse differences in risk perceptions through a choice experiment where respondents choose a site for outdoor recreation based on varying levels of ticks, LB and TBE as well as recreational qualities and distance to the sites. We also solicit information about the perceived probability and severity of tick-bites and different types of protective behaviour.

We find that tick-bites are perceived as a serious health risk by as much as 40 percent of the respondents, and a more serious health risk than for example traffic accidents. A perception that one single tick-bite is serious, is negatively correlated with actual exposure to ticks, while the opposite is true for a perception that tick-bites constitute a serious life-time health risk. Protective behaviour is driven more by the perceived severity than by the perceived probability of getting tick bites or tick-borne diseases. A larger degree of outdoor behaviour, exposure to ticks and perceived effectiveness of wearing protective clothing or checking your body for ticks are positively associated with protective behaviour.

Tentative policy implications for health agencies wanting to increase protective behaviour include actively informing people of the benefits of the different protective measures, targeting information to certain groups at risk and sharing stories from real cases in social media etc in order to stimulate a social learning process. This may be especially important in new risk areas.

Key words: risk perception, protective behaviour, ticks, tick borne disease, Lyme Borreliosis, TBE

---

* Department of Economics, University of Gothenburg, Vasagatan 1, S-405 30 Göteborg, Sweden. Tel:+4631 786 92 05. Corresponding author: Daniel Slunge, daniel.slunge@economics.gu.se

Linking land use in agricultural landscapes to Lyme borreliosis infection risk and underlying host-parasite networks

Dagmar Clough

Agri-environmental measures such as the provision of perennial elements in agricultural landscapes have positive effects on ecosystem services and farmland biodiversity, including small mammal densities. Small mammals are the most important reservoir hosts for Borrelia infection, which causes Lyme borreliosis (LB) in humans. LB transmits to humans through the bite of an infected tick. Its incidence in Europe is increasing. First empirical evidence suggests that anthropogenic land-use change can influence LB risk by affecting the diversity and density of vectors, including both small mammal reservoir hosts and non-competent hosts such as deer. Although theory suggests that wildlife biodiversity and disease infection risk are negatively associated, the mechanisms linking land-use at local and landscape scale and LB risk are poorly known. In this presentation, I will discuss the effect of agri-environment measures on LB infection risk across local and landscape scales, which will help to understand underlying ecological processes. Based on empirical data we are planning to build a predictive process-based model and map LB risk across landscapes of different complexities, providing an important tool for stakeholders to manage disease risk.

H Public health and risk perception

The Effects of Precautionary Messages about Electromagnetic Fields from Mobile Phones and Base Stations revisited: The Role of Recipient Characteristics

Abstract for the 1st conference of the Nordic Chapter of the Society for Risk Analysis - Europe.

Submitted by
Christoph Boehmert, Department of Science Communication, Karlsruhe Institute of Technology, Germany and School of Psychology, University of Wollongong, Australia
Peter M. Wiedemann, University of Wollongong, Australia
Jonathan Pye, University of Sydney and University of Wollongong, Australia
Rodney J. Croft, Australian Centre for Electromagnetic Bioeffects Research, University of Wollongong, Australia

ABSTRACT

While it still remains unclear whether radiofrequency electromagnetic fields (RF-EMFs) emitted by mobile phones and mobile phone base stations pose a risk at all, some national government authorities (e.g. in Australia and Germany) continue to communicate precautionary measures regarding RF-EMFs. Some scholars have argued that in this case, the dissemination of precautionary messages to the public would only induce fears and anxieties about a negligible risk (Burgess, 2004; Sunstein, 2005). Empirically, precautionary messages have been shown to increase recipients‘ threat perceptions about RF-EMFs in mobile communication (see e.g. Wiedemann et al. 2013). The current study analysed variables on the side of message recipients that influence this effect. The individual difference variables of interest were gender, trait anxiety, personal need for structure and personal fear of invalidity. Furthermore, the study determined whether the increased threat perception is accompanied by an increase in anxiety. 298 university students answered a survey after reading either a basic text about RF-EMFs or a text including precautionary information. Linear multiple regression with interactions analyses showed that the effect of precautionary messages differed for people with different levels of trait anxiety. How trait anxiety was related to the effect of precautionary messages in turn depended on participants‘ gender. Personal need for structure and personal fear of invalidity were mostly unrelated to the effect of precautionary messages. Regarding participants anxiety, we found

no difference in state anxiety scores between those participants who received precautionary information and those who did not. The findings show that the effects of precautionary messages on threat perception depend on individual difference variables such as recipients‘ trait anxiety and gender. Also, the fact that precautionary communication did not result in heightened state anxiety challenges the assumption that precautionary messages induce fear or anxiety.

LITERATURE

Burgess A. Cellular Phones, Public Fears and a Culture of Precaution. Cambridge, United Kingdom: Cambridge University Press; 2004.

Sunstein CR. Laws of Fear: Beyond the Precautionary Principle. Cambridge, United Kingdom: Cambridge University Press; 2005.

Wiedemann PM, Schuetz H, Boerner F, Clauberg M, Croft R, Shukla R, et al. When precaution creates misunderstandings: the unintended effects of precautionary information on perceived risks, the EMF case. Risk Analysis, 2013; 33(10):1788-801.

I. Risk and responsibility

Title: Responsibilisation or empowerment: Reflections on the notion of resilience

Johan Bergström
Division for Risk Management and Societal Safety
Lund University
Johan.Bergstrom@risk.lth.se

Submitted for presentation at the SRA Nordic chapter conference 2015

Abstract

More and more aspects of social (and societal) life are becoming part of a safety and security discourse. This trend, sometimes called securitisation, has led governments across the world to redefine the relationships (and responsibilities) of risk management efforts at different societal levels. An increasing number of appeals to the local level (individual, household or local network), to build a preparedness for the unexpected are made. The Swedish Civil Contingencies Agency has contributed to this trend through the webpage 'your safety' (dinsakerhet.se), the podcast 'if the crisis strikes' (*om krisen kommer*) and recently the city of Gothenburg launched its campaign '72 hours' letting the people of Gothenburg now that they are supposed to be self-sustained for 72 hours following a crisis situation.

The presentation will report from a postdoctoral research project in which the starting point of analysis was the question why the notion of resilience, over not more than 15 years, seems to have become such an important object of knowledge in the wider discourse of societal safety and security. As it seems the notion of resilience offers an emphasis on local level participation in a world too complex for any macro cognition to ever grasp (and definitely not control) the entire risk scenario-space that it faces. The notion of resilience has thereby legitimised this decentralisation of responsibility for public safety and security down to the level of the local network and/or even individual household.

Whether this emphasis on decentralised risk management is seen as constructive (then typically labelled 'empowerment') or destructive (then typically labelled 'responsibilisation') is ultimately a political statement. The notion of resilience satisfies a political need, which is one of the most important conditions of possibility explaining why it has been introduced as an object of knowledge in the wider discourse of societal safety and security.

I. Risk and responsibility

Abstract for the Nordic Risk Conference, 16-17 November 2015, Lund.

Oral presentation

Risk and Resilience

Marja Ylönen, Technical research Centre of Finland (VTT) Marja.ylonen@vtt.fi

Technical and social risk and resilience approaches seem to live their own lives even though there have been attempts to get them to complement each other (Renn 2008; Löstedt and Östberg 2009; Aven and Renn 2010). Endeavors to integrate technical and social aspects of risk may face practical problems. Yet, in order to maintain a fruitful dialogue between the technical and social risk fields, some basic understanding of what is going on in each other's fields is required. If scholars are aware about developments in different risk domains, better chances to dialogue, reflections and new insights into risks and resilience emerge.

This paper is explorative and deals with the originally non-sociological concepts - risk and resilience – which have become part of the social science's terminology. In the paper the recent developments of both concepts in sociological and non-sociological fields, such as technical risk domain and resilience engineering, are charted. The aim of the paper is to reflect upon whether and how the new developments in resilience engineering (such as focus on anticipation, socio-technical systems), technical risk domain (focus on uncertainties and endeavours to see beyond the probabilities) or social sciences (focus on governance and ethical and epistemological questions) could enhance fruitful dialogue between these otherwise relatively separated fields. Are there possibilities for fruitful cross-fertilization between social sciences and other disciplines as regards risk and resilience? What could a fruitful cross-fertilization entail? Or are these domains so different from each other in terms of ontology and epistemology that it is impossible to find bridges between them?

I. Risk and responsibility

Conference Abstract for The Future of Risk Analysis in the Nordic Countries (max 300 words)

Author: Ebba Brink, PhD student at Lund University Centre for Sustainability Studies (LUCSUS)
Desired form of presentation: Oral + power point presentation
Title of presentation: Towards collaborative governance arrangements for climate change adaptation: Tracing citizen–municipality interactions

Climate change poses a serious challenge to sustainable urban development and requires comprehensive responses. It is increasingly clear that, even with the most rigorous mitigation efforts, adaptation to new climatic conditions is unavoidable. Considering the urgency of the issue, scholars now argue for a shift from generating more research on sustainability *problems*(including risk and vulnerability) to focusing on potential *solutions*, including the actors and relations that make up the solution space.

Municipalities are key actors in climate change adaptation, for instance due to their responsibility for land-use planning and provision of critical societal services. Citizens' behaviour and adaptation efforts before, during and after extreme weather events greatly affect their own and others' safety. However, focus on individuals' environmental behaviour has been criticised for obscuring governments' role in structuring options and possibilities. Overall, the interaction between municipalities and citizens regarding adapting to climate change in Western societies remains largely unexplored.

I will present preliminary findings from research exploring the conditions for more collaborative arrangements for climate change adaptation. In particular, I identify and examine adaptation-related citizen–municipality interactions in three south-Swedish municipalities that are advanced in environmental policy and have been affected by several high-profile weather events in recent years: Malmö, Helsingborg and Lomma. I conduct semi-structured interviews with municipal staff and citizens in key roles. The research addresses three overarching questions: the division of responsibility between citizens and municipalities, the contextual characteristics of the identified 'adaptation interactions', and the outcome of the interactions as regards climate change adaptation.

Besides climate change adaptation, I draw from theory on collaborative governance, which helps to conceptualise the process of the 'adaptation interactions' as well as how related learning can filter back into municipal organisations.

I. Risk and responsibility

Citizen valuations for better risk decisions

Abstract

Authors:

Erik Persson[1,2], Dario Cianciarulo[1], Kristina Blennow[1]

[1]Swedish University of Agricultural Sciences
Department of Landscape Architecture, Planning and Management
PO Box 58
230 53 Alnarp
Sweden

[2]Umeå University
Department of Historical, Philosophical and Religious studies
901 87 Umeå
Sweden

Scandinavian municipalities are to a varying extent working on plans for adapting society to societal risks imposed by climate change. In order for the adaptation to be successful, the valuations of the inhabitants must be considered by the planners. A more thorough understanding of the valuations of the inhabitants of affected areas is crucial both for understanding how climate change will affect the overall risk picture and for taking the proper adaptation measures. We will present the results of a pilot study were we aim to find out not just which places are most valued by the inhabitants but also how and why they value them. By using a special questionnaire structure, constructed for this particular task, we have surveyed the valuations relating to societal risks imposed by climate change among inhabitants in three municipalities in south eastern Scania (Malmö, Burlöv and Lomma).

J Quantifying risk

Tonje Grahn, Karlstad University, Sweden

Abstract (max 300 words)

What is the risk of dying when exposed to a landslide?

Background:

Landslides can cause loss of lives. Irreversible consequences due to low frequency events need to be included in risk assessments and economic analysis. The objective of this study is to derive a damage function for the risk of loss of life due to landslides and to make recommendations on how to implement this function in risk assessments and economic analysis.

Methods:

The study uses historical data on the number of lives lost due to 72 different landslides in the two Nordic countries, Norway (57) and Sweden (15). Statistical simulations are used to fit the most suitable damage function.

Results:

The number of fatalities per landslide ranges from 0-116. Number of exposed humans ranges from 0-375. In 73 percent of the analysed landslides there were no fatalities. A zero inflated negative binominal distribution captures the effect of the many zero-fatality events as well as increases inhuman vulnerability related to the size of the exposed population. Since number of fatalities is a non-linear function, this indicates that human vulnerability at individual level, is higher when many people are exposed compared to an event when fewer people are exposed.

Conclusion:

At present time, the most frequently applied approach for including loss of lives in risk assessments is to use an average factor for vulnerability. Our study implies that this approach overestimates the number of deceased due to landslides when the number of exposed individuals are lower (15-200), but underestimates death risk when number of exposed individuals are higher (>200). A more accurate approach would be to use the derived damage function, which gives different rates depending on size of the exposed. To include loss of statistical lives in economic analysis the damage function can be combined with a monetary value of statistical life.

J Quantifying risk

Managing soil natural capital: An effective strategy for mitigating future agricultural risks?

Rong-Gang Cong [a,*], Katarina Hedlund [a,b], Hans Andersson [c], Mark Brady [a,d]

a Centre for Environmental and Climate Research (CEC), Lund University, Lund S-22362, Sweden

b Department of Biology, Lund University, S-22362 Lund, Sweden

c Department of Economics, Swedish University of Agricultural Sciences, S-75007 Uppsala, Sweden

d AgriFood Economics Centre, Department of Economics, Swedish University of Agricultural Sciences, Lund S-22007, Sweden

Abstract

Uncontrollable events such as adverse weather and volatile prices present considerable risks for arable farmers. Soil natural capital, which views the capacity of soil biodiversity to generate ecosystem services as a component of farm capital, could be important for the stability and resilience of arable production systems. We investigate therefore whether managing soil natural capital could be an effective strategy for mitigating future agricultural risks. We do this by constructing a dynamic stochastic portfolio model to optimize the stock of soil organic carbon (SOC)—our indicator of soil natural capital—when considering both the risks and returns from farming. SOC is controlled via the spatial and temporal allocation of cash crops and an illustrative replenishing land use. We find that higher soil natural capital buffers yield variance against adverse weather and reduces reliance on external inputs. Managing soil natural capital has therefore the potential to mitigate two serious agricultural risks: energy price shocks and adverse weather events, both of which are likely to be exacerbated in the future due to, e.g., globalization and climate change.

J Quantifying risk

The Risk Thermometer - A tool for risk comparison

Sand S[1], Bjerselius R[1], Busk L[1], Eneroth H[1], Sanner Färnstrand J[1], Lindqvist L[1].

[1]Swedish National Food Agency, Uppsala, Sweden

Development towards a more comparative risk assessment strategy may satisfy public interests as well as the health agencies that need to prioritize the use of their resources with respect to risk related questions. To this end, the Swedish National Food Agency (NFA) has developed a tool called the “Risk Thermometer” that for example can be used to assess and compare exposures to environmental contaminants, pesticides, food additives, as well as minerals/nutrients.

The Risk Thermometer consists of four parts: 1) a severity-adjusted margin of exposure (SAMOE) approach, which is an extension of the present approach for chemical risk characterization, 2) a model that describes the uncertainty in the SAMOE, 3) a risk classification approach that categorizes the SAMOE value in terms of health concern levels, and 4) a graphical illustration of the results. By choice the Risk Thermometer is based on both scientific considerations (risk assessment) and value-based considerations (risk management). It is, however, in line with the important principle of an operational separation between the sectors.

The Risk Thermometer provides the NFA with an improved basis for risk management and priority-setting. It also aims to communicate levels of risks to consumers, the media, and other stakeholders through a graphical front end. The tool is thus regarded to bridge the three elements of risk analysis (risk assessment, risk management, and risk communication).

While there are challenges associated with comparing chemical risks, the suggested approach increases for example the transparency by which the severity of effect influences statements regarding the levels health concern associated with chemical exposure. In general the area of chemical risk assessment is regarded to benefit from the introduction and practical use of approaches that forces the interpretation of exposures or risks in a greater context.

New Breeding Techniques and the Risk of Innovation

Artem Anyshchenko

Centre for Public Regulation and Administration, Faculty of Law, University of Copenhagen, Studiestræde 6, DK-1455 Copenhagen K, Denmark

Abstract:

There is a growing debate on whether plants manipulated using crop breeding tools known as new breeding techniques (NBTs) are genetically modified organisms (GMOs). Analysis of the status of NBTs in different jurisdictions may help elaborate on the issue.

There are two approaches to the regulation of GMOs: process-based and product-based. According to the process-based approach adopted in the EU, GMOs are defined as arising from the use of certain specific methods. The product-based approach, adopted in the US and Canada, defines GMOs as possessing a new combination of genetic material that could not have occurred naturally. The latter approach suggests that some genome-edited plants may be outside of the scope of GMO regulation since they have no transgenic insertion.

Opposition to genetic engineering is rationalized, inter alia, by the discourse of uncertainties about health and environmental risks associated with biotechnologies. In Europe, risk regulation of GMOs is different from that in North America, still it is unclear whether in Europe NBTs would result in GMOs. The question of relevant risk policy on NBTs has yet to be answered. Would the resulting products fall under the scope of GMOs legislation? In other words, is it legally feasible to separate NBTs from their transgenic counterparts? Does the law reflect adequately the present state of affairs in the field of agricultural biotechnology?

Regulatory uncertainty over genome editing makes EU regulation on GMOs unclear and ineffective. Limited success of public policies based on the precautionary principle has not resulted in significant mitigation of adverse environmental changes. Risks attributed to biotechnologies due to scientific uncertainty conflict with the inadequacy of risk governance. Rapid scientific advancements require a new policy for the risks inherent in genome editing, and therefore the issue of the legal status of NBTs deserves careful consideration.

Keywords:

Risk, innovations, GMOs, EU, health, environment, regulation.

K Risk governance in a globalized, yet bordered world

Supply Chain Risk Management (SCRM)

Supply chain risk management is a rather new research area within risk analysis and risk management. Focus is on the negative economic consequences of disruptions e.g. “negative business profit impact” or more generally “negative result impact”.

Since everyday life today is very much based on keeping different kinds of flows going, like the electricity flow, disturbances and disruptions in those flow will often have negative consequences for individuals, companies and organizations but in the end also for society in general.

In the business sector of today competition is no longer between different individual companies but between different supply chains. In those chains we can have some twenty or thirty individual links (companies), each link highly specialized and tightly integrated with other links in the chain.

In those highly specialized and tightly integrated supply chains a disruption in one link could easily spread to other links in the chain and sometimes even with increasing negative economic impact for each link (increasing domino-effects).

Within SCRM new theories and models are developed to identify, structure and evaluate those threats and to find new ways to handle them.

So far focus has mainly been on the private sector but most of the new theories may just us well be applied on the public sector and this sector is also receiving increasing attention within Supply chain risk management.

Ulf Paulsson

Associate professor

School of Economics and Management

Lund University

Risk Communication: Role of Public Participation in Regulation of Biotechnology in China and the EU

Wen Xiang[1]

Facing environmental problems and challenges in the context of globalization, China is more increasingly integrating in global environmental governance, such as actively engaging with multilateral environmental agreements and bilateral negotiations in the past two decades. The EU has been starting collaboration with China on environmental governance issue by means of the EU-China Environmental Governance Programme (EGP) in recent years. As a five years' programme, the EGP began in December 2010 and will be completed in December 2015. A recent meeting held by EGP in December 2014 aims to explore the implications for China to adopt the principles of the Aarhus Convention, which are mainly about public access to environmental information, public participation in environmental decision-making, and access to justice. Needless to say, this has influenced the domestic environmental governance in China.

Against the background of the role of public participation in international environmental governance of biotechnology, the paper will provide an overview on the EU's public participation policy in terms of environmental governance on biotechnology, followed by discussion on China's current trend on environmental governance regime on biotechnology. It is expected to address the following concerns: in the context of bilateral collaboration between the EU and China, what will be the implications of EU's environmental policies on China's environmental governance in terms of public participation in regulation of biotechnology, how to engage lay public into regulation of biotechnology to legitimate the risk governance regime? It concludes that the EU and China are facing different challenges to regulate biotechnology, due to different political systems, and development level, however both of them need to consider to establish an appropriate environmental governance regime, which can be accountable for their citizens, as well as to be consistent with their international obligations.

[1] Post-doctoral Researcher, Faculty of Law, University of Copenhagen

K Risk governance in a globalized, yet bordered world

Anna Moraczewska Ph.D
Maria Curie-Sklodowska University
Departament of International relations
Pl. Litewski 3
20-080 Lublin, POLAND
akmoraczewska@gmail.com

A failure of the European Neighbourhood Policy as an effect of an inadequate risk management strategy

It is assumed that the European Neighbourhood Policy (ENP) was based on some methods of risk management. Both Regions – the Mediterranean and Eastern European have been perceived as uncertain and risky for the European Union. To achieve two objectives – their stabilisation and increase of predictability three main instruments were adopted when creating situation scenarios for these neighbouring territories. There were: conditional financial support, processes of democratisation, and deepening economic interdependence with the EU. Contemporary situations in Eastern Europe and Mediterranean regions indicates that a chosen scenario by the Union was too optimistic and did not take into account many determinants.
The presentation will consists of two points : 1) presentation of the Neighbourhood Policy of the EU as a strategy of risk management and 2) its failure using cause and effect analysis. It is going to based on a retrospective analysis from the perspective of international relations. These methods reveal the complexity of the problem and too much optimism in the EU's risk analysis for the regions. Selected causes of negative effects will be presented in the form of a chart. A further in-depth analysis could serve to elaborate some corrective actions for this policy.

L Quantifying risk and uncertainty

Abstract of presentation:
“Risks under non fault conditions created by function limitations”.

The presentation deals with the challenge to understand the risks by fault free behaviour of a function. To analyse the risks under fault free condition, is to understand limitations of the function that can create a risk in a specific situation or scenario when the function is used.
Traditionally the focus for analysis under such standards as ISO 26262 and IEC 61508, is the behaviour of a function when there is a fault, making the function deviate from the expected behaviour.
However, to understand risks of the fault free behaviour is also important and sometimes also required. As an example, the EU regulation for Advanced Emergency Braking requires the organization to state that the function is safe under fault free behaviour. To understand risks with fault free behaviour gets more important as the functionality gets more complicated.
The presentation aims to clarify the meaning of “Limitation risk management”, describe an approach that can be used, and then uses an automotive “real” case from Volvo Trucks as an example. An analysis addressing the Stop&Go addition to Adaptive Cruise Control is walked through.

Tord Wullt:

Master of science Applied Physics (LTH 1982)
Certified by TUV Reihnland as a ISO26262 safety engineer.
30 years of experience from the SW and Electronics industry, and 15 years within safety related applications within aerospace, automation, offshore energy and automotive.
Occupation: Consultant within quality, dependability and safety(ISO26262).
Workplaces the last 10 years are DNV (Development of Quality/safety standard for offshore energy and maritime), Volvo Trucks (Safety manager/engineer Automatic emergency braking, LNG supply, Stop&Go ACC) and Volvo Cars (Safety manager/engineer High voltage energy storage for Hybrid and Electrical cars, supplier assessments).

L Quantifying risk and uncertainty

Unforeseen Accidents: Improving Risk Management Practices and Predictability

R. Taylor and I. Kozine
Technical University of Denmark

A follow-up study of the end results for 132 oil, gas and chemical plants with risk analyses carried out over 36 years demonstrates that risks were found to have been reduced significantly. Most of the major accidents have occurred due to management failure to implement recommended safeguards. This particular problem was solved over the period of the study. However 20% of the accidents were found to have been due to unpredictable accident scenarios, which is a very serious observation. If this pattern is maintained over a wider range of industrial areas, it means that the promise of risk analysis as a tool for safety improvement is much diminished. It also means that risk analysis is of limited value in making policy decisions about the safety of new technologies. Initial studies indicate that the problem indeed is significant in many areas such as aerospace, automotive, medical and pharmaceutical, energy production industries, and in power and communications infrastructures. Research is ongoing now at DTU to identify and classify the causes of unforeseen accidents and to do a mapping between them and solutions (organisational and computational) to improving the predictability of accidents.

In this research, among unforeseen accidents we distinguish *unpredictable* and *predictable* accidents. Unpredictable accidents can only be described in retrospect and after that become predictable and preventable if proper lessons have been learned and proper barriers implemented. Predictable accidents occur and become unpreventable because of deficiencies in the risk management process, negligence of the responsible personnel, misjudgement of losses and benefits, or simply because of accidents' assessment as not incurring large losses compared to expenses for their prevention. We distinguish four groups of causes for not being prepared for accidents: (1) organisational and human, (2) inadequate models (including expert judgements) providing assessments of accident probabilities (frequencies) or severity of accidents, (2) accidents which are in principle predictable, but for which current methods are impractical and (4) accidents for which there is currently insufficient knowledge to allow predictability.

A substantial volume of unforeseen accidents have been collected and a number of reasons have been identified which can lead to inability to predict accidents. To exemplify some, the following reasons are listed:

- The knowledge needed for prediction simply does not exist;
- The knowledge needed for prediction is reported, but not available to the analysts responsible for safety analysis, nor to the engineers responsible for design;
- Errors and oversights due to inadequacies in the hazard identification process;
- Deficiency in the scope of the analysis.

In the presentation we will demonstrate all the causes of inability to predict accidents we have identified and our suggestions for improvements in risk management practices to avoid preventable accidents. The current limits of accident prediction, and as far as possible, finding ways of eliminating these limits will be discussed as well.

L Quantifying risk and uncertainty

The risk with overestimating the risk – the example of metal exposure via drinking water around contaminated glass works sites

Augustsson A, Uddh Söderberg T

Abstract

Large amounts of waste material with high concentrations of various metal(loid)s are common features at old glassworks sites in southeastern Sweden. As epidemiological data indicates increased health risks for local residents around these sites, questions about how exposure occurs have been raised. One important step in assessing site-specific total exposure is to quantify exposure via intake of drinking water, and the critical variable to determine here is the metal concentration in the water to be consumed. In many routine risk assessments this is, despite well-known uncertainties, done by applying conservative and simplified transport models that simulate concentrations in water abstraction wells at certain distances from the source of contamination. To assess the accuracy of such an approch, we used a probabilistic method to simulate metal concentrations in drinking water within 500 m distance from 10 heavily contaminated glassworks sites, by applying the transport equations of the Swedish EPA generic risk assessment model. Exposure was then calculated. When concentrations in drinking water were calculated using this modelling approach, the resulting exposure estimates indicated that as much as 100% of the local residents with private wells may reach a daily intake above applicable toxicological reference values. However, when assessing the risk from measured concentrations in household drinking water instead, not even the 95th percentile of the population reached the toxicological limit. It hence appears as if metals are efficiently sorbed to the solid matrix of the soil at these sites, leaving the drinking water with concentrations well below drinking water criteria. For the average risk assessor working with contaminated sites, who often lacks training in hydrogeochemistry, the contradictory results highlight the need of more realistic generic models to be used in routine assessments of water contamination and exposure via consumption of drinking water.

L Quantifying risk and uncertainty

Exploring risk-risk trade-offs between pesticide use, ecosystem services enhancement and farmers profits using one measure of uncertainty

"The Future of Risk Analysis in the Nordic Countries", November 16-17th 2015 in Lund, Sweden

Cecilia Olsson*, Yann Clough, Henrik Smith, Mark Brady, Ullrika Sahlin

Centre for Environmental and Climate Research, Lund University
* Corresponding author: Cecilia.Olsson@nateko.lu.se

Abstract

Decision making in environmental systems such as agricultural landscapes often requires weighting multiple objective against each other, with objectives and actions often found at different spatial and temporal scales. Since the impacts of decisions are known with more or less certainty, a common measure of knowledge-based uncertainty is required in order to make appropriate trade-offs between risks and benefits. In this study we applied Bayesian Evidence Synthesis to evaluate trade-offs between multiple objectives (risks) related to integrated pest management in multifunctional agricultural landscapes, taking into account the impact of green structures on the provision of the ecosystem service biological control of pests.

The assessment was designed to evaluate the influence of uncultivated field margins (0, 2.5, 5 m) and insecticide use (preventive use, cost-efficient use, no use) on risks related to multiple objectives. The risk-risk tradeoffs were evaluated based on expected performances in private goods: farmer's profit and profit volatility (economic risk), as well as in public goods: barley yield, amount of semi-natural habitats for biodiversity in general, nitrogen load and insecticide load.

The joint posterior of parameters in the assessment model was calibrated using data from field experiments, literature and expert judgment. The assessment was performed as a 2-dimensional Monte Carlo simulation taking into account knowledge-based uncertainty in parameters and variability in aphid outbreak intensity.

Our preliminary results indicate a clear trade-off between yield on one side, and biodiversity and chemical loads on the other side. However, a farmer's profit and economic risk are positively and negatively affected by ecological intensification (i.e. more greening measures and less insecticide use), respectively. The farmer's economic risk decreases with higher concentration of soil organic carbon, but increases with higher spatial habitat heterogeneity of the farm, e.g. with more pastures and field borders. More intense aphid outbreaks increase the economic risk but influence the farmer's profit less than price volatility.