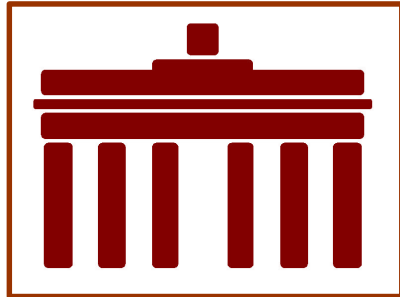


12th SRA Europe Annual Meeting 2002

Integrated Risk Management
Strategic, Technical, and
Organizational Perspectives



Management of the future must evolve to become integrative. Risks abound from all directions: some small and frequent, some large but rare. Managing these diverse risks of different nature, intents, and flavors requires a coming together of strategic, technical, and organizational perspectives. The programme of the SRA Europe Meeting addresses the following crucial topics:

<u>Topics</u>	<u>Abbreviated Topic</u>
• Holes in holistic risk management	<i>Holes</i>
• Early recognition of risks and rare events	<i>Early</i>
• Opening the process: Integrating stakeholders and stake-seekers	<i>Opening</i>
• Integrating precautionary principle (PP) in risk-based decision-making	<i>Integrate PP</i>
• Risk management of intangible assets	<i>RM Intangible</i>

Society for Risk Analysis - Europe



Final Programme

Annual Meeting
Sunday, July 21 – Wednesday, July 24,
2002
Humboldt University Berlin

Society For Risk Analysis Annual Meeting

2002 Preliminary Programme

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2002 Council

President: Jose Manuel Palma
President-Elect: Peter Wiedemann
Secretary/Chair of Nominations: Jean Brenot
Treasurer: Peter Wiedemann
Past President: Joyce Tait
Committee Members:
Peter T. Allen
Gisela Böhm
Jan M. Gutteling
Ragnar Löfstedt
Ioannis A. Papazoglou
Anna Vari

2002 Program Committee

Peter M. Wiedemann
Martin Clauberg
Research Center Juelich, Germany

Sunday		Monday				Tuesday				Wednesday			
Workshops (Training, Specialty, etc.) Training workshop <i>“Online Tools for Risk-based Deci- sionmaking”</i> <i>“EU-funding mech- anisms under the 6th Framework Prog- ramme”</i> <i>“Building a Euro- pean Risk Network of Excellence”</i> Times TBA (more information: m.clauberg@fz- juelich.de)	9:00 – 10:00	Plenary Session Three Presidents’ Talk Drs. Tait, Palma-Oliveira, Wiedeman				Plenary Session Integrated Risk Management Dr. Ben Ale, RIVM				Plenary Session Risk Governance Prof. Dr. Andreas Troge, UBA			
	10:00 – 10:30	Break											
	10:30 – 12:00	M1.1 Application of Risk Communi- cation Guidelines (Wiedeman n) 048, 107, 270, 113	M1.2 Risk Perception of Significant Events & Disasters (Allen) 011, 050, 046, 072	M1.3 Operational & Finance Risk Mana- gement (de Palma) 058, 054, 127, 135	M1.4 Risky Behaviour () 018, 037, 019, 146	T1.1 Probabilisti- c Exposure & Risk Assessment (Mekel) 123, 124, 125, 126	T1.2 KRIM I – Integrated Coastal Protection (Schirmer, Heinrichs) 042, 077, 028, 080	T1.3 Empirical Research on Risk Perception (Zwick) 151, 152, 153, 154	T1.4 Risk Managem- ent of Accidents () 100, 150, 101, 121	W1.1 Early Recognitio- n of Early Signals (van Notten) 116, 147, 275, 129	W1.2 Risk Gov- ernance & Failures (Dolislager) 023, 069, 085, 038	W1.3 Integrative Risk Managem- ent (Petts) 110, 128, 111, 112	W1.4 Holistic Frames of Risk Managem- ent () 092, 194, 086, TBA
	12:00 – 13:30	Luncheon Break											
	13:30 – 15:00	M2.1 Risk Communi- cation and EMF (Dolan) 103, 071, 031, 148	M2.2 Risk Perception in Siting Situations (Böhm) 093, 271, 060, 082	M2.3 Operational & Finance Risk Mana- gement II (Stahel) 108, 132, 272, 025	M2.4 Comparing Risks (Clauberg) 105, 144, 115, 021	T2.1 Probabilitie- s and Rare Events (Hassenzah- l) 008, 005, 059, 138	T2.2 KRIM II – Integrated Coastal Protection (Schuchard- t, Peters) 030, 033, 117, 055	T2.3 Risk Per- ception of Biotechnol- ogy (Tait) 193, 114, 040, TBA	T2.4 Decisionm- aking under Uncertainty () 017, 009, 010, 006	W2.1 Safety & Risk Culture I () 013, 063, 065, 081	W2.2 Risk Managem- ent and Medicine () 155, 156, 133, 140	W2.3 Risk Managem- ent of Catastroph- es (Kekkah) 056, 057, 088, TBA	W2.4 Risk and the Infor- mation Technolo- gies (Dolislager) 053, 067, 034, 143
Board Meeting	15:00 – 16:00	General Assembly				Poster Break				Open Meeting for SRA-E Strategy			
Opening Ceremonies	16:00 – 17:30	M3.1 Precaution- ary Principle in Risk (Pidgeon) 091, 020, 041, 149	M3.2 Risk Perception in the Nuclear Context () 012, 061, 043, TBA	M3.3 Internation- al Risk Managem- ent (Thalmann) 099, 109, 130, TBA	M3.4 Risk and Judgement (Gerrard) 024, 090, 102, 073	T3.1 Exposure and Risk (Mekel) 016, 022, 039, 083	T3.2 Media Influence on Risk (Heinrichs) 014, 015, 051, 079	T3.3 Risk and GMOs (Gnutsch) 064, 029, 094, 104	T3.4 Risk Per- ception and Communi- cation (Allen) 052, 032, 119, 047	W3.1 Safety & Risk Culture II () 036, 131, 078, 134	W3.2 Assessing Real & Perceived Risks () 004, 027, 045, TBA	W3.3 TBA	W3.4 TBA
	17:30 – 19:00	Break								Conference Conclusion			
	19:00 – ????	Evening Event				Conference Dinner				Prize Drawing for completed evaluations (must be in attendance to win)			

Integrated Risk Management Strategic, Technical, and Organizational Perspectives

Monday, July 22

9:00 – 10:00 AM – Plenary Session 1

Three Presidents' Talk on Integrated Risk Management: Past, Present, and Future

Prof. Dr. Joyce Tait, Scottish Universities Policy Research and Advice Network (SUPRA), UK

Dr. Jose Palma-Oliveira, University of Lisbon, Portugal

Dr. Peter M. Wiedemann, Research Centre, Juelich (FZJ), Germany

Tuesday, July 23

9:00 – 10:00 AM – Plenary Session 2

Integrated Risk Management

Dr. Ben Ale, National Institute of Public Health and the Environment (RIVM), The Netherlands

Wednesday, July 24

9:00 – 10:00 AM – Plenary Session 3

Risk Governance

Prof. Dr. Andreas Troge; President, German Environmental Agency (UBA), Germany

10:30 – 12:00

Room: 1

M.1.1: Application of Risk Communication Guidelines

Chair: Peter Wiedemann

ID48 Opening
The Growth and Development of Risk Communication through an Analysis of the Literature in the Field
Jan M. Gutteling; Zamira Gurabardhi; Margot Kuttschreuter, University of Twente, The Netherlands.

ID107 Opening
Risk Communication for Chemical Risk Management. An OECD-Guidance Document.
Hans Kastenholz; Ortwin Renn, Center of Technology Assessment Baden-Württemberg; Rolf Hertel, BgVV, Germany.

ID270 Opening
Communication - As necessary as it is useful - a short guideline
Gerhard Schmid, Münchener Rückversicherung, Germany.

ID113 Early
Pagination or animation? Examples of emf risk information tools for the public
Gregor Dürrenberger; Hans Kastenholz, Res. Coop. "Sustainable Mobile Communication", Switzerland.

10:30 – 12:00

Room: 2

M.1.2: Risk Perception of Significant Events & Disasters

Chair: Peter Allen

ID11 Opening
Time will tell: Changes in risk perception and the processing of risk information about the inevitable approach of the millennium bug.
Margôt Kuttschreuter; Jan M. Gutteling, University of Twente, The Netherlands.

ID50 Early
Temporal Discounting in Environmental Risk Evaluation
Gisela Böhm, PH Ludwigsburg, Germany.

ID46 Opening
Situational factors and unrealistic optimism about disaster estimations
Piotr Gasparski, Polish Academy of Sciences, Poland.

ID72 Opening
Living with Radiation: Perceptions of Radiation Risk amongst Adolescents Born after Chernobyl in Belarus and Ukraine
Elena Avetova, University of Surrey; Peter Allen, European Institute of Health and Medical Sciences, United Kingdom.

10:30 – 12:00

Room: 3

M.1.3: Operational & Finance Risk Management

Chair: Jose Palma-Oliveira

ID58 Holes
Holes in Holistic Risk Management: Financial Institutions' Approaches to 'Operational Risk'
Wilhelm K. Kross, Value Risk, Germany

ID54 Early
Zha methodology - A powerful tool
Pierre-Christian Morand, Zurich Insurance Company, Switzerland.

ID127 Integrate PP
Fast and dynamic security risk assessment and presentation for telecommunication: (Security Risk Radar)
Hugo Straumann, Swisscom AG; Andreas Fischer, University of Applied Sciences, Switzerland.

ID135 Early
Predictive Analysis for Project Portfolio Risk Management
Abderrahim Labbi, IBM Research - Zurich Lab., Switzerland.

10:30 – 12:00

Room: 4

M.1.4: Risky Behaviour

Chair: To be confirmed

ID18 RM Intangible
Associations between driver stress, locus of control and risk behaviour in traffic
Hilde Iversen; Torbjörn Rundmo, Norwegian University of Science and Technology, Norway.

ID37 Holes
The effects on traffic safety attitudes and behaviour of a safety campaign among adolescents
Hroar Klempe; Torbjörn Rundmo; Hilde Iversen, Norwegian University of Science and Technology; Harald Heieraas, The Norwegian Society for Road Safety; Karsten Nikolaisen, Authority of Public Roads, Norway.

ID19 Early
Beliefs related to natural disasters and flooding. An example from Assam, India
Meenakshi Barthakur, Norwegian University of Science and Technology, Norway.

ID146 Opening
Risk acceptability, feelings of insecurity and coping strategies of people living in a seismic and industrial risk zone
Esperanza López-Vázquez, Universidad de las Américas-Puebla, Mexico.

Monday, July 22

13:30 – 15:00
Room: 1

M.2.1: Risk Communication and EMF

Chair: Mike Dolan

ID103 Opening
Lessons learned from scientific dialogue on EMF risk assessment
Peter M. Wiedemann; Holger Schütz, Research Centre Jülich, Germany.

ID71 Opening
Mobile telecommunication technology in the UK - multi-way engagement or self-regulation gone wrong?
Joerg Niewoehner, University of East Anglia, United Kingdom.

ID31 Opening
Trust and Confidence in the Applied Field of EMF
Michael Siegrist, Universität Zürich, Switzerland; Timothy C. Earle, Western Washington University, USA; Heinz Gutscher, Universität Zürich, Switzerland.

ID148 Opening
The Impact of information frames on the laypersons' risk appraisal
Andrea T. Thalmann, Research Centre Jülich, Germany.

13:30 – 15:00
Room: 2

M.2.2: Risk Perception in Siting Situations

Chair: Gisela Böhm

ID93 RM Intangible
Images of local environmental uncertainty and an indeterminable future: A Swedish case study
Annelie Sjölander-Lindqvist, Göteborg University, Sweden.

ID271 Opening
Beyond stigma? Risk, encroachment and sense of place
Peter Simmons, University of East Anglia; Gordon Walker, Staffordshire University, United Kingdom.

ID60 Opening
Transparency and Public Hearings. An Evaluation of Dialogs in the Process of Building a Swedish Nuclear Waste Repository.
Britt-Marie Drottz-Sjöberg; Karinta Konsult, NTNU, Norway.

ID82 Opening
Stakeholders Involvement in the vicinity of industrial sites.
Hilaire Mansoux, IRSN; S. Gadbois; G. Heriard Dubreuil, Mutadis Consultants; A. Oudiz, IRSN; T. Schneider, CEPN.

13:30 – 15:00
Room: 3

M.2.3: Operational & Finance Risk Management II

Chair: Walter Stahel

ID108 Holes
Risk management as Internalization. The example of risk management by insurance
Michael Huber, London School of Economics and Political Science, United Kingdom.

ID132 Holes
Scientific and Practical Aspects of Risk Analyses and Management on Oil and Gas Production Enterprises
Vitaly I. Dmitruk, IndEcoExpert Ltd, Russia; B. P. Rozlog, Volynsky State University, Ukraine.

ID272 Opening
Innovative Packaging Methodology Construction.
Giuseppe Quartieri, OMEGADATI Srl; Alfaro, Guido Degan, Terza Università di Roma, Italy.

ID25 Holes
Obstacles to Holistic Risk Management in the Energy Sector
Wilhelm K. Kross, Value Risk, Germany

13:30 – 15:00
Room: 4

M.2.4: Comparing Risks

Chair: Martin Clauberg

ID105 Holes
Cultural dimensions of risk perception
Åsa Boholm, Göteborg university, Sweden.

ID144 RM Intangible
The Baycol/Lipobay Issue - a case study - The Politics of product recall
Peter M. Wiedemann; Martin Clauberg, Research Centre Juelich, Germany.

ID115 RM Intangible
Public Concepts of the Health Impacts of Air Pollution: Comparing Hazards.
Helen Gilbert; Nick F. Pidgeon, University of East Anglia, United Kingdom.

ID21 Holes
Technical Limitations of Cost-Effectiveness Analysis
David M. Hassenzahl, University of Nevada, Las Vegas, USA.

Monday, July 22

16:00 – 17:30
Room: 1

M.3.1: Precautionary Principle in Risk

Chair: Nick Pidgeon

ID91 Integrate PP
Ratifying Kyoto: Applying the Precautionary Principle to the Climate Change Issue Controversy in Canada *William Leiss, University of Calgary, Canada.*

ID20 Integrate PP
Broad definitions of precaution: Public preferences and the case of mobile phones *J. Richard Eiser; Mathew White, University of Sheffield, United Kingdom.*

ID41 Integrate PP
Swedish chemical regulation: Implementing the precautionary principle. *Ragnar Lofstedt, King's Centre for Risk Management, United Kingdom.*

ID149 Integrate PP
An advanced strategic risk management solution: The inclusion of precautionary principle *Jean-Francois Barbet; Julien Durand, Sector Consulting; Jean-Marc Picard, Universite des Technologies de Compiegne, France.*

16:00 – 17:30
Room: 2

M.3.2: Risk Perception in the Nuclear Context

Chair: To be confirmed

ID12 Opening
Social Sciences in a Nuclear Research Centre: Dream or Reality? *Frank Hardeman; Gaston Meskens; Bernard Neerdael; Ludo Veuchelen; Gilbert Eggermont, SCK*CEN, Belgium.*

ID61 RM Intangible
Exchange of nuclear safety information across expert groups. A study of trouble shooting. *Britt-Marie Drottz-Sjöberg; Karinta Konsult, NTNU, Norway.*

ID43 Opening
Social representations of uranium mining residues *Sylvie Charron, IRSN; Claire Mays, Institut Symlog; Jean Brenot, IRSN, France.*

ID142 RM Intangible
Paradigmatic study of risk perception from three student groups *Brian Orton, Brunel University, UK; D. Üрге-Vorsatz, Central European University, Hungary; B. M. Drottz-Sjöberg, NTNU, Norway.*

16:00 – 17:30
Room: 3

M.3.3: International Risk Management

Chair: Andrea Thalmann

ID99 Opening
Democratizing International Risk Decision Making *Andreas Klinke, Center of Technology Assessment Baden-Württemberg, Germany.*

ID109 Opening
Stakeholder Views on Transboundary Water Contamination Problems: The Case of the January 2000 Tisza River Cyanide Spill. *Anna Vari; Zoltan Ferencz, Hungarian Academy of Sciences, Hungary; Joanne Linnerooth-Bayer; Jan Sendzimir, International Institute for Applied Systems Analysis, Austria.*

ID130 Early
..."then we take berlin". Terrorism as a generalized threat *Lennart Sjöberg, Stockholm School of Economics, Sweden.*

ID137 Integrate PP
Export transactions insurance instruments for Mid-East Europe *Eugeniusz Sitek; Iwona Gorzen, Technical University of Czestochowa, Poland.*

16:00 – 17:30
Room: 4

M.3.4: Risk and Judgement

Chair: Simon Gerrard

ID24 Opening
Space, power and public constructions of risk: a case study of the foot and mouth disease outbreak in the UK *Karen Bickerstaff; Peter Simmons, University of East Anglia, United Kingdom.*

ID90 Opening
The knowledge potential of open, integrated societal decision making: the case of waste management facilities in the United Kingdom *S. M. Macgill; Y. L. Siu, Univeristy of Leeds, United Kingdom.*

ID102 Opening
Coping Capacity of People at Risk: Predictors of Households' Coping with the Risk of Flooding *Torsten Grothmann, Potsdam Institute for Climate Impact Research, Germany.*

ID73 Holes
The neglect of risks: Results from a study of experts' risk assessments *Jana Fromm, Stockholm School of Economics, Sweden.*

10:30 – 12:00

Room: 1

T.1.1: Probabilistic Exposure & Risk Assessment

Chair: *Odile Mekel*

ID123 Integrate PP
Predicting exposure concentrations of cadmium in vegetables and fruits by probabilistic modelling: Improved selection of input variables and plausibility check *Odile C. L. Mekel, Univ. Bielefeld; Reinhard Kosta-Rick, BÜB, Germany.*

ID124 Integrate PP
Exposure assessment for children: Is there a greater risk than in adults? *Gerhard Heinemeyer, BgVV; Jutta Dürrkop, UBA; Ursula Gundert-Remy, BgVV, Germany.*

ID125 Integrate PP
The principle of two-dimensional probabilistic modelling - taking extrapolation factors as an example *Olaf Mosbach-Schulz, Univ. Bremen, Germany.*

ID126 Integrate PP
Uncertainty analysis in population based environmental risk assessment with respect to traffic noise related cardiovascular mortality *Michael Schümann, Univ.-Clinics Hamburg; Hermann Neus, BUG, Germany.*

10:30 – 12:00

Room: 2

T.1.2: KRIM I

Chair: *Michael Schirmer, Harald Heinrichs*

ID42 Opening
Climate Change, Risk Constructs and Coastal Protection: Aim and Approach of the interdisciplinary Project KRIM *Bastian Schuchardt, BioConsult; Michael Schirmer, Universität Bremen, Germany.*

ID77 Holes
Basic hydromechanical information for risk assessment of coastal defences in the Jade-Weser area (Germany) *Iris Grabemann; Hans Grabemann; Hartmut Kapitza; Dieter P. Eppel, GKSS Forschungszentrum Geesthacht GmbH, Germany.*

ID28 Early
Risk Analysis within Integrated Coastal Zone Management *Stephan Mai; Nicole von Lieberman, University of Hannover, Germany.*

ID80 Opening
Scientific Risk Construct: Environmental Aspects *Dietmar Kraft; Stefan Wittig; Michael Schirmer, Universität Bremen, Germany.*

10:30 – 12:00

Room: 3

T.1.3: Empirical Research on Risk Perception

Chair: *Michael Zwick*

ID151 Opening
Trust in Science and Regulation: The Case of Biotechnological Risks *Ortwin Renn, Center of Technology Assessment Baden-Württemberg, Germany.*

ID152 Opening
Risk as Perceived by the Public: Disparities of Qualitative and Quantitative Findings *Michael M. Zwick, University of Stuttgart, Germany.*

ID153 Opening
Consumers as Guinea Pigs? The Relative Importance of the Risk Dimension in Public Discourses and Individual Evaluations of Biotechnology *Jürgen Hampel, Center of Technology Assessment Baden-Württemberg, Germany.*

ID154 Opening
Adored and Feared? The Public's Perception of Mobile Telephony *Michael Ruddat; Alexander Sautter, Universität Stuttgart, Germany.*

10:30 – 12:00

Room: 4

T.1.4: Risk Management of Accidents

Chair: *To be confirmed*

ID100 Integrate PP
Land use planning and industrial risks: tools for prevention and disaster mitigation *Scira Menoni, Politecnico di Milano, Italy.*

ID150 Integrate PP
Consequence-based approach for land-use planning: a precautionary principle in accidental risk control? *Olivier Salvi; D. Hourtolou; D. Gaston INERIS, France.*

ID101 Holes
External emergency plans: a challenging risk management tool for local communities *Scira Menoni; S. Caragliano; S. Colombo, Politecnico di Milano, Italy.*

ID121 Holes
ARAMIS project : development of a accidental risk assessment methodology in the context of the Seveso II directive *Olivier Salvi, INERIS, France*

13:30 – 15:00
Room: 1

T.2.1: Probabilities and Rare Events

Chair: David Hassenzahl

ID8 Early
Risk assessment for steel buildings and occupants under fire situation
Milan Holický, Czech Technical University, Czech Republic; J. B. Schleich, University of Liège, Luxembourg.

ID5 Early
Risk of old bridges under ship impact
Manfred Curbach; Dirk Proske, Technische Universität Dresden, Germany.

ID59 Early
Assessment of Risk in Tunnels using Bayesian Networks
Milan Holický, Czech Technical University, Czech Republic.

ID138 Integrate PP
A Study of Quantitative Risk Analysis for Business Interruption due to Fire & Explosion in the Oil & Petrochemical Process Plants
Hiroyuki Watabe; Masaru Matsumoto, The Tokio Marine Risk Consulting Co.,Ltd.

13:30 – 15:00
Room: 2

T.2.2: KRIM II

Chair: Bastian Schuchardt,
Hans-Peter Peters

ID30 RM Intangible
scientific risk construct: economic aspects
Thomas Knogge; Inhi Yu, Universität Bremen, Germany.

ID33 Opening
Climate Change, Political-Administrative Regulation and Coastal Protection "PAS"
Hellmuth Lange; Marion Saalfrank; Andreas Wiesner-Steiner, University of Bremen, Germany.

ID117 Early
Public Opinion as Constraint for Coastal Risk Management: The Role of the Media
Harald Heinrichs; Hans-Peter Peters, Research Centre Juelich, Germany.

ID55 Holes
The KRIM Decision Support System - Policy Support for Integrated Coastal Protection and Risk Management
Bernhard Hahn, Research Institute for Knowledge Systems BV; J. L. de Kok, University of Twente; Sander Bakkenist, INFRAM International b.v., The Netherlands.

13:30 – 15:00
Room: 3

T.2.3: Risk Perception of Biotechnology

Chair: Joyce Tait

ID193 Opening
Biotechnology: the Perennial Challenge
Joyce Tait, SUPRA, United Kingdom.

ID114 Early
Attitudes towards Genetically Modified Food in Six European Countries
Ortwin Renn, Center of Technology Assessment Baden-Württemberg, Germany.

ID40 Opening
Trust as a prerequisite of low risk perception in relation to biotechnology: case Finland
Timo Rusanen, University of Kuopio, Finland.

ID106 withdrawn

13:30 – 15:00
Room: 4

T.2.4: Decisionmaking under Uncertainty

Chair: To be confirmed

ID17 Holes
Researching Risk
Brian Greenford, University of Limerick, Ireland.

ID9 Integrate PP
Decision making for accidental risk management: Uncertainty level quantification
Farit M. Akhmedjanov; Victor G. Krymsky, Ufa State Aviation Technical University, Russia.

ID10 Integrate PP
Industrial risk regulation: Decision making support involving expert judgements
Victor G. Krymsky; Maria V. Krymskaia; Farit M. Akhmedjanov, Ufa State Aviation Technical University, Russia.

ID6 Integrate PP
Safety reports: Integrated russian experience
Andrew N. Yelokhin; Yury V. Tshovrebov, Insurance Company LUKOIL; Igor A. Zaikin, JSC Industrial Risk; Alexei A. Yelokhin, Moscow State University, Russia.

Tuesday, July 23

16:00 – 17:30

Room: 1

T.3.1: Exposure and Risk

Chair: Odile Mekel

ID16 Holes
Risk evaluation: The noise exposure
Guido Alfaro Degan; Mario Pinzari,
Università ROMA TRE, Italy.

ID22 Integrate PP
Why ordinary hazard identification
sessions commonly fail to reduce the
amount of inconclusive knowledge
about electrostatic hazards *Yngve*
Malmén; Minna Nissilä; Raija
Koivisto, VTT Industrial Systems,
Finland.

ID39 Holes
Scenario-Based Risk Assessment
Comparing Occupational Exposure to
Perchloroethylene and Trichloro-
ethylene in Metal-Degreasing Over
the Last 30 Years *Julia von Grote;*
C. Hürlimann; M. Scheringer; K.
Hungerbühler, Swiss Federal
Institute of Technology, Switzerland.

ID83 Holes
An example of weighing the pros and
cons of food stuffs: deoxynivalenol
(DON) in wheat *Loek T.J. Pijls,*
Health Council, The Netherlands.

16:00 – 17:30

Room: 2

T.3.2: Media Influence on Risk

Chair: Harald Heinrichs

ID14 Opening
Urban air pollution in the regional
press : A “dramatic” representation
Julien Langumier, ENTPE, France.

ID15 Opening
Did people believe in the Twin
Tower attack on September the 11th?
Hroar Klempe, Norwegian University
of Science and Technology, Norway.

ID51 Opening
Media Resonance and the Collective
Action of Experts in the Conflict of
Nuclear Waste Management *Peter*
Hocke-Bergler, Forschungszentrum
Karlsruhe, Germany.

ID79 Opening
Communicating European food
safety: British and Dutch newspapers
covering the BSE-crisis. *Freek B. J.*
de Meere; H. Caljé; F. Götte, Vrije
Universiteit Amsterdam, The
Netherlands.

16:00 – 17:30

Room: 3

T.3.3: Risk and GMOs

Chair: Markus Grutsch

ID64 Opening
The Japanese consensus conference
on GM crops: an experiment towards
deliberative policy-making *Mariko*
Nishizawa, Center of Technology
Assessment Baden-Württemberg,
Germany.

ID29 Opening
From Biodiversity to Biodemocracy ?
- Release of Genetically Modified
Organisms (GMOs) and Uncertainty
Markus R. Schmidt; André Gzásó,
University of Vienna, Austria.

ID94 Opening
Risk communication on organic
foods: effects of collaboration
between sources *Richard Shepherd;*
Moiria Dean University of Surrey,
United Kingdom.

ID104 Holes
Plugging leaks sinking ships *Patrick*
Cox, University of East Anglia,
United Kingdom.

16:00 – 17:30

Room: 4

T.3.4: Risk Perception and
Communication

Chair: Peter Allen

ID52 Opening
Questioning Social Amplification:
Learning about Risk Communication
Judith Petts, Univ. Birmingham; Tom
Horlick-Jones, Cardiff Univ. School
of Social Sciences; Graham
Murdock, Loughborough Univ., UK.

ID32 Opening
The use of mental models in
chemical risk protection - the need
for multi-method evaluation *Simon*
Gerrard; P. Cox; Jörg Niewöhner;
Nick Pidgeon, University of East
Anglia, United Kingdom.

ID119 Early
The Perception of the Galtür
Avalanche Disaster *Markus A.*
Grutsch, Research Centre Jülich,
Germany.

ID47 Opening
The Interrelation between the Internal
Organisational Processes and
External Risk Communication
Zamira Gurabardhi; Jan M.
Gutteling, University of Twente, The
Netherlands.

10:30 – 12:00

Room: 1

W.1.1: Early Recognition of Early Signals

Chair: Philip van Notten

ID116 Early
‘We didn’t see it coming’ : the subjective nature of signal detection
Susan van 't Klooster; Philip van Notten, Maastricht Univ., The Netherlands.

ID147 Early
‘We didn’t see it coming’: the subjective nature of signal detection.
II. *Susan van 't Klooster; Philip van Notten, Maastricht Univ., The Netherlands.*

ID275 Early
Early Risk Detection in Environmental Health - Is it feasible? A German Perspective
Martin Clauberg; Peter M. Wiedemann; Cornelia Karger, Research Centre Juelich; Gernot Henseler; Ursula Gundert-Remy, BgVV, Germany.

ID129 Holes
Post mining management in the Lorraine region: *Myriam Mokhtaria Merad, Paris IX – INERIS; Kouniali Samy, INERIS; Verdel Thierry ENSMN; Roy Bernard Paris IX, France.*

10:30 – 12:00

Room: 2

W.1.2: Risk Governance & Failures

Chair: Fred Dolislager

ID23 Holes
Neglected Regulation: the institutional attenuation of risk
Henry Rothstein, London School of Economics and Political Science, United Kingdom.

ID69 Holes
An integrated approach in managing risk in industrial areas
Caterina Vollono; Maria Eleonora Soggiu; Anna Bastone; Laura Lauria; Giovanni Marsili, Istituto Superiore di Sanità, Italy.

ID85 Holes
Are rules safe? A study of rule management in railways.
Andrew Hale; Tom Heijer; Floor Koornneef, Delft University of Technology, The Netherlands.

ID38 Opening
Social Trust in UK Risk Regulators: The Role of Practical Reasoning Strategies in the Formation of Public Attitudes
John Walls; Nick Pidgeon; A. Weyman; T. Horlick Jones, University of East Anglia, United Kingdom.

10:30 – 12:00

Room: 3

W.1.3: Integrative Risk Management

Chair: Judith Petts

ID110 Opening
Integrated Flood Risk Management for Hungary's Tisza River.
Joanne Linnerooth-Bayer; Tatianna Ermolieva, International Institute for Applied Systems Analysis, Austria; Anna Vari; Zoltan Ferencz, Hungarian Academy of Sciences, Hungary.

ID128 Opening
Informational regulation of major industrial accidents: The case of the U.S. LEPCs
Nathalie de Marcellis-Warin; Bernard Sinclair-Desgagné; Ingrid Peignier, CIRANO, Canada.

ID111 Opening
SERF3 - Socio-economic Research on Fusion. The Narrow Path for ITER.
André Gázsó; Steven Sholly; Markus Schmidt; Wolfgang Kromp, Institute of Risk Research (IRR), Austria.

ID112 Opening
Risk and Sustainability. The Claim of Sustainability.
André Gázsó; Markus Schmidt; Wolfgang Kromp, Institute of Risk Research (IRR), Austria.

10:30 – 12:00

Room: 4

W.1.4: Holistic Frames of Risk Management

Chair: To be confirmed

ID92 Holes
Integrated Risk Analyses to Drive Business Decisions
Seshu Dharmavaram; C. A. Soczek, E.I. du Pont de Nemours & Co., USA..

ID194 RM Intangible
Classifying corporate occupational safety cultures: lessons learned from six case studies in Germany and the UK
Horst Rakel, Motorola Corporation, Germany.

ID86 Early
Classification of concepts of accident scenario's
Nils Rosmuller; I. Helsloot, Dutch Inst. Fire Service Disaster Management, The Netherlands.

ID89 Holes
The requirements for holistic risk management
S. M. Macgill; Y. L. Siu, Univeristy of Leeds, United Kingdom.

13:30 – 15:00

Room: 1

W.2.1: Safety & Risk Culture I

Chair: To be confirmed

ID13 Holes
Safety culture: an integrative concept for managing risks? *Isabelle Fucks, The Belgian Nuclear Research Centre (SCK - CEN), Belgium; Michel Llory, Institut du Travail Humain, France.*

ID63 Integrate PP
Inherent Flight Safety vs Operating Safety Aspects *Giuseppe Quartieri, OMEGADATI Srl; Guido Alfaro Degan, Terza Università di Roma; Matteo Quartieri, Globallnet Srl, Italy.*

ID65 Holes
The 5S Technique for Small to Medium- Sized Businesses: A Risk Management Perspective *Sharon Wright; Alison Collins, Health and Safety Laboratory, United Kingdom.*

ID81 Early
Evaluation of operating experience for early recognition of risks *Heinz Peter Berg, Bundesamt für Strahlenschutz (BfS), Germany.*

13:30 – 15:00

Room: 2

W.2.2: Risk Management and Medicine

Chair: To be confirmed

ID155 RM Intangible
Bloody Work": Where is the risk on the hospital waste? *Graca Gonçalves; Jose M. Palma-Oliveira, University of Lisbon, Portugal.*

ID156 RM Intangible
Radioactive contamination of wild mushrooms: A cross-cultural risk perception study using World Wide Web. *Irina Druzhinina, Uni. Vienna, Austria; Jose M. Palma-Oliveira, University of Lisbon, Portugal.*

ID133 RM Intangible
Estimating quality-quantity risk trade-off value: Decision-making in hospital management *Fumiaki Yasukawa; Satoko Tsuru, Hiroshima-shi International University, Japan.*

ID140 Integrate PP
Consciousness difference between doctors-nurses on the medical information that affects the risk assessment of the ward *Satoko Tsuru; Fumiaki Yasukawa, Hiroshima International University, Japan.*

13:30 – 15:00

Room: 3

W.2.3: Risk Management of Catastrophes

Chair: Mojdeh Keykhah

ID56 Early
New Approach to early recognition of risks and rare events: The application of the theory of catastrophes and the mathematical modeling *Konstantyn Atoyev, Ukrainian NAS, Ukraine.*

ID57 Integrate PP
Elementary my dear Watson: On condition and cause in catastrophe risk *Mojdeh Keykhah, Univ. Oxford, USA.*

ID88 Integrate PP
Managing the risk of secondary traumatization for psychosocial helpers in catastrophes *Gernot Brauchle, Institut für Hygiene und Sozialmedizin, Austria.*

ID84 withdrawn

13:30 – 15:00

Room: 4

W.2.4: Risk and the Information Technologies

Chair: Fred Dolislager

ID53 Opening
Short term and long term management of a nuclear accident : a CD-ROM for the construction of a common risk culture between stakeholders and stake-seekers. *Hilaire Mansoux; A. Oudiz, IRSN, France.*

ID67 Early
Prospective risk recognition through Petri Net simulation and reachable-states analysis *David Vernez; G. Pierrehumbert, IOHS, Switzerland.*

ID34 Holes
IT-Operation Criteria Selection for Risk Analysis Support *Andreas Fischer, Univ. Applied Sciences, Zurich; Ralf Mock, Swiss Federal Institute of Technology; Frank Möhle, Univ. Applied Sciences, Switzerland.*

ID143 RM Intangible
Assessing websites for risk information and disaster preparedness *Bernd Rohrmann, University of Melbourne, Australia.*

Wednesday, July 24

16:00 – 17:30
Room: 1

W.3.1: Safety & Risk Culture II

Chair: To be confirmed

ID36 Holes
The psychometric qualities of the employee safety, health and environment questionnaire *Torbjørn Rundmo; Hilde Iversen, NTNU, Norway.*

ID131 Holes
Social aspects of risk management: Integrated perspectives after the first ten years *Konstantin A. Feofanov, Moscow State Technological University, Russia.*

ID78 Holes
Application of risk analysis technologies for optimization of administrative decisions in safety when for storage of irradiated nuclear fuel. *Vitaly A. Eremenko, ACTIS; Nina S. Yanovskaia, ICC "NUKLID"; Elean S. Shilova, IAES, Russian Federation; James G. Droppo, Jr., Battelle - PNNL, USA.*

ID134 Holes
MIRIAM : an integrated approach to organise major risks control in hazardous chemical establishments *David Hourtolou; E. Plot; F. Prats; A. S. Vince, INERIS BP2, France.*

16:00 – 17:30
Room: 2

W.3.2: Assessing Real and Perceived Risks

Chair: To be confirmed

ID4 Opening
Understanding Public and Other Stakeholder Perceptions of Risk During the Siting Process for a Waste Transfer Station (WTS) in an Urban Neighbourhood *Salim Vohra, London School H&TM, UK.*

ID27 Early
A formal approach to health risk assessment for cases of acute and chronicle exposure *Andrey A. Bykov, IndEcoExpert Ltd; Irina A. Pronina, Moscow State Univ., Russia.*

ID45 Opening
Seperate aspects of multifactorial consequences of the chernobyl NPP accident for children's population in ukraine *Elena I. Bomko, AMS, Ukraine.*

TBA

16:00 – 17:30
Room: 3

W.3.3 TBA

Chair: TBA

16:00 – 17:30
Room: 4

W.3.4 TBA

Chair: TBA

Posters

- ID26 Early
Competitive health risk model based on the mortality age-dependent model and population heterogeneity assumption. *Irina A. Pronina, Moscow State University; Andrey A. Bykov, IndEcoExpert Ltd, Russia.*
- ID136 Early
Conditions and development analysis for maximum environmental accidents at oil industry units. *Sergey G. Mironyuk, IndEcoExpert Ltd, Russia.*
- ID141 Early
Sensitive Factors Associated with Cancer Risk due to Inhalation Exposures to Volatile Organic Compounds in Drinking Water during Showering. *Mu-Rong Chao; Kuen-Yuh Wu; Louis Chang, NHRI, Taiwan.*
- ID66 Holes
Consumer exposure to chemicals widely used in personal care products: A scenario-based exposure assessment of polycyclic musk compounds. *Matthias Wormuth; J. Gauckler; M. Scheringer; K. Hungerbühler, Swiss Federal Institute of Technology Zurich, Switzerland.*
- ID68 Holes
Managing occupational risk in the health care facilities. *Grazia Petrelli; Caterina Vollono; Laura Lauria; Anna Maria Giannelli, Istituto Superiore di Sanità, Italy.*
- ID87 Holes
Decision Making and Bids in Construction Industry. *Renáta Heralová, Czech Technical University, Czech Republic.*
- ID74 Holes
Financial Provision of Emergency Risk Management. *N. P. Tikhomirov, G.V.Plekhanov Russian Economic Academy, Russia.*
- ID75 Holes
The Problem of Municipal Solid Waste in the Moscow Region. *Sergey G. Kharchenko; Boris B. Fomin, The Russian Academy of State Service, Russia.*
- ID76 Holes
Weighing ecological risk and environmental impact: Developing a holistic risk management strategy for wetland sediment remediation. *David W. Hohreiter, BBL Sciences, USA.*
- ID7 Integrate PP
Normative regulation of emergencies prevention on the design stage of potentially dangerous objects on the territory of Russian Federation. *Viktor A. Sovko; Eugeny A. Kozlov; Yuriy V. Alyoshin; Russian Ministry for Emergencies (Emercom); Andrew N. Yelokhin, Insurance Company LUKOIL, Russia.*
- ID62 Integrate PP
Chernobyl disaster and its ecological-genetic consequences through 15 years after - specialists' opinion. *K P. Checherov, RSC, Russia; A. I. Glouchtchenko, Ben-Gurion University, Israel; I. I. Suskov, Russian Academy of Sciences, Russia.*
- ID137 Integrate PP
Export transactions insurance instruments for Mid-East Europe. *Eugeniusz Sitek; Iwona Gorzen, Technical University of Czestochowa, Poland.*
- ID44 Opening
e-Risk management. *Claudiu Moldovan, MAPN, Romania.*
- ID145 Opening
Reduction of pollution using technologies and methods for identification, estimation and limitation of industrial risk. *Maria Dumitrescu; Roxana Elena Lazar; Ioan Stefanescu; Dan Trancota, Nat. Inst. Cryogenic and Isotopic Technologies, Romania.*
- ID274 Opening
Affected people's flood risk perception and local experience of disaster management. *Tina Plapp, University of Karlsruhe, Germany.*
- ID98 RM Intangible
Risk Modified Dynamic Model Creation. *Václav Beran, Czech Technical University, Czech Republic.*
- ID276 Integrate PP
Risk of Maritime Traffic Accidents at the Turkish Straits. *B. Gül Göktepe,, Turkish Atomic Energy Authority, Turkey.*

Posters may be shown over the entire length of the conference, but authors are expected to be at their posters during the Poster Break from 15:00 to 16:00 on Tuesday, July 23.

Abstract Index

ID4

W.3.2

Vohra, Salim; London School of Hygiene & Tropical Medicine

Understanding Public and Other Stakeholder Perceptions of Risk During the Siting Process for a Waste Transfer Station (WTS) in an Urban Neighbourhood

Community protest at the siting of technological facilities has been increasingly recognised. This phenomenon in expert and lay discourse has tended to be pejoratively described as NIMBYism. This is despite the fact that environmental impact assessment (EIA) experts during the siting process show that the environmental, health and other risks are low.

This paper describes a qualitative study exploring this issue during the siting process for a WTS in an urban neighbourhood in London, England. It shows that individuals and communities are intuitive, emotional and reasoned in their responses to such siting processes.

The objectives of the study were to describe how each stakeholder group perceived the risks and develop an understanding of why stakeholders held these 'risk worldviews'. A community profile, in-depth interviews with residents and expert professionals, observation at public meetings, some local media analysis and a systematic review of written public comments were undertaken.

Residents were concerned principally with the siting of such a facility in what they perceived as a residential neighbourhood that was already poor, neglected and degraded. Specifically, they were worried about the traffic consequences resulting from the operation of the WTS which they felt would generate increased air pollution and adverse impacts on the health of adults and children, along with a diminished quality of life from having a noisy, smelly and large industrial facility near their homes. They also felt a perceived lack of adequate consultation on the siting and design, a sense of not having all the information to make an informed judgement and of only being told the most favourable results from the EIA. There was also a feeling of powerlessness and being imposed upon among residents, and a sense that the local authority and the developer were colluding together for their own mutual benefit and to the detriment of the community at large.

A conceptual framework for understanding local residents and other stakeholders concerns was developed. This framework argues that there are three strands to understanding the concerns of local residents and other expert stakeholders to the WTS siting process: direct, process and symbolic concerns. While experts and EIA's deal reasonably well with the direct environmental, social, economic and health implications of potential developments and their siting they deal poorly with the process and symbolic concerns that communities have.

The direct concerns involve issues relating directly to the facility and its operation in the neighbourhood. The process concerns involve issues about the openness and participatory nature of the siting and planning process. The symbolic concerns involve three core issues: power, values and identity. Power involves questions of who has power to affect residents and exercise of power seen as legitimate. Values involves moral and ethical questions about fairness, equity and respecting communities. Finally identity concerns issues of personal and community identity and how the siting impacts on perceptions of and ideals about home and neighbourhood.

This study points to the need for EIAs and the planning process to incorporate the process and symbolic concerns that communities and stakeholders have.

Keywords: risk perception; public; stakeholders; EIA; planning process

ID5

T.2.1

Curbach, Manfred; Proske, Dirk; Technische Universität Dresden, Germany.

Risk of old bridges under ship impact

The major goal of the examination is a statement about the risk of old bridges under impact load of inland waterway ships. This question arose due to the expansion of rivers in Germany along with the increasing mass of the inland waterway ships.

Preliminary examinations showed, that a typical bridge is not stable under this imposed load relating to valid codes of practice. Because ship impacts are very seldom incidents it has been decided to prove the stability through a evaluation of the probability of failure. Therefore an extensive FEM-model were developed and connected with a Response-Surface-Algorithm (RSM) and different FORM (Rackwitz-Fießler, Hahnwald-Busch) and SORM (Breitung, Nielsen, Elishakoff) algorithms. It is known, that the Response-Surface-algorithm not always leads to satisfying results and therefore a second approach were installed. A genetic optimisation tool were included using the interim results of the RSM to develop another substitution of the limit state function. This substitution may be very complicated and other optimisation routines were used to evaluate the safety index. The use of special types of Monte-Carlo-Simulation were not possible due to the long duration of computation of the mechanical model. Because just special points of the model are subjected to the so far explained calculation, the individual probabilities of failure of this points have to be connected to give the system safety index. Different methods to evaluate boundaries of the system safety index have been used (Simple borders, Rackwitz borders, Ditlevsen borders and various methods to evaluate multinormal probabilities). After the evaluation of the probabilities the risk were calculated and compared to other risks, whether or not the risk is to high. This discussion is still in progress. The examination has been done for two bridges.

Keywords: ship impact; probabilistic calculation; response-surface-algorithm; bridge failure; risk

ID6

T.2.4

Yelokhin, Andrew N.; Tshovrebov, Yury V.; Insurance Company LUKOIL; Zaikin, Igor A.; JSC Industrial Risk; Yelokhin, Alexei A.; Moscow State University, Russia.

Safety reports: Integrated russian experience

One of the basic Federal Acts in the field of safety is Federal Act "About Industrial Safety of dangerous industrial objects" (1997). This Federal Act defines legal, economical and social principles of supply of safety exploitation of the dangerous industrial objects and is directed for the prevention of emergencies on the dangerous industrial objects and supply of availability of the organisations exploiting dangerous industrial objects, for localisation and liquidation of emergencies consequences. In the correspondence with Federal Act "About Industrial Safety of dangerous industrial objects" the document, which is named Safety Report (Declaration of industrial safety), must be prepared on each dangerous object. About 600 Safety Reports in Russia are prepared for this time, more than 200 are prepared by JSC "Industrial risk" (not only for "LUKOIL" objects - the enterprises for production, processing, realisation of oil and petroleum). Information concerning accidents in Russian industry for the last years is summarized in the paper. In "LUKOIL" the requirements for safety exploitation of the dangerous industrial objects and engineering designs are stricter than at any other Russian industrial company. Information about "LUKOIL" requirements for industrial safety and experience is resulted in the paper. For example, the final result of any Safety Report for "LUKOIL" dangerous industrial object is a special Program of Loss Prevention and Safety Promotion. In this Programs the following basic groups of measures (directions) are contained:

- The accumulation and analysis of the initial data on property of the industrial object, estimation of the replacement price of equipment;
- Estimation and forecasting of not planned losses, connected to occurrence of the responsibility before the third persons and business interruption;
- The accumulation and analysis of the data on industrial accidents and emergencies in the appropriate branch of industry;
- Quantitative risk analysis, development of the individual program of preventive measures;
- Creation of risk management system;
- Measures for system of insurance protection from accidents and emergencies.

Keywords: prevention; dangerous; industrial; risk; safety

ID7

Poster

Sovko, Viktor A.; Kozlov, Eugeny A.; Alyoshin, Yuriy V.; Russian Ministry of Emergencies (Emercom); Yelokhin, Andrew N.; Insurance Company LUKOIL, Russia.

Normative regulation of emergencies prevention on the design stage of potentially dangerous objects on the territory of Russian Federation

The European Community Directive 82/501/EEC became the basis for the system approach of emergencies prevention.

In Russia the problem of emergencies prevention become very acute after Chernobyl tragedy. Basic Federal Acts in the range of safety such as "About Safety of the population and territories from natural and technical Emergencies" (1994), "About Industrial Safety of dangerous industrial objects" (1997), "About Fire safety" (1994) and "About Safety of Hydraulic Engineering Structures" (1997) were accepted.

In the civil-engineering designs of potentially dangerous objects, for the solution of problems of emergencies prevention and decreases of hazards are stipulated two sections: the section "Environmental control" and the section "Measures for prevention of emergencies". An assessment of affecting of the harmful production factors on an enclosing environment and the measures of protection from the negative affecting of these factors are resulted in section "Environmental control". In section "Measures for prevention of emergencies" the information on district of location of the object (definition of possible zones of potential danger), designed decisions for prevention of technical and natural emergencies developed with the account of the potential danger of designed and acting neighbouring objects, outcomes of engineering surveys, assessment of dangerous climatic conditions, and also the designed decisions, directed for safety of staff of the potential dangerous objects and for the population living near these objects are resulted. In this section the outcomes of analysis of hazard are resulted, and this allows determining the probability of emergencies originating on the designed object and the scales of consequences of emergencies.

There is one more obligatory document, which permits to determine a level of risk for the staff of the dangerous manufacturing objects and for the population, living near to them. This document is - Safety Report (Declaration of Industrial Safety of the dangerous industrial object). Using foreign experience, Emercom initiated the procedure of working out of Declarations of Industrial Safety of the dangerous industrial objects in Russia. State Expertise of Emercom provides the control of fulfilment of the requirements, for the preventing emergencies conditioned by accidents, of all the types. The experience of the expertise procedure of the potentially dangerous objects on design stage and the expertise procedure of Declarations of Industrial Safety demonstrates that this procedures among other measures permitting to reduce a level of risk are the most effective.

Keywords: prevention; emergencies; expertise; safety; designs

ID8

T.2.1

Holický, Milan; Czech Technical University, Czech Republic; Schleich, J B.; University of Liège, Luxembourg.

Risk assessment for steel buildings and occupants under fire situation

Safety in case of fire is one of the essential requirements imposed on construction works by Council Directive 89/106/EEC, by new European documents (Eurocodes) and by International Standards [1,2]. It is shown that methods of risk assessment may provide useful background information to minimise unfavourable consequences of fire situations. Basic concepts of fire risk assessment for steel buildings and occupants are developed using available international documents and data [3,4,5].

Experience and available data however indicates that the probability of rare events as fire start and conditional probability of fire flashover given fire starts may be expected in a given building within a broad range depending on applied fire safety system. Similarly probability of structural failure and extend of possible injuries given fire is fully developed considerably depend on the system of structural protection and arrangement of escaping routes.

It appears that Bayesian causal (belief) networks supplemented by appropriate input data may provide an effective tool to analyse the significance of various characteristics of fire safety system to the resulting probability of flash over. Moreover Bayesian networks supplemented by decision nodes and a number of utility nodes (influence diagram) make it possible to estimate the expected total risk for both the buildings and their occupants.

The input data for influence diagrams consists of conditional probabilities concerning states of chance nodes and data describing possible consequences of unfavourable events including costs due to injuries. Submitted analysis clearly indicates that expected total risk depend significantly on the size of the building and on the application of various fire safety measures including arrangements of the escaping routes for occupants.

References

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- (2) [2] prEN 1990: Basis of Structural Design. (Transformation ENV 1991-1, 1994) Brussels, 2001.
- (3) [3] Holický M. & Schleich J.-B. 2000b. Estimation of risk under fire design situation. Proc. of Risk Analysis 2000 Conf., Bologna, 11/13.10.00, WITpress, Southampton, Boston, pp. 63-72, ISBN 1-85312-830-9.
- (4) [4] Holický M. & Schleich J.-B. 2001a. Modelling of a Structure under Permanent and Fire Design Situation. Proc. of Safety, Risk and Reliability -

Trends in Engineering. International Conference, Malta, 21/23.3.01, A.A. Balkema, Rotterdam, pp. 789-794, ISBN 3-85748-120-4.

- (5) [5] Holický M. & Schleich J.-B. 2001b. Probabilistic risk analysis of a structure in normal and fire situation including life safety. Proc. of the International Conference ICOSSAR 2001, Newport Beach, California, USA, to be published, 2001.

Keywords: Steel building; Rare events; Fire; Bayesian network; Risk assessment

ID9

T.2.4

Akhmedjanov, Farit M.; Krymsky, Victor G.; Ufa State Aviation Technical University, Russia.

Decision making for accidental risk management: Uncertainty level quantification

The paper considers decision making (DM) procedures oriented towards satisfaction of the requirement to decrease accidental risk level inside industrial areas. Such procedures belong to a group of the most important components created as the parts of regional risk management system.

According to its definition DM can be represented by some specific operations on the elements of alternatives set [1]. In relation to risk management problem such DM looks very often as hazardous plants ranking with respect to their hazard degrees [2]. In turn the ranking results become a basis for administrative actions as well as for financial resources distribution that aim to prevent accidents in future.

Detailed analysis of the plants ranking procedure shows that:

- I. this procedure must allow to accomplish multi-criteria choice of the plant with the highest degree of hazard (in the real world it is necessary to take into account accident probabilities and at least one consequence measure):
- II. plants performance comparison is usually implemented under the conditions of uncertainty (in particular, accident consequence measures also have random values and correspond to different distribution laws).

Of course, uncertainty influences the likelihood and correctness of DM process conclusions.

The authors propose to compute special cost functions (CF) estimating uncertainty level for each DM procedure. These CF are in fact entropy functions of the random variables system where both accident possibilities and consequences have been distributed involving accumulated statistic data or expert judgements [3]. Such approach provides further calculations so called "belief coefficients" whose values reflect a scale of decision maker's belief in likelihood of ranking results. If "belief coefficient" value is not large enough then it is recommended to collect more information on the plants to be compared in order to be sure that the final

conclusions are correct. In other words the correct ranking corresponds to acceptable level of uncertainty.

The ideas above mentioned have been applied to forming Hazardous Plants Register Placed in the Territory of Bashkortostan Republic (Russia). The paper outlines possibilities provided by this Register for DM support organization.

References

1. Lotov A., Bushenkov V., Kamenev G. Feasible Goals Method: Mathematical Foundations and Environmental Applications. - Lewston (NY, USA), the Edwin Mellen Press, 1999. - 400p.
2. Krymsky V.G., Zinoviev A.V., Yunusov A.R. Hazardous Plants Regional Register as the Basis for Risk Comparisons. - New Risk Frontiers, Proceedings of the Annual Meeting of the Society for Risk Analysis-Europe. - Stockholm, Stockholm School of Economics Publ., 1997. - P.234-236.
3. Krymsky V.G., Cooke R.M., Yunusov A.R. The Role of Expert Judgement in Hazardous Factors

Keywords: risk management; decision making; uncertainty quantification;

ID10

T.2.4

Krymsky, Victor G.; Krymskaia, Maria V.; Akhmedjanov, Farit M.; Ufa State Aviation Technical University, Russia.

Industrial risk regulation: Decision making support involving expert judgements

Industrial risk regulation becomes now the problem of the first priority for administrations in local areas of many countries. Such regulation in turn requires constructing a multi-functional system composed of "mechanisms" for risk assessment and management (like Safety Declarations of Hazardous Plants, Regional Register of Industrial Hazard Sources, etc.). Risk-based decision making (DM) can be considered as one of the main "chains" in a global regulatory system and as a necessary condition for reducing hazard level in relation to population and environment.

Meanwhile the most important specific feature that influences greatly the DM results is uncertainty caused by limited volume of information on the accident statistical data. This difficulty can be partly overcome by means of expert judgement involvement. There are a lot of situations where expert judgements are the only approaches for initial data elicitation but the DM results obtained are sufficient in a sense of quality [1], [2].

The paper describes the authors' experience in constructing DM support on a basis of expert judgement organization and treatment. The central idea is to form special risk measures (RM) totality that reflects different hazard characteristics on

one hand and provides desirable performances for expert judgement procedures on other hand. Such totality is built with respect to the following desiderata [3]:

- I. decision makers usually need a small number of RM that are able to characterize total accident picture (probabilities of accident scenarios, the number of possible deaths, the number of people to be injured and a damage to be expected);
- II. experts involved can give assessments for levels of hazard various types related with each plant (chemical hazard, fire or explosion hazard, radioactive contamination hazard, etc.);
- III. initial information submitted by industrial specialists for experts' consideration is represented mainly by technological characteristics concerning substances and their masses, regular wastes and pollution, equipment failures and current state, etc.

The authors have proposed to construct hierarchical (three-level) structure of RM totality where "upper" and "lower" levels are interconnected by the results of expert judgements. These results final treatment allows to obtain hazard generic level categories for the plants located in the considered area and to accomplish the plants ranking for DM support.

All positions of the paper are illustrated by the effects of their application to industrial risk regulation in the Republic of Bashkortostan (one of the largest industrial areas inside Russia).

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Keywords: risk regulation; risk measure; expert judgement

ID11

M.1.2

Kutttschreuter, Margôt;; Gutteling, Jan M.; University of Twente, The Netherlands.

Time will tell: Changes in risk perception and the processing of risk information about the inevitable approach of the millennium bug.

A field study was performed on the perceived risks related to the millennium problem. Two cross-sectional surveys were executed to study whether risk perception regarding the millennium problem, the perceived societal and personal capabilities to mitigate the risks, the attitude toward computers and the attitude toward the availability of information 10 months before 1-1-2000 differed from those a few weeks before this crucial date. Four hypothetical reaction patterns were distinguished, based on the possible psychological reactions to the nearing of the risk threat. Results showed a significant decrease in the perception of the risks, a significant increase in the perceived risk mitigation at the personal and societal level, a significant increase in the perceived awareness of the problem among the general public combined with a significant decrease in the need for information, and no change in the attitude toward computers. This combination of results was considered to fit best one of the theoretically distinguished reaction patterns. The applicability of our model to other risk areas is being discussed.

Keywords: Risk perception; millennium problem; denial; arousal; information transfer

ID12

M.3.2

Hardeman, Frank; Meskens, Gaston; Neerdael, Bernard; Veuchelen, Ludo; Gilbert Eggermont, SCK*CEN, Belgium.

Social Sciences in a Nuclear Research Centre: Dream or Reality?

The Belgian Nuclear Research Centre SCKoCEN this year celebrated its 50th anniversary: half a century of high level research in the nuclear field. In the first decades, periods of considerable scientific investments and technological success followed one another. Fifteen years ago however, a period of reorganisation with reduction in staff and budget started, stabilising ten years later. At present, the staff consists of 600 highly qualified employees (25 % university degree). We are now running two research reactors, hot cells, an underground research laboratory in the frame of waste disposal, and laboratories for different analysis purposes.

Till several years ago, research programs were essentially of technological nature. However, input from social sciences became a prerequisite in the whole decision-making process regarding nuclear activities. A first reason for broadening our scope is to better understand society, and to improve communication with stakeholders such as authorities, local population and media. Secondly, fairly new concepts such as 'sustainable development', 'the precautionary principle', 'dealing with genetic susceptibility', are requiring a transdisciplinary approach. Finally, the non-technical dimensions of nuclear emergencies and waste disposal gained importance and were included in order to improve our problem solving capacity.

After pilot initiatives dealing with law and liability, or economics, a program for the integration of social sciences has been launched, in the line of the strategic decision of the Board of Governors and Directors.

Many initiatives have been taken:

- Nomination of a program co-ordinator, reporting directly to the general manager;
- Recruitment of social scientists for PhD and postdoctoral theses enlarging through promotorships the network with the Belgian universities;
- Support of these research projects in the various departments under the guidance of international steering committees;
- Discussions of hot topics in 'reflection groups' composed of SCKoCEN staff and external experts, followed by e-discussions;
- Organisation of 'Topical Days' to make people more familiar with social sciences and humanities;
- Introduction of 'new' (for SCKoCEN) methodologies such as enquiries (on expert's culture or transgenerational ethics), focus groups (on safety culture), Delphi exercises (on sustainability);
- Onset of an ethical charter, involving a large participation of all SCKoCEN employees.

Recently, we broadened our scope, leading to contract work, to participation in networks and in particular, to contacts with the local population in the frame of nuclear waste disposal.

This paper aims at giving an overview of this program, focussing on the lessons learnt. Most of the initial goals have been achieved (definition of relevant research topics, enhancement of contacts with universities and openness, stimulating discussions and exchange of information). The reactions of the staff are very encouraging (large participation to enquiries, topical days). A broad discussion forum was created enlarging the scope to the real world outside the nuclear island. However, some difficulties were identified as well: lack of a common language; difficulties in assessing weaknesses and strengths in the methodologies used and in evaluating proposals; a too ambitious program; need for adequate training. Examples from the day to day experience will be given.

Keywords: social sciences; nuclear; integration; stakeholders

ID13

W.2.1

Fucks, Isabelle; The Belgian Nuclear Research Centre (SCK - CEN), Belgium; Llory, Michel; Institut du Travail Humain, France.

Safety culture: an integrative concept for managing risks?

This paper results from our reflection within the framework of the PhD research at SCK - CEN (Belgian Nuclear Research centre) in collaboration with the University of Liege. One of the aims is to make concrete the concept of safety culture within the scope of a specific organisation. The starting point is the IAEA report 75-INSAG-4, which describes a "theoretic model" of safety culture. What we

are doing is to face this model up to the reality of the SCK - CEN. It's the subject of our paper today. In a second time, we will try to put safety culture, at SCK - CEN, in relation with organisational factors because they represent a "new area of influence" for organisations.

After 15 years of research, only one consensus can be presented: safety culture is a broad notion. It is an abstract and multidimensional concept, which refers to something shared, stable and functional. Deep researches are needed in order to have a global view of safety culture in organisations. The knowledge about safety culture is important in order to exchange experiences and to appreciate "the own level of safety culture". Indeed, safety culture isn't quantifiable, we need some concrete and global examples to assess the own safety culture.

This paper will focus on the three components, which form the safety culture at the level of the staff (INSAG-4): questioning attitude, prudent and rigorous approach and communication. These three pillars, are explicit by a set of items. What is the practical manifestation of them?

The methodology is based on three phases. First, a period of observation, to collect examples of working situations in order to supply future discussion. During the observation, we noted some practices, which seem to be obvious for workers, which they do spontaneously. Second, discussions were organised according to the Focus Group methodology and third, completed if needed, by individual interviews. To reach the purpose, a specific interview technique was required for two reasons. First the topics were presumed difficult to express. Second, to make concrete these attitudes, it was necessary to go deeper than "perception" of workers. For achieving this, a "comprehensive approach" was adopted as a guideline for conducting the discussion.

These first results will be presented with a special focus on the sense of these practices, their role in relation with safety culture, the norm and the values, which support them. They will allow us to present safety culture as an integrative risk management because they tend to manage different risks of different nature.

Keywords: safety culture; organisation; focus group; comprehensive approach; practices

ID14

T.3.2

Langumier, Julien; ENTPE, France.

Urban air pollution in the regional press : A « dramatic » representation

Regularly some newspapers headline: "Lyon, the most polluted city in France". Actually, on the one hand the second major metropolitan area of France concentrates different pollution sources due to intense traffic, the presence of chemical industries and urban heating systems in winter. On the other hand, the topic of air pollution has turned out to be a media success which can explain to some extent this sensational headline. From a scientific viewpoint, many uncertainties

regarding measurements, sources and damage on human health help fuel the debate open to experts, officials, journalists and the population.

How can we explain the regional press focus on air pollution issues? The construction and the circulation of information through the press regarding a controversial subject reveal the nature of the representation of a risk such as air pollution.

Press articles are not a neutral mirror of the scientific debate and they reveal the journalist's influence that translates information into news to a sensational effect. The daily format makes the journalist state exceptional and punctual events whereas air pollution is a diffuse and continuous phenomenon. The pollution peak is a helpful element to sensitize public opinion because it presents the characteristics of the media event. Articles focalize on this technical construction and journalists produce a narrative similar to tragedy to give a sense to the alert coding. Headlines and photos constitute illustrative news that tells what science cannot affirm rigorously: air pollution is a life-threatening disease. This dramatic representation (in the sense of a drama) gives a commercial value to the topic and reveals media functioning, submitted to ever growing economic constraints. Air pollution does not create a real social conflict, but it does scare people, so it is news that mobilizes a broad based readership. Its media success and now its decline show the transformation of news into a product of mass consumption. This research is based on the analysis of a regional press corpus concerning the period from 1974 to 2000 and it represents a one-year study.

Keywords: Air pollution; sociology of the media; sociology of risk; social representation; Lyon (France)

ID15

T.3.2

Klempe, Hroar ; Norwegian University of Science and Technology, Norway.

Did people believe in the Twin Tower attack on September the 11th?

The title of this paper is rhetoric in the sense that it refers to a study Herta Herzog published in 1940 which was called "Why did People Believe in the 'Invasion from Mars'?". The occasion was the very special media event from 1938, which made people believe that an invasion from Mars really had happened. The study showed that the thirties was characterised by a nervous political and cultural situation, which made people believe in very many strange and unpredictable things.

When the Twin Tower attack in New York on September the 11th was broadcasted throughout the world, it was at least a real catastrophe that was shown. Thus it would be naturally to expect some similarities in the patterns of reaction between the two media events. The situation though has changed in very many respects through seventy years, not at least when it comes to the extent of the broadcasting network. While the radioplay reached out to the New York-citizens and some close neighbours, like Orange , New Jersey, in which the study of Hertzog

took place, CNN covers today almost the whole world. The McLuhanian prophecy from the sixties about the global village has definitely been fulfilled in a technical sense. The question is whether it has been fulfilled in other senses? Do the citizens around the world feel that a catastrophe in New York in 2001 concern them in the same way as the radioplay did concern citizens of Orange, New Jersey in 1938?

The study presented here is a survey made among undergraduate students in media research (N=153) and psychology (N=248) two and three days after the catastrophe, respectively (on September the 13th and 14th). The questionnaire was construed for the situation, and contained of six different sections: 1. Background informations, 2. When and where they did get informations about the catastrophe, 3. The immediate emotional reactions, 4. The immediate intellectual reactions, 5. The immediate ideas of consequences, and 6. the depth of emotional reactions. Section 3 to 5 was formed as a five points Likert-scale, whereas section 6 was formed as a seven point semantic differential.

The study revealed that the situation in 2001 is quite different from 1938. The immediate reactions recorded in this survey show a more or less flegmatic attitude when it comes to the consequences of the catastrophe. The emotional reactions, on the other hand, showed very deep felt harm and sorrow. This means that media events still seems to have very much emotional impact on the individual. But the short term effect does not imply any changes in the patterns of everyday acts. The latter might then be considered as a long-term effect of the catastrophe.

Keywords: Risk perception; media effects; emotional reactions; behavioral change

ID16

T.3.1

Degan, Guido Alfaro; Pinzari, Mario, Università ROMA TRE, Italy.

Risk evaluation: The noise exposure

The propagation of environmental noise is carefully considered in Italy, a high urbanised Country. This work deals a simply method for evaluate the noise risk. First of all a measurement technique and a simple prediction are used for establish the expectable noise level in gravel Mine in Central Italy. The first step is, indeed, the determination of sound power levels of noise sources using sound pressure as pointed out by UNI EN ISO n° 3746 (31/12/1997) with an enveloping surface over a reflecting plane. The model used for simulate the sound propagation is an adaptation of the method suggested in ISO 9613-1/2 1993 (E); the issues are compared with those measured and those obtained using the well-known method of the pyramid tracing (generation of triangular beams from the centre of the sound source).

At this point it is possible to follow two different ways: evaluate the exposure of each worker in the mine and risk connected, otherwise evaluate the noise pollution due to the sound emission at the boundary of the mining site.

The risk evaluation is obtained using the FAST (Functional Analysis Space Technique) method. It comprises the following phases:

- Realisation and elaboration of the PERT network.
- Individualisation of the Functional Spaces (presence of men).
- Individualisation and the space-time characteristics of the hazards.
- Value of any exposure to hazard with the calculus of the doses (equivalent personal level).

The noise pollution that the mining site produce can be evaluate using both the LEQ (good for stationary sounds) or SEL (the best descriptor of the noise from transient phenomena as blasting) indicators.

As an example of the results of the suggested method, the forecast and the measured values of the sound pressure level and doses are reported

Keywords: risk analysis; risk assessment; noise evaluation; workers exposure

ID17

T.2.4

Greenford, Brian; University of Limerick, Ireland.

Researching Risk

Risk management has been adopted by many different disciplines in reaction to the concern that society is now expressing about the risks that are faced. This was predicted by Ulrich Beck (1992) in Risk Society where he argued that society is now much more concerned with the distribution of risk than the distribution of wealth. Mary Douglas (1994) also has shown how each society decides what to fear and this is evident in the approaches that have developed to risk from engineers, bankers, and environmentalists. The case of insurance company claims handlers dealing with litigation risk will be used to explore a way of conceptualising risk from a holistic viewpoint.

If risk management is to be integrated and approached holistically a general understanding of the different approaches to risk needs to be explored and a means developed of researching risk from all perspectives. Renn (1992) argues that risk involves three elements that can be used as a guide to understanding different approaches to risk. These are:

1. The conceptualisation of uncertainties; that is how do we specify or measure uncertainty.
2. The scope of the negative effects; that is what are the undesirable outcomes?
3. The degree to which human knowledge reflects reality.

These three factors are a starting point which I will argue lead to the idea that risk can be considered at a number of different levels of social reality. Layder (1993) explores four levels of social reality from which an understanding of risk can be obtained. The first level is the self, that is the individual who is concerned about the risks that may be faced by themselves or others. At this level individuals will deal with risks based on their own psychological makeup. The individual will

conceptualise the uncertainties and decide what are undesirable outcomes. Thus a claims handler will have to make a decision concerning settlement of a claim. This self is influenced by interaction with others at a situated activity level. That is to say during discourse with others or in interaction either in considering risks or taking them a view will be formed about the nature of risk. In the case of the claims handler this will arise in discussion with third party solicitors or witnesses. These views are also affected by the setting in which the situated activity takes place. An organisation will have a view on the conceptualisation of risk and its outcomes which affects actions taken by the individual or during situated activity. For example lawyers are taking risks in proceeding with actions in the courts. The setting in which these risks are considered is the legal culture of the courts which affects the situated activity or, perhaps, negotiating settlement and the personal decision to dispose of a case. Finally the context or macro setting in which the risks are considered is important. Different societies have different views on risk or uncertainty (Douglas, 1994; Hostede, 1980). These four levels interact with each other and are more like a spiders web than levels. Throughout these levels though are incidences of power and history which also affect how risk is understood. The power of an insurance organisation as holder of finances can affect a solicitor in the approach to a case and the history of a particular case, injury or type of case will affect the manner in which the risk is viewed.

The approaches to social reality suggested by Layder and Renn's conceptualisation of risk based on his consideration of the views held by various disciplines should provide us with a holistic way of examining risk.

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Keywords: holistic risk; researching risk; litigation risk; categorising risk; levels of reality

ID18

M.1.4

Iversen, Hilde; Rundmo, Torbjörn; Norwegian University of Science and Technology, Norway.

Associations between driver stress, locus of control and risk behaviour in traffic

Projected increase in traffic and consequent congestion on the roads implicates driver stress as an increasingly important element of driving behaviour. In more severe reactions driving induced-stress can disrupt performance and reduce safety.

This study examines associations between self-reported driver stress and risky driving. Locus of control, measured by the Montag Driving Internality and Driving Externality scales (Montag & Comrey, 1987), were used in an attempt to predict both driver stress and risky driving. Data were collected from 2614 Norwegian drivers, drawn from the driver's licence register. They participated in a mail questionnaire survey carried out in year 2000/ 2001. The response rate was 50 %.

The principal findings were that level of stress related to aggression or frustration while driving were the most important factor in explaining variations in risky driving, but also Confidence and Alertness had significant effects. Level of stress explained a significant percentage of variance in risky driving behaviours related to violation of rules and speeding, as well as reckless driving. Subjects with an external locus of control experienced more driver stress than drivers with an internal orientation. There were also effects from gender and age on driver stress and risk behaviour. Older subjects experienced less driver stress and practised less risky behaviours than younger drivers. Women experienced more stress related to confidence and alertness than men, while men reported more risk behaviour in traffic.

ID19

M.1.4

Barthakur, Meenakshi; Norwegian University of Science and Technology, Norway.

Beliefs related to natural disasters and flooding. An example from Assam, India

The populations of the Third World countries have always been among the most affected by catastrophes, especially natural disasters and weather events like earthquakes, floods, droughts, storms, etc. The aim of this presentation is to highlight people's beliefs about natural disasters, especially flooding, and the relationships to religious values or beliefs. The state of Assam, which lies in the northeastern part of India, is extremely prone to flooding and thereby endangering the livelihood of the people and causing major losses to life almost every year. Data from a questionnaire study in the state of Assam is presented. Three samples participated in the study (n = 312), i.e. those who were (i) usually affected by flooding (the affected sample), (ii) not normally affected by flooding but residing in risk prone areas (the at risk sample), and (iii) not affected by flooding nor residing in risk areas (the comparison sample). The results showed e.g. that the respondents generally agreed that natural disasters, including flooding, are threats to them (personal/family as well as to people in the region), however the comparison sample gave the lowest mean value in this respect. The results also showed that people in the at risk sample, and especially the men, disagreed more often than others that natural disasters are caused by God's will, although all the respondents disagreed to some extent with that kind of perception. The participants usually indicated that

they were religious. The individuals in the affected sample prayed more often, and they were also significantly more superstitious. Females were overall more superstitious than males. Women in the affected sample were the most superstitious, followed by women in the at risk sample and the comparison sample. The role of religious and other kinds of beliefs in relation to catastrophes are discussed in the paper.

Keywords: natural disasters; beliefs; religion; risk perception

ID20

M.3.1

Eiser, J. Richard; University of Sheffield, Mathew White, UK.

Broad definitions of precaution: Public preferences and the case of mobile phones

The UK's largest review into the potential health & safety risks of mobile phones (IEGMP, 2000) concluded that enough uncertainty remained to warrant "a precautionary approach" to their use until further research had been carried out. To date, the UK government's response has been the recommendation of limited use while driving and by children and investment in further research rather than any new (cautionary or precautionary) legislation. We investigated public opinion on these issues using an 89-item survey questionnaire (N =1,320). Specifically, we wanted to know not only what the public's preference's for precaution were (as reflected in their desire for regulation) but also the underlying factors influencing their decisions.

Calls for at least some kind of regulation of mobile phone use by children (90%) were significantly higher than for adults (69%), although only 18% called for an actual ban (compared to just 3% for adults). However, while preferences for precaution were greater when the perceived likelihood of health effects was high, preferences were significantly lower when the perceived benefits were perceived to be high for both adults and children. In other words, calls for precaution, even for children, seem to reflect a consideration of both potential risks and benefits.

While 86% called for a total ban on the use of hand-held sets while driving (as well as 69% of those who reported using a mobile while driving themselves), only 34% (12% of users while driving) called for similar regulation of hands-free sets. In other words, most people intuitively believe (despite research to the contrary (e.g. Strayer & Johnson, 2001)) that the hands-free risks are significantly less than the hand-held risks. If we view the public as valued stakeholders in the risk debate then we must recognise that any regulation here, while cautionary in the opinion of 'experts' would be seen as precautionary in the eyes of many within this broader risk community.

In addition to a consideration of benefits, calls for regulation of base stations were equally motivated by issues of uncertainty about the potential aesthetic and economic (e.g. house prices) effects as by any uncertainty regarding health effects.

In other words, a precautionary approach may be invoked for a range of risks over and above health concerns.

The current research suggests that the public's approach to issues of precaution is complex. People are concerned about the uncertainty surrounding potential health risks, but they are also concerned about other risks such as uncertain economic costs and the potential loss of benefits that regulation implies. Furthermore, uncertainty should not simply be equated with 'scientific uncertainty'. Differences between public and scientific perspectives (in whichever direction) reflect a broader level of uncertainty and thus there may be a need for a more holistic conception of precaution than originally conceived.

Keywords: Precaution; regulation; mobile phones

ID21

M.2.4

Hassenzahl, David M.; University of Nevada, Las Vegas, USA.

Technical Limitations of Cost-Effectiveness Analysis

Comparing or prioritizing diverse risks using a common metric (e.g. cost-per life saved) is viewed by many as a useful role of government. The efficacy and wisdom of this approach, however, is by no means universally accepted. This paper evaluates the uncertainty in published cost-effectiveness estimates. The analysis suggests that calculated values chronically underestimate or ignore uncertainty, leading to spurious conclusions about efficacy of different policy choices. In addition, the estimates vary in absolute value, range of values and attention to uncertainty along disciplinary lines. This suggests that prioritizing risk management interventions using published values will be both methodologically and normatively suspect. This could have the unintended long-term effect of marginalizing the use of risk analysis in the policy making process. In contrast, propagating uncertainty and focusing on extreme (high cost and net-benefit) risk management options could simultaneously increase the acceptability of risk analysis as a decision making tool and improve risk analysis methods and information. Examples of well- and poorly-understood risks illustrate this effect.

Keywords: Cost-effectiveness; uncertainty; valuation; risk comparison; risk management

ID22

T.3.1

Malmén, Yngve; Nissilä, Minna; Raija Koivisto, VTT Industrial Systems, Finland.

Why ordinary hazard identification sessions commonly fail to reduce the amount of inconclusive knowledge about electrostatic hazards

All of us have experienced static electricity in one form or the other. In some cases, however, there is inconclusive knowledge about whether static electricity constitutes a hazard or merely a nuisance. In an industrial environment, the risk-

based decision-making concerning static electricity is far from straight forward. Indeed, too often fires and explosions have occurred due to inconclusive knowledge about electrostatic hazards.

As a result of the complexity of the phenomenon, static electricity is seldom considered in a comprehensive way when decisions on precautionary measures to tackle electrostatic problems are taken. Thus add-on safety solutions such as grounding or inerting are commonly used instead of inherently safer options. Based on the ideas of inherent safer processes and plant design, problems related to static electricity should be identified and removed at the earliest possible stage of process development. As not all electrostatic problems can be removed, a need to address these problems during the whole life cycle of a process remains, i.e. from the choice of the synthetic route to the decommissioning of the plant.

The intention of this paper is to follow the process from process development via plant design to plant operation in order to find out what opportunities there are to identify potential electrostatic problems as part of ordinary risk analyses. The authors selected hazard identification methods that already are commonly used by the process industry in Finland. The following risk analysis methods were used to assess the possibility to identify electrostatic hazards at different stages of the life cycle:

- Potential Problem Analysis
- Hazardous Scenario Analysis (HAZSCAN)
- A method for the classification of areas where explosive atmospheres may occur
- Hazard and Operability Study (HAZOP)
- Action Error Analysis.

The results presented are mainly from desktop studies, where the analysis group consisted of experts in risk analysis techniques, static electricity and process engineering. The results show that it, in principle, is possible to identify electrostatic problems during general hazard identification sessions. This seems to require, however, that the phenomena involved are well known by one or several persons in the analysis team. Inconclusive information also about the chemicals, the process, and the construction materials makes the work of the analysis team even more difficult. In order for the analysis sessions to be both successful and cost efficient, there seems to be a special need for the analysis leader to understand not only process technology and the risk analysis method used, but also enough about electrostatics to understand where in the process or plant design static electricity might cause problems and where it can be overlooked.

Some of the experiences of the studies described in this paper will be used in the development of a new method for the identification of electrostatic hazards and potential operational problems in a process environment. The paper therefore also presents some ideas that have been used as starting points for the development of

this method. Moreover, it discusses some hurdles that need to be overcome in order for such a risk analysis method to be generally accepted by industry.

Keywords: hazard identification; static electricity; inconclusive knowledge

ID23

W.1.2

Rothstein, Henry; London School of Economics and Political Science, UK.

Neglected Regulation: the institutional attenuation of risk

The social shaping of the perception of risks to human health and safety has received much academic and policy attention in recent years, with greatest attention paid to lay public perceptions of risk. Many of those accounts conventionally contrast 'irrational' lay perspectives against assumed models of 'rational' bureaucratic expertise. Yet studies within a diverse range of literatures, including institutional design perspectives, public choice approaches, socio-legal studies and bounded rationality models, suggest that bureaucratic worldviews and behaviours are shaped by a range of institutional factors. This paper, therefore, turns attention to the social shaping of regulatory officials' perceptions of risk. In particular, the paper considers the extent to which the perceptions of risk by officials monitoring and enforcing risk regulation are aligned with regulatory requirements, and, if not, what factors explain those perceptions. Moreover, the paper considers the impact of officials' perceptions of risk on policy processes and outcomes.

The paper draws on detailed studies of three UK risk regulation regimes that have been marked by serious underperformance in monitoring and enforcing regulatory compliance. Those regimes are: occupational exposure to radon; chemical migration from plastics food packaging; and, BSE related controls on specified bovine offal. Empirically, the first two case studies draw upon a range of primary documentary sources and in-depth face-to-face interviews with relevant state officials and business representatives, whilst the third case study draws on evidence gathered for the Phillips inquiry into BSE.

Analysis of those regimes suggests that conventional accounts that contrast 'rational' bureaucratic expertise against 'irrational' lay perspectives can miss the institutional 'irrationalities' that shape officials' perceptions of risk and associated behaviour. In particular, the analysis suggests that complex risk regulation regimes are vulnerable to a phenomenon of 'institutional risk attenuation', whereby a host of institutional factors can combine to diminish the perception of risk by officials monitoring and enforcing risk regulation. Those factors include policy and scientific expertise deficits, buck passing, institutional size and fragmentation, multiple regulatory cultures, technical-legal problems, internal political pressures and dysfunctional external relationships with regulatees. Furthermore, the case studies show how institutional risk attenuation effects can result in officials neglecting monitoring and enforcement duties. The paper concludes that risk regulation regime

design needs to pay greater attention to institutional risk attenuation effects if future regulatory failures are to be avoided.

Keywords: Regulation; Institutional Attenuation; Risk Perception

ID24

M.3.4

Bickerstaff, Karen; Simmons, Peter; University of East Anglia, United Kingdom.

Space, power and public constructions of risk: a case study of the foot and mouth disease outbreak in the UK

In this paper we develop an analysis of the social production and deployment of spatial constructions in the lay public's talk about risk and risk management practices. Our discussion centres on a major issue which recently forced itself onto the 'risk' agenda, namely the UK foot and mouth disease outbreak, and is viewed through the discourses of people in two communities differentially affected by the crisis, and in themselves very different spaces and places. We begin with a brief history of the crisis and the risk management response of science and government before moving on to say a little about the research methodology and the selection of the place study areas.

In the main discussion we review some of the key spatial constructions people invoked in three arenas of sense making; assessing risk, the causes of the outbreak and risk management practices. To develop our analysis we also draw upon certain theoretical ideas about the relations between power, knowledge and risk. Implications are developed relating to the spatial constructions of risk embedded in science and government, stressing the need for a more open, responsive system of expertise that engages and includes the identities of place – and confronts the attendant inequities of power and knowledge.

Keywords: Foot and mouth disease; space and place; power; social construction;

ID25

M.1.3

Kross, Wilhelm K., Value Risk, Germany.

Obstacles to Holistic Risk Management in the Energy Sector

Price hikes and credit turbulences in US power trading in 1998 obliged energy companies and stakeholders to admit that effective risk management is not trivial. The recent Enron collapse added publicity, triggered wide-spread criticism, allowed stakeholders and politicians to call for additional control and higher levels of transparency, but did not contribute to solving problems. Unavoidable difficulties relate to the diversity of and the high levels of specialisation required in energy sector risk management activities, ranging from

- real-world generation/transformation/transmission/distribution operations using short and long term system and environmental/health risk management techniques; to
- permitting of hazardous waste management facilities using long-term performance analyses and sophisticated risk communication and group decision making techniques;
- financing and operation strategy development and scheduling of capital intensive facilities using probabilistic cash flow modelling and real-option valuation techniques; and/or
- sophisticated cross-commodity energy and weather derivatives trading using a combination of systems and portfolio risk management techniques to cope with extreme short-term volatilities and poorly understood correlations in markets with limited liquidity;

to mention some extremes. The breadth and depth of risk management techniques and approaches used, combined with the impact of short-term market volatility and the lack of reliable longer-term information, is unparalleled in other industries. Even more obstacles have arisen in recent years through the influence of competitive forces in drastically changing natural, commercial and regulatory environments. As a consequence, and to some extent as an accelerating factor, the energy sector has become the focus of attention of fleets of consultants and academics, regulators, banks, insurances, investors interested in mergers and acquisitions, brokers, software product developers, and stock exchanges, to mention a few.

Since most commonly practiced risk management techniques were not criticised beyond usual levels before Enron's bankruptcy, one may conclude that by and large, although not formally specified in a code of practice shared across continents, system and environmental risk management techniques have reached an elevated degree of public acceptance. Furthermore, market and credit risk evaluation techniques, successfully applied in banking and investment management for years, yield insufficient grounds to accuse energy sector companies of mismanagement - although it is recognised that the conversion of techniques from other industries introduces a poor understanding of energy sector risk factors and introduces excessive workloads if poorly managed.

So what may need to be tackled in response to the wide-spread criticism of risk management in the energy sector, is the multidisciplinary integration of effective measuring, analysis, monitoring and management techniques to address the combination of operational, credit and market risk factors exposing companies and stakeholders to undesirable consequences. Intransparent risk/return management strategies, intransparent trading strategies (hedging vs. speculation, risk taking behaviour correlated to business success fluctuations), and poorly understood capital allocation and pricing processes, are likely to become predominant focuses of management and stakeholder scrutiny. Risk management infrastructure supporting

informed management decision making and improving transparency for stakeholders, must ensure the seamless integration of work processes and procedures in both trading and real-life operations management, with data management software, forward curve builders, fundamental analysis tools, volatility and correlation estimators, commodity pricing software, scenario simulation and optimisation software, information support software, scheduling software, settlement systems, exposure analysis, and key management figures reporting. Beyond reactively addressing stakeholder requirements, appropriately designed and implemented risk management infrastructure investments may become a business enabler.

Keywords: Energy Sector; Risk Management Techniques; Computer Applications; Holes in Holistic Risk Management

ID26

Poster

Pronina, Irina A., Moscow State University; Bykov, Andrey A.; IndEcoExpert Ltd., Russia.

Competitive health risk model based on the mortality age-dependent model and population heterogeneity assumption

The paper deals with introduction of probabilistic approach to health risk assessment as a continuation of populations' mortality research. Generalized age-dependent mortality model was taken as a basis for elaborating competitive health risk model, presented in this paper. Population was considered as heterogeneous aggregate with different sustainability to external risk factors' burdens. Genetic, accidental and connected with ageing components were proposed as a competitive in health risk model. Decomposing of typical curves of age-dependent death rates to specially selected net-probability distribution functions allow to point out principal competing mortality risks. The well agreement of proposed model predictions with the statistical data is demonstrated on the mortality data of Russian population. Preliminary analysis of dynamical tendencies of parameters, reflecting genetic harm, net-life-time, etc. leads us to the conclusion that developed general probabilistic model could be a good basis for planning future studies, connected with thorough investigation of environmental risk model component for acute and chronicle exposure; dynamical analysis of different types of environmental exposures influences; introduction of environmental risk equivalent factors; estimation of complex environmental influence on human health.

Keywords: competitive risks; mortality age-dependent model

ID27

W.3.2

Bykov, Andrey A.; IndEcoExpert Ltd; Pronina, Irina A.; Moscow State University, Russia.

A formal approach to health risk assessment for cases of acute and chronicle exposure

The influence of contaminated environment to human health is acting together with different competitive risk factors: transport and other accidental and violent causes, social stress factors, organism internal features, genetic harm luggage and some others. The application of competitive risk model principals was realized in formalized health risk assessment methodology, presented here. Health consequences caused by various exposure factors (especially by carcinogenic contamination of environment) were analyzed. Cases of acute and chronicle exposure were considered. Approach advantages were demonstrated by opportunity of taking into account: time delay of impact and consequence manifestation; easy comparisons of exposure factors with different nature and various consequences; social and environmental components in overall mortality. The approach was tested on Russian demography and environmental data, comparison with analogous EPA approach was made. The application prospects of the methodology and the results obtaining on its basis for different application are discussed.

Keywords: risk assessment; acute and chronic exposure

ID28

T.1.2

Mai, Stephan; University of Hannover; von Lieberman, Nicole, University of Hannover, Germany.

Risk Analysis within Integrated Coastal Zone Management

The most essential hazard for the coastal zone of Germany is the storm surge. Thus an analysis of the risk is the basic part of Integrated Coastal Zone Management (ICZM). Within this framework risk is defined as the product of the probability of a storm surge and its consequences for the coastal zone (see e. g. PLATE AND DUCKSTEIN, 1988). This paper will focus on the direct economic consequences in the hinterland in case of failure of the coastal defence system, e. g. dike breaches. The probability of storm surges and subsequent failure of the coastal defence system is derived on the basis of the statistics of water levels and winds recorded approximately since 1850. These statistics are transformed using numerical models of tide and wave hind-casting in order to derive the statistics of loads on the coastal defence system (MAI AND VON LIEBERMAN, 2000). Comparing the loads with the resistance of the coastal defence system, e. g. parameterised by the ge-ometry of the different defence elements, like dikes, storm surge barriers or quay walls, the probability of failure is calculated. In order to determine the economic consequences the area flooded in case of failure of the coastal defence system is calculated by numerical modelling (MAI AND VON LIEBERMAN, 2001, Fig. 1). Using the digital landscape model of the Institute for Land Survey of Lower Saxony, Germany, the uses affected from flooding are estimated. The economic value of the different land uses are derived disaggregating county statistics on dwellings,

livestock, industry, and agriculture. An example of the total property asset is given in Figure 1 for the city of Bremerhaven located at the estuary mouth of the Weser. The paper to be presented will also put focus on the city of Bremen as well as on the city of Brake, both located at the Weser estuary.

The results on failure probability and economic consequences as well as the maps of risk zones are included in the interactive Risk Information System Coast - RISC (VON LIEBERMAN ET AL., 2001) as shown in Figure 1. Thus RISK provides a tool for decision makers within Coastal Zone Management.

Keywords: **Integrated coastal zone management; storm surge; failure of dikes; flood zone; values at risk**

ID29

T.3.3

Schmidt, Markus R.; Gázsó, André; University of Vienna, Austria.

From Biodiversity to Biodemocracy ? - Release of Genetic Modified Organisms (GMOs) and Uncertainty

The impact of biotechnology on the environment is discussed in the case of the release of genetically modified organisms (GMOs) and their possible medium and long term effects on biodiversity. As no medium and long term studies are available for GMOs, a comparison with data from invasive species and their impacts on local biodiversity, e.g. hybridisation with native species or in extreme cases extinction of the native species, is carried out. A special focus is put on the risks of the release of transgenic crops in their centers of agrobiodiversity, such as corn (*Zea mays*) in Central America or cassava (*Manihot esculenta*) in northern South America.

Scientific investigations show that uncertainty remains about the biodiversity effects of GMOs, as well as about other environmental, health and socio-economic effects. The question of how to cope with the uncertainty is answered in a different manner by the involved stakeholders representing their particular interests. The discussion about the release of GMOs seems to be a surrogate conflict between stakeholders with different values and philosophies. The paper questions our democratic capability to resolve this and further similar conflicts without revealing and accepting the underlying values.

Keywords: **biodiversity; GMOs; uncertainty; stakeholder; values**

ID30

T.2.2

Knogge, Thomas; Yu, Inhi, Universität Bremen, Germany.

scientific risk construct: economic aspects

"Regional Economic Risk and Response Analysis of Climate Change Impacts (REcoACT)" is the economic subproject within the General Project "Climate Change Impact and Preventive Crisis- and Coastal Protection-Management on the German North Sea Coast" (KRIM). Within this joint frame, the objective of this

subproject is: first to analyse the primary and secondary economic impacts of a flood event caused by climate change at the German north-west coastal zone, secondly to help the joint calculation of the risk of a flood event by developing theoretical water depth/damage functions, and thirdly to analyse cost and multiplier effects of possible coastal protection strategies.

1921 Frank H. Knight first suggested that risk and uncertainty might be relevant for the economic analysis: He used the expression risk referring to situations where the decision-maker can assign mathematical probabilities to the randomness which he is faced. Whereas uncertainty is used in situations when this randomness cannot be expressed in terms of specific mathematical probabilities.

REcoACT uses the following perspective of natural disasters: Natural events become hazards if the possibility of the loss of life or loss of assets exists - but they become "just" risks if the freedom of decision exists. Therefore the damage depends not only from the natural conditions but also from the early warning system, the policy of settlement or the protection construction - things which are results of decision processes.

Within REcoACT risk is defined as result of the dot product of the failure probability of a defence system and the consequential damage due to this failure. Hence the risk is measured in units of the damage which could be the loss of life, the loss of capital stock, loss of employment or loss of production due to the loss of the capital stock. Therefore the economic perspective distinguishes the stock oriented risk (capital stock, life) from the flow oriented risk (production, employment).

Keywords: **climate change; economic risk analysis; stock oriented risk; flow oriented risk**

ID31

M.2.1

Siegrist, Michael; Universität Zürich, Switzerland; Earle, Timothy C., Western Washington University, USA; Gutscher, Heinz; Universität Zürich, Switzerland.

Trust and Confidence in the Applied Field of EMF

Trust is an important factor in risk management. It affects judgments of risk and benefit, and, directly or indirectly, it affects acceptance of technologies and other forms of cooperation. There is little agreement among researchers, however, as to how trust in risk management should be studied. Many researchers seem to be atheoretical with regard to trust.

Based on a comprehensive review of the trust literature we propose a "dual-mode model of social trust and confidence." Trust and confidence are separate, but, under some circumstances, interacting sources of cooperation. Trust is based on value similarity, and confidence is based on performance. According to our model judged value similarity between the observer's currently salient values and the values attributed to others determine social trust. Thus, the basis for trust is the belief that that the person to be trusted would act as the trusting person would. The

interpretation of the other's performance influences confidence. Confidence can be based on formal record keeping, contracts, control systems or other indicators of past performance. This division of information, although central in studies of impression formation, has been overlooked in most studies of trust and confidence in risk management contexts. We hypothesize that trust information tends to dominate performance information. By "dominate" we mean that, to an observer, morality information is more important and that it conditions the interpretation of performance information. For example, given positive morality information, negative performance is judged much less harshly than it would be if the morality information were negative. According to our model, both social trust and confidence have an impact on people's willingness to cooperate (e.g., accept antennas emitting electromagnetic fields in the neighborhood).

Our model was tested in the applied context EMF risks. Data from a random sample of 1313 Swiss citizens were collected. The telephone survey yielded a response rate of 42%. Structural equation modeling procedures were used to test the plausibility of the postulated dual-model of social trust and confidence. Results indicated that the proposed model fits the data very well. The practical implications of the results will be discussed.

Keywords: Risk perception; EMF; trust; confidence; mobile phones

ID32

T.3.4

Gerrard, Simon; Cox, P.; Niewöhner, J.; Pidgeon, N., University of East Anglia, UK

The use of mental models in chemical risk protection - the need for multi-method evaluation

Comparing expert and lay knowledge to inform risk communication using mental models is a well-established methodology that has been described in a series of publications over the last decade. The approach has been developed further in the context of chemical safety communications, employing a qualitative, "bottom-up" analysis of interview data to acquire a broader understanding of user views. Here we present the results of an integral part of that methodology - multi-method evaluation as a means of furthering the comprehensive understanding and integration of user knowledges and beliefs. Our objective was to evaluate the methodology's success in eliciting and prioritising safety messages that are both substantively and contextually relevant to occupational chemical users.

The first part of the project employed lay-expert mental modelling techniques to elicit gaps and misunderstandings in user models. The communication content prioritised on the basis of this modelling was incorporated into a simple communication tool. The second phase, reported here, evaluated the suitability and relevance of this communication using verbal protocols, questionnaires and user evaluation groups.

The results show that protocols and questionnaires were able to demonstrate difficulties in comprehension of structure and wording. The user evaluation groups delivered findings more strongly related to the particular occupational context within which users were operating. Important issues surrounding self-efficacy, job satisfaction and operational aspects were found to act as crucial barriers to information uptake.

Our conclusions are three-fold: (1) Evaluation is a necessary part of any audience-centred communication design process as it validates the initial design as well as delivering additional information. (2) Evaluation procedures should employ a range of methods as more deliberative tools such as user groups add significant value to the more structured methods of protocols and questionnaires. (3) Audience-centred communication that actively seeks to include stakeholders/seekers in the design process leads to more relevant communication. Opening up this element of risk management to more deliberative methodologies that are able to deal with the complexities of intuitive or lay knowledges appears to be a crucial step towards innovative communication solutions.

ID33

T.2.2

Lange, Hellmuth; Saalfrank, Marion; Wiesner-Steiner, Andreas; University of Bremen.

Climate Change, Political-Administrative Regulation and Coastal Protection "PAS"

Today, coastal protection decisions are risky decisions under a multiplicity of uncertainties, mangling society and nature. As part of the interdisciplinary KRIM project, the PAS-subproject seeks to improve our knowledge about the climate sensitivity of socio-economical systems and their need to cope with climatic change. The development of measures dealing with coastal protection takes place within a framework of political processes, where political-administrative systems (PAS) are allotted a key role.

In our session, we want to address the following issues: What new kinds of societal conflicts can we expect due to scientific scenarios of climate change? What challenges for PAS-actors and other stakeholders involved in coastal protection emerge out of those scenarios?

In order to develop a dense understanding of PAS-structures and actions dealing with coastal protection, we apply two different perspectives: (1) To come to grips with the complexity of heterogeneous institutional and actor constellations, we perceive the PAS as a multi-level-problem. (2) To identify the main risk assumptions and to specify what we label the "political-administrative risk-construct", we use discourse analysis. With that we not only conceptualise coastal protection measures as risky decisions taken under uncertainty about expected

damages but analyse the risk assumptions that are used as "obligatory passage points" for political-administrative decisions and actions in the form of discourses.

We thus want to present a first "map" or profile of the main discourses, risk-assumptions and risk-practices of PAS-actors dealing with coastal protection at the German North Sea coast. Based on empirical research (expert-interviews), we examine (A) how different risk-assumptions, routines and organizational actions are currently employed in the field of coastal protection, (B) how the main discourse-variants look like and (C) how they are distributed across different actor groups inside and outside the PAS.

By means of integrating our findings into the KRIM-DSS, the planned discussion of scenario-based coastal protection measures together with PAS and non-PAS actors will be our next step towards an integrated management of coastal protection and risks.

Keywords: Climate Change; Risk Management; Governance; Coastal Protection

ID34

W.2.4

Fischer, Andreas; University of Applied Sciences, Zürich (HSZ-T); Mock, Ralf; Swiss Federal Institute of Technology; Möhle, Frank; University of Applied Sciences, Zurich, Switzerland.

IT-Operation Criteria Selection for Risk Analysis Support

The risk analyses methodology of IT-networks is in its early stages of development and propagation. Simplicity and practicability (i.e., "quick & dirty" approaches) mark the analysis techniques in use. As an effective IT-network operation must take a multitude of operation parameters into account, a sophisticated risk analysis methodology is also dealing with a multi-criterial approach.

Recent research activities of HSZ-T and ETHZ extract the most relevant IT-operation and risk criteria from case studies in specified branches (telecommunication, banking, application service, and university) and best practice standards (e.g., IT-Baseline Protection Manual, BSI). The Open Systems Interconnection Reference Model (OSI model) structuring an IT-network in functional layers as well as the principles of unified software development and programming (e.g., using Java) give further support in search of important criteria. This review process resulted in a list of about 350 criteria. In a next step, these criteria are ranked referring to risk analysis purposes and positioned as layers within hierarchical trees. Level A criteria indicate highest importance (e.g., threat, natural disaster, and failure) and major branches of hierarchical trees. You will also find most of the high level B criteria in common risk analyses and trees (e.g., administration, monitoring, and vulnerability of hardware). Level-C (medium) and D-criteria (low) refine the structure of a tree up to a basic level. This classification

scheme simplifies the rapid creation of master logical diagrams (MLD) that is a hierarchical tree technique widely used in risk analysis of technical systems. Each level indicates a hierarchic layer of a MLD. In depending on the top level of a MLD, each layer is specified by a subset of dedicated criteria. This approach will be exemplified by case studies.

Within a specified level, the criteria can be grouped to different "families", e.g., (failure of system) components and failure causes. Then, the criteria subsets within two families are used for spanning a matrix. In this case, each component failure is correlated to a number of potential failure causes. This approach is finalized by a screening procedure rejecting nonsensical combinations. As the combination of criteria also creates unexpected results for IT-network operators, the matrix widens the imaginativeness at brainstorming meetings. The results give direct input information for established risk analysis techniques, e.g., FMEA (Failure Modes and Effects Analysis). Again, case studies are used for exemplification purposes.

Although the usage of significant IT-labeling criteria is methodological simple, it supports IT-network risk analysis. It bears in mind the constraints of a highly dynamic and changeable industrial branch. Due to the authors' experiences, the time horizon to undertake risk analysis is usually limited on about three up to six months. There is also a strict demand for highly applicatory techniques. These boundary conditions usually prevent sophisticated system modelling and analysis, detailed risk analyses, etc. On the contrary, simple methodical aids generally enables IT-network operators to perform risk analysis for the first time.

Keywords: IT-Criteria; Fast System Screening; Reliability; Master Logic Diagram; Hierarchical Trees

ID36

W.3.1

Rundmo, Torbjørn; Iversen, Hilde; Norwegian University of Science and Technology.

The psychometric qualities of the employee safety, health and environment questionnaire

The aim of the present paper was to determine the reliability and validity of two questionnaires to be used to measure employee assessments of health risks and occupational hazards in the industrial company Dyno Nobel. The study was initiated because the Company intended to include evaluations of safety, health and environmental issues into their risk management system. A total of fifteen plants participated in the main study and about 1100 respondents replied to the questionnaire. A random sample of employees at all the plants was asked to fill in the questionnaire. The reliability was tested separately for both the versions of the questionnaire. The results showed that the reliability of all the indices included in both the questionnaires was satisfactory. Because both the versions of the questionnaire consist of the same fifteen indices we could examine discriminant and

criterion-related validity by using the entire material. The discriminant validity was good. All the indices were moderately correlated, however, not too strong. There were also as hypothesised plant differences in the employees' SHE-assessments. Self-reported risk behaviour and safety status were used as criterion variables and the criterion validity of the other indices was tested and found to be good. Direct as well as indirect effects of the predictor variables were tested. The predictors were Organisational Factors and Safety Attitudes, Attitude towards Accident Causation, and Employee Risk Judgements. In total we were able to explain about 40 percent of the variance of the criterion variables. The questionnaires are now a regular part of Dyno Nobel's risk management system.

Keywords: risk perception; safety attitudes; organisational factors; occupational safety

ID37

M.1.4

Klempe, Hroar; Rundmo, Torbjørn; Iversen, Hilde; Norwegian University of Science and Technology, Norway; Heieraas, Harald; The Norwegian Society for Road Safety; Nikolaisen, Karsten; Authority of Public Roads in Nordland County, Norway.

The effects on traffic safety attitudes and behaviour of a safety campaign among adolescents

During the last few years the frequency of fatal injuries caused by traffic accidents has increased in Norway and this is a threat to public health. Young drivers and their passengers are high-risk groups and accidents amongst adolescents reduce the years of living more than most other threats to human health. Therefore, the Norwegian Authorities of Public Roads prioritise to find measures aimed at reducing the number of health injuries caused by adolescent risk taking in traffic. The present paper shows some results from an intervention study aimed at evaluating the effects of measures implemented to promote adolescent safe driving behaviour. The recipients were adolescents in a Norwegian county aged 18 years (n=182). The intervention was made up of six groups. In four of the groups an attitude campaign was implemented. Not all aspects of attitudes towards traffic safety are important predictors of behaviour. Therefore, the countermeasures of the campaign were implemented based on our results of multivariate analyses of associations between safety attitudes and traffic behaviour based on two survey materials amongst representative samples of the Norwegian public (n=2600) (see Iversen and Rundmo, 2001a,b, 2002a-c). In the other groups behaviour modification with positive reinforcement was applied. There was a change in self-report behaviour, attitudes towards traffic safety and risk perception when the group of respondents replying to the questionnaire before exposed to the measures was compared to those who did so after. Multivariate analyses also showed significant associations between risk perception, risk-taking attitudes and driving behaviour.

ID38

W.1.2

Walls, John; Pidgeon, N.; Weyman, A.; Horlick Jones, T., University of East Anglia, UK.

Social Trust in UK Risk Regulators: The Role of Practical Reasoning Strategies in the Formation of Public Attitudes

Concerns with the public perceptions of risk regulators has increased over the last decade, particularly in relation to an organizations trust profile in its target population or the public at large, with low trust seemingly impacting negatively upon the public's uptake of risk communication material. Furthermore, understanding how people negotiate attitudes and experiences toward risk regulators is vital to the process of developing meaningful democratic decision making structures.

Drawing upon quantitative and qualitative data generated from a project designed to map and benchmark trust in the UK Health and Safety Executive I will examine the practical reasoning strategies deployed by lay actors in negotiating and constructing attitudes toward risk regulators. As part of the process of tapping into public perceptions of HSE, the research team was interested in assessing HSE's 'trust profile' in comparison with other institutions of government and state whose remit included forms of risk regulation broadly conceived. The data will suggest that there exists remarkably wide differences in the trust profiles. In particular different trust rankings will be shown to relate to a range of factors; perceptions of track records of performance and openness, public interest, direct and mediated experiences of the individual as well as the broader cultural and political profile of risk regulators. In terms of public perceptions of HSE, workplace experience was related to knowledge of the inspection function of HSE although most people were not aware of its broader regulatory role and as an information provider. The paper also reports differences in attitudes toward HSE between manual, non manual workers and the self employed. Knowledge of risk regulation also appears prone to be affected by high profile incidents and accidents and general service issues. For example the particular signature of rail safety in the UK impacted negatively upon trust in a context of low prior knowledge.

Particular emphasis will be placed on attitudes and experiences which are articulated and reconciled through the operation of lay practical reasoning strategies. The reconciliation of often contradictory information and experiences is often not resolved in the context of everyday life. It will be shown that absence of firm knowledge about specific risk regulators will be mitigated by a range of practical reasoning strategies, lay heuristics and broad politico-cultural sentiments. Public attitudes are rarely worked through in the context of everyday life and are often ambivalent and accepted by individuals as partial. Knowledge is not assessed

according to its consistency but whether or not it is useful and whether it 'works' in the context of everyday life. The Implications for 'public' involvement in decision making will then be discussed.

Keywords: Practical Reasoning; Every day Life; Risk Regulators; Social Trust; Health and Safety Executive

ID39

T.3.1

von Grote, Julia; Hürlimann, C.; Scheringer, M.; Hungerbühler, K., Swiss Federal Institute of Technology, Switzerland.

Scenario-Based Risk Assessment Comparing Occupational Exposure to Perchloroethylene and Trichloroethylene in Metal-Degreasing Over the Last 30 Years

The aim of this study is to develop a method that is able to describe the risk through occupational exposure to perchloroethylene (PERC) and trichloroethylene (TRIC) used in metal-degreasing depending on the changes in legislation and machine technology. PERC and TRIC are both suspected to cause cancer in humans. Germany was chosen as model country because the German 2nd federal air pollution regulation has fundamentally changed over the last 30 years and is today among the strictest worldwide. The risk is described in terms of how many workers are exposed and to which extent. What have been the key factors for the long-term development and what is the remaining risk today?

Modeling is needed since there is very little measured exposure data providing detailed information on the applied technology in the past. Therefore, the method "Scenario-Based Risk Assessment" (SceBRA) originally developed for different solvent applications was adapted to metal-degreasing. In SceBRA different scenarios for possible exposure situations are defined to describe this broad and heterogeneous field. The scenarios are defined by parameters describing different technologies of degreasing machines, different machine sizes, various emission sources, the variety of cleaned metal pieces, and by factors describing the workplace surrounding. For the vicinity of the machine (near field), as well as for the far field, airborne concentrations are calculated with indoor air mass balance models. The risk is characterized by the ratio of the airborne concentration and the effect level, and by the number of exposed workers.

Metal-degreasing machines are classified in five machine types, starting with fully emissive open-top machines, followed by encased machines with electro-cooling and suction device, and finally modern hermetically closed one-working-chamber machines with closed loop drying systems and refrigeration-cooling where no exhaust air is released. The combination of the various parameters leads to up to 2000 scenarios for each machine type. These scenarios cover the spectrum of all possible occupational situations for normal use. Model consistency could be shown by comparison with measured airborne concentrations.

SceBRA is a method capable to describe the exposure risks caused by widely and variably used chemicals. For metal-degreasing it could be shown that the tightening of environmental laws together with technological innovations have reduced the exposure risk substantially. The solvent consumption of PERC and TRIC has been reduced by more than 87% since 1986 because of closed-loop technology, rationalization and substitution with other solvents. This has led to a decrease in the number of exposed workers from 47'000 in 1985 to around 5200 today. Finally the occupational exposure has significantly been reduced particularly due to hermetically closed machines where the cleaned parts are only accessible when the chamber concentration has dropped below 1g/m³ after drying.

Keywords: risk assessment; occupational exposure; indoor air modeling; metal degreasing

ID40

T.2.3

Rusanen, Timo; University of Kuopio, Finland.

Trust as a prerequisite of low risk perception in relation to biotechnology: case Finland

According to the results of two recent Eurobarometer surveys (1996, 1999), public attitudes towards biotechnology in Finland appear to be a special case among the countries of the European Union (EU). Although the level of public understanding of biotechnology in Finland is relatively high, public attitudes to biotechnology and the forms of public participation are different from those in other similarly knowledgeable, technologically advanced European countries. In particular, trust is very high and risk perception very low in relation to biotechnology. These attitudes are even more characteristic than in the more agrarian countries of southern Europe.

This question is based on Eurobarometer surveys and further analysed with extensive Finnish data drawn from focus groups, a longitudinal media corpus (1973-1999), and a longitudinal biotechnology policy analysis (1973-1999).

It is suggested that pragmatic attitudes towards modern technology and relatively low risk perceptions, as well the high social trust in relation to biotechnology in Finland reflect culturally specific aspects of Finnish economic, social, political and cultural history.

The Finnish people apparently trust the political decision-making process and the administration in charge of the implementation of the laws and regulations. The experts have inherited the same trust that public officers developed long ago in Finland's history being allied with the people against the foreign administrative authority. In contrast to people in some other European countries, the Finnish public feel that experts know and will inform people whether applications are safe or not. This fact is reflected in the development of the special Finnish biotechnology legislation and the public discussion connected with it.

The role of NGOs and other informal actors has been rather limited, although their influence appears to be increasing and has been encouraged by the state. Partly due to the close bound between the state and the civic society, the NGO's have been highly institutionalised and rather close to the formal (state) sector. A civic society has existed in Finland in the form of associations and club activities at a lower level than in Central Europe.

All these factors make Finland a top-down society and leads into difficulties in integrating the various stakeholders into the societal decision-making. This approach is different to the one based on an active initiative of the civic society in Central Europe.

Keywords: risk perception; perceived trust; models/methods for public participation; social history; Eurobarometer

ID41

M.3.1

Lofstedt, Ragnar; King's Centre for Risk Management, UK.

Swedish chemical regulation: Implementing the precautionary principle.

This paper focuses on the use of the most radical form of the precautionary principle (reversed burden of proof) as applied to Swedish chemical regulation. In the first half of the paper I explain why it is so important to examine Swedish chemical regulation, focusing among other things on Sweden's role in drafting the EU Chemical White Paper and the country's push for a toxic free society 2020. In the second half of the paper I look at a few examples of how the precautionary principle has been implemented in practice: namely the reduction of pesticide use on Swedish farms by almost 75 percent over a 10 year period and the gradual phase-out of Swedish boat owners' use of antifouling paints. I conclude the paper by arguing that one can use the reversed burden of proof of regulation if the various peak actors agree that the goal of regulatory intervention is to reduce the use of chemicals as much as possible.

Keywords:

ID42

T.1.2

Schuchardt, Bastian; BioConsult; Schirmer, Michael; Universität Bremen, Germany.

Climate Change, Risk Constructs and Coastal Protection: Aim and Approach of the interdisciplinary Project KRIM

Background: The German climate research program DEKLIM demands in its focus "Climate Impact Research" to provide integrated orientation- and action-taking know-how on the impacts of climate change. At the German North Sea coast especially the aspect of accelerated sea-level rise and future coastal protection is highly relevant. Therefore BMBF is funding the joint research project KRIM

(Climate Change and Preventive Risk and Coastal Protection Management on the German North Sea Coast).

Aim: The joint project KRIM aims at providing know-how for the societal future task "risk management in coastal protection under climate change conditions" giving special attention not only to natural, engineering and economic sciences, but also to the processes of perception, communication, interpretation, organisation and funding. Conflict potentials, decision making structures and possible solutions will be analysed.

Approach: Within the KRIM project the consequences of an accelerated sea-level rise and intensified extreme incidents (formulated as climate scenarios for the year 2050) and of jointly developed possible adaptation measures for the natural and the social structures will be analysed. Geographically the examination of 8 representative coastal situations within the Weser-Jade-Region in Northern Germany is the main focus.

For the various disciplines involved risk analysis or a contribution to risk analysis is a major issue. Therefore a common understanding and handling of risk has been worked out, focussing on the identification of a scientific, a political administrative and a public risk construct. Identification of the main aspects of each and of the relationships between these 3 risk constructs is forming a major part of the interdisciplinary research process as well as their integration within a Decision Support System .

Structure: To achieve this complex objective a consistent combination of different scientific disciplines has been brought together in an integrated research concept following a top-down approach. The following sub-projects (abbrev. titles) are taking part in the joint project KRIM:

- "Hydrodynamics and Morphology" (GKSS-Research Center Geesthacht)
- "Coastal Protection" (University of Hannover, Franzius-Institute)
- "Ecology" (University of Bremen FB 2, Dept. Aquatic Ecology)
- "Regional Economic Risk Analysis" (University of Bremen FB 7)
- "Political Administrative System" (University of Bremen FB 1, artec)
- "Climate Change and the Public" (Research Center Juelich, MUT)
- "Integrative Analysis and Decision Support System" (BioConsult Bremen, University of Bremen FB 2, Dept. Aquatic Ecology in cooperation with Infram Marknese and RIKS Maastricht).

Decision Support System (DSS): A html-based decision support system for the coastal protection management will be developed during the course of the project as a methodological instrument for the integration of the interdisciplinary research process, as a tool for integrative risk analysis and as a tool for the public discourse on the handling of climate change impacts.

Keywords: Climate Change; Integrated Risk Analysis; Integrated Risk Management; Coastal Protection;

ID43

M.3.2

Charron, Sylvie; IRSN; Mays, Claire; Brenot, Jean; IRSN, France.

Social representations of uranium mining residues

For many years, social scientists have sought to understand public concerns about nuclear energy and radioactive waste. Factors determining public attitudes in regard to nuclear waste (high-level nuclear waste storage and disposal facilities) are now well known. Comparatively little research has concerned the low-level radioactive waste from uranium mill tailings, which represent a significant amount of wastes in mining countries.

Our qualitative study fills this gap by focusing particularly on individual and social representations of uranium mining residues. The study is conducted by IPSN and Symlog and is partly funded by the French Ministry of Environment.

An extensive literature review yielded a conceptual model and interview guide. Six themes are hypothesized to structure representations of both nuclear waste and uranium mining residues: Matter (physical forms of the waste, its production, etc.); Place (impact of the presence of radioactive waste in local geography and culture); Duration (social and technical implications of the long term); Trust (competence, credibility, openness, reliability, integrity, impartiality, responsibility of players, institutions); Ethical concerns (value systems, justice, inter- and intra-generational equity; models of democracy); Management options (storage depth, reversibility, decision making processes, etc.).

Some fifty million tons of uranium mining residues are found in France's former mining regions in landscaped surface storage deposits. We report semi-directive individual and focus group interviews with thirty residents of Limousin in central France, who are neighbors to now-closed uranium mines and their storage areas.

Uranium mining residues are situated on a semantic continuum stretching from the uranium content of the Limousin geology and soil, to mining residues, to depleted uranium, to nuclear fuel and fuel waste, to Chernobyl fallout: all these forms are discussed by interviewees. This continuum, rather than indicating an error of understanding, corresponds to an integrative life-cycle view of issues involved in the use of radioactive materials for power generation. Sense of place is addressed in recall of how the uranium mines brought 50 years of prosperity to a poor area, and the coming to grips with physical and social changes introduced in residents' landscape. Issues of the long-term are explored in concerns over possible health impacts of the stored wastes, in a rich representation of scientific and societal uncertainty.

Historic lack of transparency in managing mining wastes (including contaminated equipment) places a heavy handicap upon confidence in institutions. Perceived contradictions between assurances of insignificant risk, and the numerous precautionary measures around stored residues, reduce credibility. Delivering the

"bad news", or considering in an open way the possible negative impacts of these waste materials, might restore it.

Hosting uranium waste storage is seen by some as an ethical counterpart to former mining prosperity. A sustainable development ethos guides views of duty to future generations. The moral duty toward current generations is seen not only in public health protection, but also in active public information.

Residents call for a clear institutional structure ensuring neutral monitoring of environment and health impacts, and for a role in identifying issues of primary concern.

Keywords: Risk perception; social representation; long-lived radioactive waste; uranium mining residues; qualitative study

ID44

Poster

Moldovan, Claudiu; MAPN, Romania.

e-Risk management

Risk management can and must be a valuable environment for optimizing decision making processes by providing a proactive attitude instead of a reactive one and by assuring knowledge delivering instead of just information collection.

This paper tries to underline a possible framework for implementing strategies for managing e-risks at a corporate level, by analyzing every aspect at five levels: systemic, structural, cognitive, functional and technical.

ID45

W.3.2

Bomko, Elena I., Academy of Medical Sciences of Ukraine.

Seperate aspects of multifactorial consequences of the chernobyl NPP accident for children's population in ukraine

The most major technogenic catastrophe of a nuclear source - an accident at the Chernobyl NPP - took place on 26, April, 1986. A special cohort of survivors was formed - those were individuals having been children at the moment of the accident, e.g., born in 1972-1986.

It was established that growth of pathologies of thyroid gland, iron deficiency anemias, gastrites and duodenites, vegetovascular dystonia, disruptions of physiological functions of psychogenic etiology are taking place.

Factorial analysis was implemented. It was established that thyroid irradiation dose level was from 0.3 to 22 Gy; summary internal and external irradiation dose was from 10 to 120 mSv for 12 years. It was revealed by a dispersion analysis method that fraction of radiation factor in formation of level of morbidity indices was from 2% to 20%.

Territorial differences were revealed. Countermeasures introduced for diminishing of internal and external irradiation doses became impact factors, besides others, after the accident. These are different limitations: consumption of food products from private husbandries (vegetables, fruits, milk, meat); stay in open air (ban for usage of forests and water basins); and also travel of children for sanitation on "clean" areas (leaving family). It everything promoted the fact that during several years non-balanced diet, deficiency of proteins, especially of animal origin, vitamins and microelements, excess of carbohydrates, psychoemotional tension had taken place.

The factors distinguished are not specific for pathology revealed. Unipath of operating of their impact however led to growth of morbidity indices for children's population included to the category of survivors of the Chernobyl NPP accident.

Keywords: Chernobyl NPP; children; morbidity; factors; unipath of operating

ID46

M.1.2

Gasparski, Piotr; Polish Academy of Sciences, Poland.

Situational factors and unrealistic optimism about disaster estimations

The paper examined the effect of situational impact on unrealistic optimism. The survey included 400 respondents. A questionnaire contained items concerning respondents own experiences with disaster, observed situations with other people, and probability of future disaster. A strong effect of unrealistic optimism was confirmed. Results indicated limitations of the phenomenon related to the individual experience with disaster. The more salient experience the lower the level of unrealistic optimism.

Keywords: unrealistic optimism; disaster; subjective probability

ID47

T.3.4

Gurabardhi, Zamira, Gutteling, Jan, University of Twente, The Netherlands.

The Interrelation between the Internal Organisational Processes and External Risk Communication

This paper focuses on the interaction between the private sector organizations in the Netherlands and their external stakeholders. More specifically we look at the internal organizational processes that play role in the effectiveness of external risk communication, as well as at the way external risk communication influences internal legitimacy of corporate's risk communication.

A few studies in risk communication research have investigated how organizational factors affect corporate's dialogues with risk stakeholders. Based on a limited number of case studies, the results of that investigation open the way for further research, in order to provide insight into or predict other companies' risk communication efforts.

Our data analysis is based on a survey of (risk) communication professionals and (risk) managers of more than 200 companies in the Netherlands, defined as "risky companies". The paper investigates the interaction by focussing on a series of factors, including the role of the perceived threat, the organizational structure, the link between Risk Management and Risk Communication, the organizational culture and the organizational learning.

Keywords: Risk Communication; Internal (risk)communication; External (risk)Communication

ID48

M.1.1

Gutteling, Jan M.; Gurabardhi, Zamira; Kuttschreuter, Margot; University of Twente, The Netherlands.

The Growth and Development of Risk Communication through an Analysis of the Literature in the Field

Risk communication during the years has shown its vitality and has proved its importance as a field of research. This paper looks at the literature of Risk Communication research to examine its growth and the characteristics of its development.

The data for the analysis come from a coded information over 70 attributes of more than 400 citation of published articles. These were selected from the articles matching the keywords related to Risk Communication in ISI Web of Science, in its indices: Science, Social Science and Art & Humanities Citation Index.

The Content analysis shows the amplitude of the publication in years, issues the risk communication research is focussed on, the most involved authors, etc. An important place is given to the development of thinking in Risk Communication, based on the evolution of two perspectives: technical approach and democratic approach.

Keywords: Risk Communication; Development of Risk Communication; Technical Approach in Risk Communication; Democratic Approach in Risk Communication

ID50

M.1.2

Böhm, Gisela ; PH Ludwigsburg, Germany.

Temporal Discounting in Environmental Risk Evaluation

Decision research has shown that delayed consequences are discounted in their subjective significance compared to immediate consequences. It is thus assumed that environmental risks are evaluated as less serious if their consequences are delayed. This effect is expected to interact with the risk's perceived causal structure. Thus, two determinants of environmental risk evaluation are investigated: the

causal structure of the risk and the time perspective of potential harmful consequences.

Three types of causal structure are distinguished: (a) anthropogenic risks that endanger only nature, (b) naturally caused risks with potential harmful consequences for humans, and (c) anthropogenic risks that may harm humans. Time perspective refers to when potential consequences are expected to occur. It is assumed that a risk's perceived causal structure determines the intensity of ethical evaluation whereas time perspective of consequences affects perceived risk. Both evaluative aspects are assumed to elicit specific emotions and behavioral preferences. Two hundred and seventy participants took part in an experiment where scenario information about environmental risks was provided. The scenarios differed with respect to causal structure and time perspective. For each scenario, subjects evaluated the event's morality, perceived risk, the intensity of specific emotions, and their preference for prospective actions. Factor analyses yielded three types of emotion (ethical, loss-based, and helplessness) and four types of behavioral tendencies (help, aggression, escape, and indirect / political action). Causal structure turned out to be more influential than time perspective. The implications for the evaluative process and the mediating role of emotions are discussed.

Keywords: Risk Perception; Environmental Risks; Temporal Discounting; Ethical Evaluation; Emotion

ID51

T.3.2

Hocke-Bergler, Peter; Forschungszentrum Karlsruhe, Germany.

Media Resonance and the Collective Action of Experts in the Conflict of Nuclear Waste Management

Disputes about the use of large-scale technologies often develop into "conflicts", in which uncompromising positions oppose each other. A process of finding a common understanding which would allow for decisions leading to an adequate solution of the problem, often cannot be imagined during this type of conflict. The confrontation about final disposal sites for nuclear waste in Germany is an example for this type of conflict. Since the end of 1998, the red-green federal government has tried to break up this stalemate situation, for example by the search for and development of forms of deliberative politics. A special commission of experts (called "AkEnd" for "Arbeitskreis Auswahlverfahren Endlagersuche / Working Group for defining selection procedures for a final nuclear waste disposal site") was established to help the federal government to solve the open question of final storage of radioactive waste. Supporters and opponents of nuclear energy are members of this commission. The Institute for Technology Assessment and Systems Analysis (ITAS) of "Karlsruhe Research Center - Technology and Environment" supports the AkEnd with an evaluation study within the framework of the project "Communication of experts in the conflict on nuclear waste management". As part

of this study, ITAS analyses the resonance of the topic of "nuclear waste" in German mass media and some selected specialised journals. By using time series data generated by quantitative and qualitative content analysis ITAS tries to find out which issue attention cycles have dominated the discourse about nuclear waste management in the years 1997 to 2002. Special attention is given to the question to which extent the AkEnd commission's attempt to integrate the participation of citizens in the deadlock political decision-making process is mentioned in the media. If it is accepted that organizations near to the government should serve to defuse conflicts, especially the media play an important role in framing the problem and preparing collective decisions with binding character. As preliminary results of the study show the AkEnd has so far not been sufficiently successful in influencing the debate in the media about nuclear waste management. The controversy about Germany's phasing out of nuclear power and its consequences is largely overlaying the reporting on the search for a final nuclear waste disposal site.

Keywords: nuclear waste management; deposit of nuclear waste in Germany; content analysis; nuclear waste deposits in the mass media

ID52

T.3.4

Petts, Judith; University of Birmingham; Horlick-Jones, Tom; Cardiff University School of Social Sciences; Murdock, Graham; Loughborough University, UK.

Questioning Social Amplification: Learning about Risk Communication

This paper will present the findings of a major project to examine the role of the media in the amplification of risk issues. The study focused on five different risk issues: air pollution; genetically-modified (GM) food; train accidents; the Millennium Bug; Radon. The research tried to respond to the heterogeneous but also still largely stratified nature of the UK media. It combined a quantitative content analysis of the reporting of risk and qualitative analyses of the language and imagery used. It also analysed how lay public respond to specific reporting.

The paper will discuss the primary results that show the media organisations shifting to address people as consumers. The 'popular' orientation of certain segments of both the press (particularly the tabloids) and the television news emphasises lay experiences and initiatives and gives precedence to lay voices. There is a tendency to personalisation of explanations of risk events, looking for individuals as the cause. There is a very powerful use of visual images, and a preference for reporting of risk issues that are already familiar and the anchoring of them in the deep-seated fears and anxieties which are part of popular expression and images.

The media are not transmitters of official information on risk as suggested by the linear social amplification framework, but dynamic interpreters and mediators, who seek to respond to and reflect social preferences and concerns and in so doing stake and maintain their position. They are not a 'single black box'. They can only

amplify or attenuate risk if they capture or resonate with an existing public mood, and even then the media are not alone in this function.

Importantly the lay public are not passive recipients of media messages but sophisticated and 'media-savvy' users; they understand hype and sensationalism when they see it, they recognise the 'badges' and styles of the media which they consume and the impact of these on the information being presented to them; they turn to specific media when they want information on important and serious issues or to verify facts.

The paper will discuss the implications of the findings for best practice risk communication. In particular the need for design-based and user-centred communication. The media will be discussed as an opportunity rather than a problem.

Keywords: media; risk perception; social amplification; risks reporting

ID53

M.3.2

Mansoux, Hilaire; Oudiz, A.; Institut de Radioprotection et de Sûreté Nucléaire, France.

Short term and long term management of a nuclear accident : a CD-ROM for the construction of a common risk culture between stakeholders and stake-seekers

The management of a nuclear accident involves many actors apart from the radiation protection and nuclear safety experts, such as the emergency services, the local authorities. An efficient involvement of these stakeholders requires a good understanding of the safety and radiation protection aspects of the different steps of the management of a nuclear crisis: what is the nature of the accident? What are the expected releases? What is the potential exposure of the population? What are the various short term and long term countermeasures (sheltering, stable iodine intake, food banning, environment remediation, etc.) and what is the rationale for their implementation? In addition, there are also neighbours of nuclear installations (inhabitants, local associations and commissions, local political representatives) that would be impacted by a nuclear accident and thus wish to be informed and associated to the emergency preparedness process.

In order to contribute to building progressively a common nuclear risk culture between the already active stakeholders and the new stake-seekers, the information about the accidental risk and its management needs to be clearly presented and offered to the debate. Hence, IRSN decided in year 2000 to elaborate a specific feature providing an opportunity for better information and debate.

A CD-ROM is currently being elaborated by a multidisciplinary task group, taking into account:

- the « social expectancies », as they have been identified by a sociologist,

- the existing documents about the nuclear risk, the crisis and its management, which were analysed. The analysis shows that there is a need for a new type of feature.

The CD-ROM will contain first a common bulk, which addresses all types of nuclear accidents:

- general considerations about radiological risks,
- general considerations about the types of accidents which can occur in a nuclear installation the associated releases and the actors that would be involved,
- exposure pathways of man and environment,
- health and medical dimensions of a nuclear accident,
- short term and long term countermeasures,
- post- accident management.

The CD-ROM will contain also specific developments for each type of accidents occurring in different nuclear installations, namely nuclear power plants:

- potential radiological consequences of the accidental release,
- implementation of short term countermeasures and their related efficiency,
- efficiency of post-accident countermeasures and remediation actions.

This complete picture given by the description of accidents, their consequences and the protective actions is a very innovative dimension of the project, and is made to show the very large and complex interactions in time and space between the many actors that would be involved.

Specialists in CD-ROM design are involved in the project. It is very important to design the structure of the CD-ROM in such a way as it presents the technical information in an understandable and attractive manner for non-specialists and in various ways.

This CD-ROM, which should be widely distributed and will serve as a support for debates, may contribute to building up progressively a common risk culture. It should help to aim at a better mutual understanding between experts and lay people whose points of view about the nuclear risk management need to be properly taken into account. This should tend to improve the risk management strategies, short and long terms.

Keywords: nuclear accident; accident management; information and debate; CD-ROM; risk culture

ID54

M.1.3

Morand, Pierre-Christian; Zurich Insurance Company, Switzerland.

Zha methodology - A powerful tool

The Zurich Hazard Analysis (ZHA) was developed to systematically identify, evaluate and manage industrial, commercial and entrepreneurial risks. Its ability to reveal risks makes it one of the most powerful risk analysis tools.

The approach of the ZHA corresponds to that of the inductive methods. The ZHA is a methodical, forward-looking search for potential accidents and losses. The analysis attempts to identify hazards, investigate their triggers and effects, and evaluate them on a relative basis. It provides criteria which serve as a basis for the decision-making processes necessary for the optimum management of risks. Risk-reducing measures can be developed in accord with the risk policy and with due consideration given to the company's financial resources. With the ZHA, a company make all the key decisions himself: he determines the gravity of the risks identified, and he also decides what level of risk he's prepared to tolerate. This level of involvement increases risk awareness and builds confidence in the results of the analysis, making it easier to develop tailor-made risk reduction measures.

The ZHA is team-based and relies on the in-house expertise of a company. The people most knowledgeable about the product, process or components to be analyzed are selected to participate as team members. A team leader is needed to facilitate the ZHA process.

The ZHA has been used successfully employed by various industries to identify and manage all types of risks. The power of the ZHA can be described as follows:

- **Simplicity:** A ZHA project can begin immediately because team members only require minimal training.
- **Efficiency:** A ZHA takes less time than other hazard analysis methodologies, because it focuses on risk(s) that have been defined as 'intolerable'.
- **Visibility:** A graphical depiction of the Current and Target Risk Profiles lets 'see' the results of implementing the improvement actions.
- **Proficiency:** The team-based nature of the ZHA brings together individuals who have first hand knowledge and expertise of the scope of the analysis.
- **Flexibility:** The ZHA can be applied across a wide range of industries, and at any phase of a process, project, or product life cycle.

The ZHA-NT 3.0 Software is the new support package for the risk analysis methodology of that name. The software (3.0 Standard) follows in the footsteps of its predecessor, so that existing features have been retained or improved. Furthermore, there are enhanced exporting and filtering capabilities, multi-language and editing functions, among others.

A major development is the 'consolidation' feature of the ZHA-NT 3.0 PRO software, that allows to merge any number of hazard analyses and categorize each scenario with risk 'keywords'. For example, by location, area of risk such as 'strategic' or 'operational', and type of risk (as subcategories). The 3.0 PRO version will generate statistics and produce dynamic graphs and charts of selected categories and type of risks.

Keywords: ZHA - Zurich Hazard Analysis; Risk Identification; Risk Profile; Software - ZHA-NT 3.0; Risk Management Process

ID55

T.2.2

Hahn, Bernhard; Research Institute for Knowledge Systems BV; de Kok, J. L.; University of Twente; Bakkenist, Sander, INFRAM International b.v., The Netherlands.

The KRIM Decision Support System - Policy Support for Integrated Coastal Protection and Risk Management

The expected accelerated sea level rise as well as the increased probability of extreme events requires us to explore various policy options suitable to counter these problems and to develop integrated risk management strategies for the German North Sea Coast. To achieve this, it is essential to gain a holistic understanding of how the coastal system behaves under these circumstances.

The interdisciplinary research agenda of the KRIM project is designed to develop such an understanding by integrating the data, knowledge, and models from the participating disciplines. A Decision Support System (DSS) for integrated coastal protection and risk management, which will be developed as part of the KRIM project, plays a key role in this effort.

During the project the development of the DSS will contribute to the formulation of the relations between processes and disciplines and therefore stimulate interdisciplinary research. These relations are needed to enable the development of an integral model, which is at the core of the DSS. Building such a model is scientifically as well as technologically a challenging and innovative task, because it involves in-depth study of an adaptive complex system and the development of methodologies and computer-based tools to simulate its behavior.

By means of the model, the DSS will represent knowledge from many different, but interrelated, disciplines (e.g.: hydrodynamics, morphology, ecology, economy, risk-management, social sciences, etc.) in a network of interdependent processes. Especially the combined representation of physical and socio-economic processes in a truly dynamic system, make the decision support system useful for both interactive exploration of the decision space and as a facilitating tool in a participative policy-making process.

After the project, the DSS will serve as a methodological instrument for the integrative analysis and as a tool for the awareness building, learning and public discourse on the handling of climate change impacts. It will allow developing integrative assessments and proposals for a precautionary handling of the impacts of the global climate change on the German North Sea coast.

Keywords: Climate Change; Coastal Protection; Integrated Risk Management; Policy Support

ID56

W.2.3

Atoyev, Konstantyn; Ukrainian National Academy of Sciences, Ukraine.

New Approach to early recognition of risks and rare events: The application of the theory of catastrophes and the mathematical modeling

The events of September 11, 2001 attract attention to the problem of early recognition of risks and identification and ranking of critical factors, which determine rare events realisation. Indeed, these events also as Chernobyl disaster have shown that even negligible value of risk can occur. One of the most distinctive features in the study of such events is difficulty in choice of adequate mathematical apparatus for their investigation, as the theory of probability cannot be correctly utilised for risk assessment because of uniqueness of these catastrophes. There is another approach to risk assessment, which may prove more useful here. In this approach the risk estimation is carried out using the theory of smooth functions allowing the determination of critical parameter values which describe the levels of control system intensities and reserve possibilities. The risk is estimated on a degree of the system parameter approximation of the bifurcation values, which characterise the system's transition from one steady state (norm), to another (catastrophe). This approach allows not only estimation of risk of emergency, but also description of the quantitative characteristic of reserve possibilities of the system and its components. The dynamics of these system parameters is determined with the help of dynamic modelling. The main advantage of this approach is the determination of risk dynamics as the function of dynamic variables of the investigated system. It also allows identify the weakest link of examined system and area of needed improvement. On the basis of this approach, the computer technology has been elaborated to support the solution of following tasks: 1) data analysis of remediation activity; 2) risk assessment for the emergency's origin and forecasting on potentially dangerous objects; 3) determination of optimal control for effective remediation; 4) defining critical levels of parameters that drive technological, economical, social, ecological, epidemiological and biomedical safety. In this work the development of economical, social, ecological and epidemiological situation in Ukraine is analysed with the help of aforementioned mathematical approach. The problems inherent in the optimum redistribution of resources with the purpose of maximising the efficacy of remediation are examined. Optimisation problems were solved by a method of casual search. We considered multi-criterion statement of a problem to find an optimum control, which would permit to balance changes of parameters, describing above systems, maximise the level of manufacture and quality of health care, on the one hand, and minimise epidemic risk and level of pollution, on the other. This work illustrates the same approach application in following fields: 1) risk assessment of health deterioration connected with negative environmental impacts; 2) ranking of some countries on risk of HIV/AIDS escalation; 3) ranking of some Eastern European countries on social risk and analyses of various scripts of realisation of reforms to economic and social stabilisation; 4) ranking countries on

their weakness, vulnerability and unpreparedness to possible bioterrorist attack and evaluation of capability to respond effectively to the threat of bioterrorism and to deal with consequences of terrorist attack.

Keywords: Theory of catastrophes; Risk management; Optimization; Health care; Bioterrorism

ID57

W.2.3

Keykhah, Mojdeh; University of Oxford, USA.

Elementary my dear Watson: On condition and cause in catastrophe risk

Catastrophe risk from natural hazards is a threat to economies, livelihoods, and sustainability. Step changes in the vulnerability of ecosystems or the frequency of extreme events are some of the scenarios proposed by the Intergovernmental Panel on Climate Change. The efforts to "manage" catastrophe risk range government regulation to private sector initiatives. However, in each of these proposals for risk management, there is a lack of clarity in distinguishing the cause of loss from the condition of loss. Indeed, while the causes of loss have received the greatest attention, considerably less focus (but arguably greater human control) is given to the conditions of loss.

Unless managed in a more balanced fashion of conditions and causes, the losses due to the string of natural hazards will continue not only to rise, but to surprise as well. If expectations are formed only on the basis of causes of things, and not their conditions, then there will be many occasions for "surprise" to occur. Instead, this talk argues that in order to avoid surprise in environmental decision making regimes, it is essential to broaden the casual web, to include conditions as contributing to outcomes, rather than as simply innocent bystanders.

Based on research conducted with catastrophe reinsurers at Lloyd's of London, this talk outlines the decision making strategies of catastrophe underwriters and the implications for early recognition of potential catastrophes. In the world of insurance, as in the world of environmental issues such as sustainability, there is a certain tension between capturing gains versus avoiding losses. In catastrophe underwriting, it is premium income that is the gain, and future liability that is the loss. In environmental issues, it is projecting sustainability onto societal welfare as the gain, and avoiding environmental pollution damaging life giving processes in the biosphere as the loss. Surprise in both decision making regimes are linked to how risk is recognized and evaluated within environmental management institutions. The reason for increasing losses is essentially linked to the framing of policy issues as cause driven or condition driven.

In this talk, a risk analysis framework is proposed that is inspired from legal perspectives on causality and liability. In applying this framework to catastrophe risk underwriting as well as a number of other risk issues, the aim is to propose that risk analysis focus not only external causes, but emergent conditions of loss,

including the human dimensions of institutional decision making routines, markets and capital flows. It is a framework that may be gainfully applied to the articulation of the precautionary principle, itself a combination of legal and scientific perspectives. In policy guidelines for environmental decision making regimes, there is a definite need to outline the cause of loss and the condition of loss, lest our approach fashion a risky situation into a catastrophic one.

Keywords: catastrophe risk; decision making; uncertainty; insurance; causality

ID58

M.1.3

Kross, Wilhelm K., Value Risk, Germany.

Holes in Holistic Risk Management : Financial Institutions' Approaches to 'Operational Risk'

Widely publicised catastrophes in the financial services sector in the last decade (Barings, Metallgesellschaft, Orange County, etc.) have added to the volatility in financial markets and forced regulators to recognize that the current supervisory framework for financial institutions, and the figures financial institutions measure and report, remain inadequate. The Basel II capital accord, a new framework developed under the guidance of the Bank for International Settlements, due to become reality in 2004, strengthens the 3-pillar framework of financial services providers supervision. New features include the reflection of additional risk factors (i.e., 'operational risk') in the calculation of minimum regulatory capital requirements; the recognition of enhanced risk analysis and modelling techniques; an enhanced supervisory control process introducing supervisory transparency and accountability, thereby reducing regulatory arbitrage opportunities; a step towards the harmonization of banking and insurance supervision; and enhanced market discipline and disclosure requirements. Not only due to the extent of changes and the lack of relevant available information, regulators will likely tolerate a variety of compromises for some time beyond 2004.

'Operational risk', interpreted as "the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events", introduces an entirely new world to financial institutions' risk controllers who in the past have relied predominantly on information derived from econometric models, a variety of more or less sophisticated portfolio management techniques, and statistical analyses, to measure and manage their organization's exposure to what is commonly referred to as 'market risk' and 'credit risk'. Financial institutions may desire to assess 'operational risk' in a similar fully automated manner as those key management figures currently derived for 'market risk' – possibly as an aggregated enterprise-wide Value-at-Risk, complemented with some stress-test scenario results – but in most cases have to date ignored some prerequisite steps in developing defensible information and data bases, and defensible analysis and evaluation processes. Preoccupied with traditional approaches and techniques that have been applied

successfully to analyse the exposure to portfolio-level risk in the financial sector, and somewhat removed from physical processes and hence system analysis approaches that have been applied quite successfully to address 'operational risk' in other industries, many financial institutions are currently in the process of collecting a wide array of failure event and financial loss data which may be less than adequate to address their supervisors' future needs and their stakeholders' desires.

Basel II's ignoring risk mitigation techniques, insurance, outsourcing, contract clauses, etc. in the minimum regulatory capital provision for operational risk may in part be to blame for the slow pace in financial institutions' recognition that the management of 'operational risk' has been an opportunity enabler in many industries, provided an organization learns to shift away from purely compliance-driven and introvert business-as-usual approaches, towards a more proactive and value-focused risk management culture supporting better decisions for the right reasons. It may require the publication of a few exemplary success stories in management literature, and networking in and around business schools, to trigger wide-spread sharing of problem solving knowledge across industries and hence, the much faster convergence of portfolio-level and system-level risk management techniques.

Keywords: Operational Risk; Financial Institutions; Basel II; Holes in Holistic Risk Management

ID59

T.2.1

Holicky, Milan, Czech Technical University, Czech Republic.

Assessment of Risk in Tunnels using Bayesian Networks

Tunnels and other underground structures are becoming indispensable engineering works in highly congested urban regions and other areas. Tunnel structures are however complicated engineering systems that may be exposed to rare hazard situations leading to unfavourable events with serious consequences (risks). Submitted contribution describes an attempt to analyse risks in tunnels that are proposed as parts of newly developing highway route in Prague area. Quantitative risk assessment is based on application of Bayesian networks supplemented by decision and utility nodes as described in [1,2,3].

Random nodes characterize discrete states of main indicators (elements) of the tunnel systems including transport intensity, hazards situations, fire start, fire flash over, smoke intensity and number of endangered persons. Decision nodes describe alternative arrangement of concerning tunnel length, distance of escaping exits, fire extinguish equipment, ventilation and information system. Utility nodes are used to describe social risk (injuries) and other damages caused by unfavourable events and cost of additional tunnel equipment. Causal links between nodes are represented by arrays connecting appropriate parents and children nodes.

Input data for each node consists of conditional probability distribution of chance nodes and data for the utility nodes. The pattern of the input data for children nodes depends on the states of relevant parent nodes. Required input data are based on available information from similar tunnel routes and on expert judgments. Analysis of the network indicates that the expected total risk is significantly dependent on the states of considered decisions nodes, in particular on the tunnel length in combination with fire distinguishing equipment ventilation and information system.

Obtained results enable to assess tunnel safety using criteria recommended in [4,5]. In addition the results provide valuable background information used in final design of the route, particularly in design of escaping exits, ventilation and information system. However, in order to balance the total risk and relevant costs of mitigation measures, further investigation of input data (conditional probabilities and consequences of unfavourable events) is required. Nevertheless, it appears that Bayesian networks supplemented by decision and utility nodes provide an effective and transparent tool to analyse and assess risk of rare events in tunnels.

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Keywords: Tunnels; Rare events; Bayesian network; Risk assessment

ID60

M.2.2

Drottz-Sjöberg, Britt-Marie; Konsult, Karinta; Norwegian University of Science and Technology, Norway.

Transparency and Public Hearings. An Evaluation of Dialogs in the Process of Building a Swedish Nuclear Waste Repository.

Public hearings were held in the Swedish municipalities of Östhammar, Tierp and Älvkarleby (in Norduppland), Hultsfred and Oskarshamn (in Småland) and in Nyköping (Södermanland) in February of 2001. The municipalities had taken part in feasibility studies, conducted by the Swedish Nuclear Fuel and Waste Management Co (SKB), in the previous years. The hearings were organised by the Swedish

regulatory authorities, i.e. the Swedish Nuclear Power Inspectorate (SKI) and the Swedish Radiation Protection Authority (SSI) and aimed at complementing the authorities' reviews of SKB's work and plans. Central themes of the hearings were SKB's choice of municipalities for the next phase of the program to build a high level nuclear waste repository, and their choice of method for this work. Representatives of the municipalities participated in the planning of the hearings, which were guided by a theoretical model developed within the RISCOP Project (see e.g. Andersson & Wene, 1998). The authorities had ordered an evaluation of the proceedings and the participants reactions to the events and the presentation is based on that report (i.e. SKI Rapport 01:39). The participants were overall content with the outcomes of the hearings even though they seldom changed the basic views they had brought with them. The strategy of openness, based on the concept of transparency, had played a central role in the realisation of the hearings, and enhanced the results from the questioning and dialogue that took place. The discussion focuses on the potential conflict between transparency and stakeholder interests, and the role of transparency in a democratic society. It is concluded that transparency is a necessary although not sufficient factor in the decision-making process related to controversial and complex issues.

Keywords: Nuclear waste repository; public hearings; transparency

ID61

M.3.2

Drottz-Sjöberg, Britt-Marie; Konsult, Karinta, Norwegian University of Science and Technology, Norway.

Exchange of nuclear safety information across expert groups. A study of trouble shooting.

The paper summarizes the results of a Nordic Nuclear Safety Research (NKS/SOS-1) project in 2000 where nuclear power personnel as well as politicians and administrators of a Swedish nuclear community participated in focus group discussions and questionnaire studies. The project aimed at pinpointing areas of perceived difficulty regarding the understanding and communication of nuclear safety issues. Central themes of the discussions included e.g. expectations, roles, powers, criteria for selecting and prioritizing abundant information, use of information channels, persons' knowledge and experience, and use of terminology. Three main areas emanating from the focus group discussions were outlined in the subsequent questionnaires, i.e. problems in information transmission, handling situations, and ways to improve the communication situation. The collected data could be structured in reliable indices, or clusters of related items, within each defined part of the questionnaire. Thus, problems with respect to the information situation resulted in the indices of "structural problems" and "human problems". The ratings of 22 items on job and information related situations gave five indices, i.e. "communication ability", "competence", "ability to synthesize", "context

uncertainty", "bridging ability". Regarding ways to improve the communication situation with respect to nuclear safety issues, three indices could be constructed, i.e. "understanding and clarity", "relations and context", and "development and feedback". Comparisons could be made between nuclear experts and politicians/administrators on the basis of the indices, and the similarities of and differences between the groups are discussed in the paper, together with the contents, interpretations and possible future use of the indices. The study may have a considerable impact on the local safety council of elected representatives in terms of agenda setting and internal communication procedures.

Keywords: nuclear safety information; expert groups

ID62

Poster

Checherov, K P.; RSC "Kurchatovski Institute", Russia; Glouchtchenko, A. I., Ben-Gurion University, Israel; Suskov, I. I.; Russian Academy of Sciences, "N.I.Vavilov Institute of General Genetics", Russia.

Chernobyl disaster and its ecological-genetic consequences through 15 years after - specialists' opinion

As believe the authors of the present report, the nuclear explosion has happened 26 April 1986 on the 4-th block of Chernobylskaya Nuclear Power Plant (NPP) (more exactly, the acceleration of the powerful energetical reactor RBMK-1000 on the so named «simultaneous neutrons of fission»). The pit of the reactor is empty, outside of the block was effluent more than one milliard (billion) Kuri [1,2]. In-first Chernobyl fallouts were fixed in Studsvik (Sweden) by morning 28 April 1986 [3], after have dissimilated on all Northern Hemisphere and were fixed at twice on the territory USA [4], Canada, Japan, in other countries of the World.

The Chernobyl Disaster- this is unique nuclear-ecological catastrophe of planetary scales. On the opinion of one from the leading specialists in field of the radiation medicine, professor Iuri Bandajevski (Belarus):

"Chernobyl Disaster has very serious influence on organism of the significant part of the population of all World. The consequences of this influence still haven't determined sufficiently clearly. It's connected with the numerous pathological effects, which arise under the influence of various radioactive agents, character of its influence during life for one or some generations.

The study of the influence for one of most wide- spread in environment radionuclides cesium-137 on human organism has shown numerous of the mutual-connected changes in the various organs. The small (on a level of energetic potential) quantities of the radiocesium become as very dangerous after the penetration in the human organism and the internal organs, producing to death or increasing the existing illness. It's necessary also to take into attention the organ-acceptance to this radionuclide in the situation with small doses. The incorporation

of the miocard by this radionuclide comes earlier than in other organs. It causes the serious structural-metabolic changes" [5].

The works of Israel and Russian genetics [6,7], published in last years, are important especially. As it has been shown in the work [6], the exposure to low-dose radiation could cause heritable changes in germ cells and lead to increased load of de novo mutations in the progeny of the liquidators and other persons suffered to this exposure. In the work [7] are examined the phenomenological aspects of the genomic instability induced in the descendants of the multi-divided cells having been exposed to the radiation.

It is demonstrated that the regularity of the chromosome instability induction do not corresponds to the classical conception of the radiation genetics (hit principle and target theory). The mechanism and the biological significance of this new genetic phenomenon in the child organism under conditions of low-intensive effect of small-dose radiation and its connection with the state of health are discussed.

In light of the abovementioned the problem of creation of the all-European network of the ecological-genetic monitoring which is discussed already in the previous works of the authors of the present report (see, for example, [8]) acquires the sharp actuality. Taking into attention that the main part of the territory of Western Europe is contaminated by the radionuclides of cesium-137 (T~30 years), the actuality of problem of the creation of the all-European network of the ecological-genetic monitoring increases with the each year. On the authors's opinion, this problem may be considered as one of the ways of practical realization of integrating precautionary principle (PP) in risk-based decision-making.

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Keywords: nuclear explosion; Chernobyl effluent; small radiation doses; induced genomic instability; ecological-genetic monitoring

ID63

W.2.1

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Inherent Flight Safety vs Operating Safety Aspects

Flight safety aspects are various and quite different each other in such a way to include inherent aircraft (generally system) project safety, dependability, project functional & environmental test qualification, human factors and human machine interface, aircraft material technologies, flight tests plus organisational aspects on board and on ground (airport logistic support and so on).

The first set of aspects could be summarized as inherent flight safety. The second set of aspects are usually defined as organisational aspects. Inherent Flight Safety (IFS) is supported by Organisational Safety Aspects (OSA). The safety margin strategy (SMS) is mainly based upon OSA. However, during all the mission flight phases the OSA cannot improve the IFS. In other words, OSA and SMS can only and only maintain the inherent safety figures but never improve these figures. During flight phases, the pilot reliability is part of IFS as well as all the on board navigation and communication aids.

Both the aspects serve to assure safe flight including safe take off and landing. A good design would harmonise the two aspects whilst preferring one aspect against the other would unbalance the overall project and reduce the flight safety a part how it is measured (SIL, failures per flight hours, Monte Carlo simulation and so on).

IFS is mainly a design tasks and activities whilst OSA is mainly a managerial activities. Both are complex processes but where the first is lacking the second cannot substitute it. So harmonisation of the two aspects is mandatory but preventing actions, i.e. the design and projects activities, get the priority. Actually, post mortem analysis, i.e. analysis of aircraft accidents are the main tasks of organisational experts, whilst dependability and safety system project engineers, mathematicians and physicists are usually not included in the group of experts to investigate the causes of the aircraft accident. This is a big error!

Among others, these kinds of reasoning clarify why safety is to be considered out of dependability, whilst it was always included in the acronyms of RAMS.

ID64

T.3.3

Nishizawa, Mariko; Center of Technology Assessment Baden-Württemberg, Germany.

The Japanese consensus conference on GM crops: an experiment towards deliberative policy-making

The growing consumer's ambivalence towards transgenic foods led the Japanese government to host the Japanese consensus conference of GM crops in 2000. Drawn from interviews and document research in Japan, my presentation aims to consider whether/how a participatory practice could become a lasting form to reconcile socially controversial technology disputes in Japan. I will argue that the consensus conference was a milestone in the development of citizen deliberation in science- and technology assessment. But its framework and procedures still reflected the tradition of the Japanese elitist policy-making and the limited citizen participation in public policy decisions. I will conclude that relating citizen deliberation to policy process, restrained governmental involvement and improved transparency are key challenges for the promotion of citizen deliberation in Japan. In the long run, this may lessen the prevailing public apprehension of pervasive technology and the current crisis of confidence that is afflicting risk institutions in Japan.

Keywords: GM crops; citizen participation; consensus conference; Japan; public policy decision

ID65

W.2.1

Wright, Sharon; Collins, Alison; Health and Safety Laboratory, UK.

The 5S Technique for Small to Medium- Sized Businesses: A Risk Management Perspective

The 5S technique originated in Japan as a means of establishing and maintaining a quality and productive environment within an organisation. The 5Ss stand for: sort; systematise; sweep; standardise and sustain. The technique, which is seen as the first stage to improvement in total quality management, is widely utilised in Japan but has yet to become widely practiced in the Western World.

This paper reports on the findings of an exploratory study looking at the implementation of the 5S technique in small to medium-sized companies in England. The focus is on the potential of the 5S technique as a risk management tool.

A selection of companies were invited by the Health and Safety Executive (HSE) to a 5S seminar held at Rolls-Royce UK (a large organisation that has successfully implemented the 5Ss). Here, company managers and health and safety personnel were shown the 5S technique in action and supplied with literature regarding its nature and use. The 5S technique was promoted as a tool for improving productivity while at the same time helping to identify hazards and control risks to workers. Attendees were then asked to provide an action plan stating how their company was going to implement the ideas as presented at the seminar.

Companies sent in an action plan to the HSE (the Regulatory Authority for the UK) outlining changes that they had made or that they were planning to make. The information contained within the action plans varied greatly in terms of depth, quality and quantity. Ten companies were selected for visitation by researchers based on the information provided in the action plans.

An interview tool was designed that would elicit information regarding implementation of the 5S technique by the companies. In particular, the researchers were interested in the understanding of the 5S technique, changes the companies had made based on the technique, worker responses to the 5Ss, resistance to the 5S technique, health and safety arrangements, hazard identification (particularly with regard to manual handling; slips, trips and falls; and workplace transport) and costs and benefits both in terms of productivity and health and safety. Researchers interviewed managers and shop-floor workers for their perspectives on the 5S technique. This paper presents the findings of these interviews and discusses the practical utility of the 5S technique for small and medium-sized businesses in the Western world.

As a tool that improves productivity whilst simultaneously improving the health and safety of workers, the potential value of the 5S technique cannot be overlooked.

Keywords: 5S Technique; hazard identification; risk management; Small/Medium Businesses; Total quality management

ID66

Poster

Wormuth, Matthias; Gauckler, J.; Scheringer, M.; Hungerbühler, K., Swiss Federal Institute of Technology Zurich, Switzerland.

Consumer exposure to chemicals widely used in personal care products: A scenario-based exposure assessment of polycyclic musk compounds

Many chemicals are valuable "multi-talents" as they provide outstanding properties such as high stability and therefore are utilised in numerous consumer products used by millions of people daily. In most cases, however, little or no information is available concerning the consumer exposure to these chemicals in different product applications and resulting effects on human health.

Since several of the broadly applied chemicals have been found to be persistent and bioaccumulative (e.g. the polycyclic musk compounds, PMCs, which are

investigated here), the knowledge gaps are problematic and might hamper necessary risk assessments. While a number of studies surveyed the PMCs' acute toxicity and medium-term systemic effects, few authors tried to monitor in detail the consumer exposure to these chemicals under realistic use conditions and their long-term effects. As PMCs were measured in environmental compartments, in animal and human tissues and mother's milk, their wide utilisation in consumer care products has become controversial, although no significant toxicological effects have been observed for the most common PMCs, 7-Acetyl-1,1,3,4,4,6-hexamethyl-1,2,3,4-tetrahydronaphthalene (AHTN) and 1,3,4,6,7,8-hexahydro-4,6,6,7,8,8-hexamethylcyclopenta-gamma-2-benzopyran (HHCB).

The aim of this study is to estimate the consumer exposure to AHTN and HHCB through the use of various personal care products. These two PMCs are produced worldwide in amounts of several thousand tonnes per year. A scenario-based risk assessment approach (SceBRA) is applied that is able to reflect the wide range of different product uses and thereby covers the great variety in consumer behaviour. Multiple scenarios defined by a set of variable parameters (e.g. room sizes, typical use amounts, number consumers, mode of use etc.) are used to calculate the consumer exposure. The SceBRA approach characterises the risk of a substance by the ratio of exposure concentration and effect levels. The extent of the risk is indicated by the number of exposed users.

In a first step available data are gathered to comprehend the important material flows and the distribution of PMCs in the market (i.e. volumes of use, concentrations in products, market penetration etc.). In a second step this information is combined with documented results of studies dealing with consumer behaviour to define multiple-use scenarios. These are necessary to calculate the number of consumers and their exposure resulting of different product uses. Whenever possible, in a third step the calculated data are compared to and cross-checked with measured values and results obtained by other models.

Keywords: risk assessment; consumer exposure; polycyclic musk compounds; care products

ID67

W.2.4

Vernez, David; Pierrehumbert, G., Institute of Occupational Health Sciences, Switzerland.

Prospective risk recognition through Petri Net simulation and reachable-states analysis

Early risk recognition has become a main issue in risk management since man-made systems turn out to be a significant cause of large scale disasters. Such rare events were clearly beyond the grasp of the traditional "a posteriori" risk management. Thus, several "a priori" Quantitative Risks Assessment (QRA) methods, either based on an inductive or a deductive exploration of the accident

process, have been developed. Although these methods are widely used, it must be stressed that severe limitations may be encountered while trying to analyze complex and dynamic systems. Because of their "static" nature, classical methods can not cope with dynamic constraints such as concurrency or parallelism. For instance, the fault-tree method only take a trivial time logic into account, as each event entering a logical gate (a cause) must occur before the outgoing event (a consequence).

Two reasons may contribute significantly to the current lack of widespread dynamic RA tools. (1) The safety science market is too "narrow" to support the development of the computerized tools required to solve the combinatory problems encountered with "manual" methods. (2) The accident-paths building process generally used in RA methods requires systematic inputs from the analyst. At each step of the building process (i.e. each logic gate in a fault-tree) the analyst must define the events which are relevant. As long as the risk analysis is approached this way, an automated building process of the accident paths is not possible.

The use of generic tools based on discrete event or states simulation, such as the Petri nets, may be an interesting alternative to the classical RA approach. Due to their large calculation capabilities and the continuous developments of their functionalities, these tools may be able to overcome the limitations encountered. Petri nets and Markov's chains are already used in QRA methods, such as the state Space Method, in order to calculate a system's reliability, availability or maintainability. Although of great interest from a quantitative point of view, these methods can not be used in a 'prospective' way. Indeed, a description of all the possible system states is required prior to any calculation.

Another possible use of the discrete event simulation tools is to generate the whole set of reachable states of a system. When using this method, normal events are not differentiated from "accidental" ones during the simulation. Although, the number of possible states generated may be tremendous, this solution is of utmost interest because the state-paths building may be automated. Moreover the computerized tools available at the present time may handle simulation up to 105-106 states.

The risk analysis of industrial processes through discrete events simulation is currently undertaken in the MORM project. Because of the generic nature of Petri nets, tools developments must be made in order to address safety issues and to analyze the large data generated through simulation. The project is expected to produce a versatile analysis tool able to produce, in an automated and systematic way, an exploration of the possible system states.

Keywords: prospective risk analysis; dynamic system modeling; states simulation; Petri Nets; occurrence graph

ID68

Petrelli, Grazia; Vollono, Caterina; Lauria, Laura; Giannelli, Anna Maria; Istituto Superiore di Sanità, Italy.

Managing occupational risk in the health care facilities

The management of occupational risk poses relevant problems when workers are exposed to toxic agents which are known to be carcinogenic, teratogenic and mutagenic to humans such as many antineoplastic drugs. The exposure and absorption among workers of medical facilities can occur in preparing and handling these compounds during the routine activity. Usually the exposure doses are very low, but the potential adverse effects associated with long-term exposures induce concern among the workers operating in health care facilities. In this context, the exposure reduction must be pursued through adequate risk management procedures that should be based on the adoption of safety measures able to reduce risk exposure; frequent controls of safety devices; monitoring adverse health effects on the exposed workers, and, through a correct risk information, training the hospital personnel for safe behaviour in drug-handling, promoting a wider participation of the workers to the safety management process in the health care facilities. In this context, dispositions concerning health protection of workers and specific guidelines and recommendations regarding occupational exposure to antineoplastic drugs have been issued by the health authorities in many countries.

However, exposure data referred to the workers occupationally exposed are often not available, and we do not have much information on the correct application of guidelines in the handling of these drugs. In order to overcome these limits, a survey was performed on two samples of nurses operating in general hospitals located in two geographical areas of Central Italy (Rome and Viterbo). A questionnaire was mailed to the subjects enrolled in the study, with the aim to investigate: risk perception and consciousness of risk deriving from professional exposure among nurses and especially among those who state to be exposed or to have been exposed in the past to antineoplastic drugs; the routine exposure patterns and accidental contamination occurred at work; the knowledge of the recommended protective measures and safety devices to adopt in drug-handling practice. Besides, professional training regarding correct behaviour in drug-handling and safety procedures was surveyed. In Rome 250 self-administered questionnaires were completed and 261 in Viterbo. Survey results showed: 1) a very high perception of risk stated by the respondents; 2) an insufficient knowledge of the effectiveness of the recommended safety devices in spite of a high confidence in individual protective measures; 3) insufficient information and training promoted by the management of the medical facilities. About 53% of the workers in the respondent sample stated to be exposed or to have been exposed (to the risk factor) in different jobs of their professional health care practice and about 20% of all the exposed workers stated to have been exposed also to an accidental contamination. These results confirm the need of improving the risk management system in the medical

Poster

facilities through a larger participation and responsiveness of all subjects operating in hospitals. In order to minimise the risk, those responsible for management must supervise the correct application of procedures regarding the handling of antineoplastic drugs; the adequacy and good function of safety devices and they should also promote the training of the workers handling antineoplastic drugs.

This study was supported by the research projects: Donna salute lavoro: nuovi orientamenti nella ricerca (ISPESL); Models for the evaluation of reproductive risks from the environmental compounds (ISS).

Keywords: safety management; occupational risk; risk perception; exposure quantification; professional training

ID69

W.1.2

Vollono, Caterina; Soggiu, Maria Eleonora; Bastone, Anna; Lauria, Laura; Marsili, Giovanni; Istituto Superiore di Sanità, Italy.

An integrated approach in managing risk in industrial areas

The complexity of the impacts on health, environment and society produced by risk deriving from human activities suggests the necessity to adopt new strategies aimed at improving the territory management system, including all the risk sources existing in a defined area. Besides, this kind of approach should consider the multiplicity of demands expressed by the exposed community, in terms of health and environmental protection, but it should also safeguard local economic interests.

In practice, we notice a wide fragmentation in managing risk located in a defined territory. It reflects the corresponding fragmentation of national laws, which rule separately and independently each single risk source. In fact, different authorities are identified by the law for the control of each single risk source (for example, air pollution caused by industrial emissions or by traffic and home-heating contributes).

On the contrary, the contemporary presence of numerous risk factors on a territory, even though quite different one from another for origin, dimension of hazard, and related adverse effects, is perceived by the population as a sole threat to the welfare of the community. In this context, initiatives promoted for coping with a single risk factor do not seem to satisfy citizens' demands and in some cases can even induce social conflicts.

In order to cope with the environmental, health and social problems deriving from the fragmentation of the environmental regulations, an integrated approach to the management of local risk is recommended. As evidenced by the results of studies carried out in some industrial areas, this approach may permit the evaluation of different risks deriving from industrial activities located in the area (atmospheric pollution connected to the routine operations in plants, major chemical hazard, transport of chemical substances, etc.). By this way, the single aspects posed by industrial risk can be approached in respect of a wider project of land-use planning. An effective risk management should then subsequently identify different options

for the reduction of the specific impacts produced by industrial activities on the community, with the aim to offer a decisional support to the local decisors. At the same time, this approach requires the analysis of risk perception of the people concerned, the level of public confidence in local risk management and information needs expressed by the population resident in the area. This in order to characterise the community demands and to improve the local risk decision making process.

In order to support the integrated approach in managing risk existing in a given territory, here will be discussed the results of a study carried out in Mantova (Italy), as a contribute to the European debate regarding the promotion of an environmental management scheme (Eco-Management and Audit Scheme). The aim is a more punctual definition of procedures and methods of risk evaluation in order to pursue a continuous risk reduction process and an effective land-use planning, and to define the necessary procedures to allow and favourite citizens' participation to the management process of risk existing on a defined territory.

Keywords: Industrial risk; risk perception; regulation; risk evaluation; decision making

ID71

M.2.1

Niewoehner, Joerg, University of East Anglia, UK.

Mobile telecommunication technology in the UK - multi-way engagement or self-regulation gone wrong?

This paper investigates the industry-driven best practice liaison processes ('ten commitments') surrounding mobile telecommunication base stations in the UK from a communication and information management perspective. Including the regulator, business and the different sections of the public, the research attempts to illustrate how the dynamics of discourses in various arenas shape decision-making and, subsequently, the evolution of the issue itself as well as the performance of best practice. Particular attention is afforded to the role of stake-seekers, e.g. consumers struggling to make their voices heard.

The paper draws on elite interviews and workshops with representatives of politics, business and 'civil society' as well as reviews of the perception literature on mobile telecommunication technology and the available grey literature on planning and regulation.

The analysis shows that partnership-building attempts between body politic, business and civil society have so far only been partially successful. The efforts to improve dialogue and interaction appear to foster primarily dealings between local authorities and operators. As an unintended consequence, close interactions between organisations have a tendency to increase the level of institutionalisation of process and language, thereby excluding often ab initia diverse local knowledges and beliefs from the debate.

The paper concludes that the move towards regulated self-regulation illustrated to some extent in the 'ten commitment' approach by the UK operators needs to be carefully evaluated with respect to its mid- and long-term consequences. Criteria should not only include effectiveness and efficiency of regulatory and planning performance and siting output, but also broader aspects of individual well-being and empowerment as well as community structures and values. A holistic evaluation process will clarify the consequences of such business initiatives and recommend adjustments in the case of MTT and possibly also other issues based on innovative technologies.

Keywords: mobile telecommunication; risk communication; self-regulation; stakeholder participation; evaluation

ID72

M.1.2

Avetova, Elena, University of Surrey; United Kingdom; Allen, Peter, European Institute of Health and Medical Sciences, United Kingdom.

Living with Radiation: Perceptions of Radiation Risk amongst Adolescents Born after Chernobyl in Belarus and Ukraine

It has been more than 15 years since the accident at the Chernobyl nuclear power plant in 1986. Those who were born in the year of the accident and immediately afterwards have already become adolescents. These young people have lived with the radiation situation all their lives: the post-accident environment is all they know. Their everyday life has been built around factors which were major disruptions to their parents' livelihood, for example the accident trauma itself and various countermeasures implemented to protect from radiation such as relocation and restrictions on behaviour.

Data collected as part of project HELPPROM, a multi-component health promotion project in the affected region, have been used to answer questions about the everyday life of these adolescents. Is the accident a special issue for them or is it now merely an historic fact commemorated on the anniversary of the accident? Does living with the risk of radiation all their life affect the way they perceive and respond to this risk? Previous research in the Chernobyl area suggests that the accident and its aftermath had a significant and prolonged detrimental effect on the psychological well being, or psychological distress, of the affected population, including schoolchildren. Is there high anxiety or psychological distress in regard to radiation in this new generation or have the consequences of the accident been absorbed into normal everyday life?

Schoolchildren vary in their understanding of radiation. Though some seem to understand the main problems, common misconceptions suggest that the large amount of information provided to them has produced confusion. This confusion

extends to beliefs about health effects. They continue to engage in behaviour that can increase dose, though many have learned to adapt.

Our findings come from three sources: in-depth interviews with experts (medical doctors, teachers and school nurses) working with schoolchildren aged 10-15 in the affected areas; focus group discussions with schoolchildren of the same age and quantitative data derived from a survey conducted in the affected areas using a systematically stratified sample of 1600 10-15 year olds.

Keywords: Chernobyl; adolescents; risk perception; anxiety

ID73

M.3.4

Fromm, Jana; Stockholm Schools of Economics, Sweden.

The neglect of risks: Results from a study of experts' risk assessments

Giving a risk the appropriate level of attention and predicting future risks are very difficult, if not impossible, tasks. In the public debate about risks, experts and professionals within governmental agencies, academic researchers etc. play an important role - to some extent determining what risks society should focus upon. For this reason, it might be of interest to find out what risks the experts believe receive too much or too little attention in society. Furthermore, it could be of interest to learn more about how the identification of these risks interact with the experts' field of work.

The results to be presented are based on data collected in Sweden during the autumn of 2000. A questionnaire was sent out to approximately 640 Swedish professionals in risk-related fields. The response rate was well over 60% and the respondents' area of expertise covered a wide range of fields. One of the aims of the study was to provide an inventory of risks in society that are considered over-emphasized or neglected. This was achieved by letting the respondents answer open-ended questions where they were to state up to five risks they believed receive too much and too little attention respectively. In a follow-up question they indicated which actors in society they believed were responsible for this over-emphasis or neglect.

The present paper focuses on the existence of a possible connection between the identified risks and the respondents' field of work. Could it be that the professionals only identify risks within their own sphere of work and are there any differences between over-emphasized and neglected risks in this respect? Another issue that is brought up for discussion in the paper is the responsible actors - what actors are neglecting the risks and can any patterns be identified for the different categories of identified risks?

The results suggest that the experts identify risks in very diverse areas - they do not strictly keep within their own area of expertise, neither when it comes to over-emphasized nor neglected risks. However, a few patterns of identification can be distinguished. Looking at the actors singled out as being responsible for the

inappropriate level of attention, no clear-cut distinctions could be made with regard to the various categories of risks.

This study was funded by a grant from the Bank of Sweden Tercentenary Foundation.

Keywords: risk perception; neglect; attention; experts

ID74

Poster

Tikhomirov, N. P.; G.V. Plekhanov Russian Economic Academy, Russia.

Financial Provision of Emergency Risk Management

It has to be admitted that the current costs of emergencies (accidents or disasters) for the society and various individual recipients in the Russian Federation are considerably higher than the reasonable or theoretically acceptable level. The most likely major reason for such a situation is that the main focus when dealing with emergencies is now on rescue efforts and elimination of consequences. Financial provision of emergencies prevention, securing their less severity is obviously insufficient, especially taking account of the number of potentially hazardous objects and territories, where industrial and natural accidents are quite likely.

Right now it's absolutely necessary to create organizational and economic mechanism which would efficiently accumulate and rationally distribute financial and material resources for the sake of successful solution of the whole complex of problems related to protecting the population from natural and industrial accidents. This mechanism, as we see it, should be based on the system of federal and regional economic funds for emergency management.

Determining the sources of finance is the most important problem associated with establishing such a system. Our point of view is that most money could be raised by these funds by means of introducing a special "safety tax" as well as insuring with respect to responsibility for the consequences of the accident and liability of indemnity.

As we see it, with respect to the industrial accidents the tax rate should be associated with the level of danger. Protection of the territory from industrial accidents should be principally secured by the sources of danger. But the rate of the tax to be imposed on a territory should not be related to the likelihood of natural disasters. It implies that enterprises situated in the relatively safe areas by means of such tax do pay a part of a "safety rent".

The "insurance" component of these funds can be raised by means of transferring a part of the profits of the companies involved in effecting compulsory insurance of responsibility of "hazardous" industrial sites and voluntary insurance of the potential losses due to industrial and natural accidents. To our mind, the sites where industrial accidents can occur due to the so called cascade effects should be compulsorily insured.

Keywords: cost of emergencies; emergencies prevention; economic mechanism; safety tax; voluntary insurance

ID75

Poster

Kharchenko, Sergey G.; Fomin, Boris B., The Russian Academy of State Service, Russia.

The Problem of Municipal Solid Waste in the Moscow Region

The Moscow Region (MR) is the central region of the Russian Federation. Its area is 47 thousand sq. km. The main problem of the waste management in the Region is that certain waste processing and waste eliminating facilities and all the industrial and inert waste placement facilities are situated on the territory outside the city, i.e. in the Moscow County. There has traditionally been little cooperation and collaboration on the environmental issues among responsible agencies in Moscow City itself and in the surrounding region. Indeed, with some local authorities outside Moscow refusing to accept solid wastes generated outside their limited borders, the problem of how to dispose of solid waste has quickly become a crisis. The annual Municipal Solid Waste (MSW) build-up in the MR is 5 to 6 million tones, including over 3 million tones in Moscow. Meanwhile an insubstantial part of the waste flow is utilized in Moscow (5 to 7 per cent of the total amount of the waste produced), as only 1 incinerator and 3 waste transfer stations operate in the city now. The major part of waste goes to facilities in the Region, i.e. 46 equipped polygons and over 200 dumps with the area of over 1 hectare. Minor spontaneous polygons with the area less than 1 hectare are practically unaccountable. In fact, the overwhelming majority of the polygons existing in the MR lack special environmental facilities; there is also no ecological monitoring system. Polygon projects and their technical standards either have not been developed at all or are not being appropriately implemented. The combination of these factors leads to a sharp deterioration of the ecological and technical conditions of the polygons, resulting in spontaneous dumping of MSW, which is totally opposed to the legally accepted waste burial technology.

Keywords: municipal solid waste; waste management; Moscow City; principles of decision-making

ID76

Poster

Hohreiter, David W.; BBL Sciences, USA.

Weighing ecological risk and environmental impact: Developing a holistic risk management strategy for wetland sediment remediation

This paper describes a risk management strategy for a contaminated wetland adjacent to a known hazardous waste disposal site. The strategy was designed to address two primary and sometimes contradictory objectives: reducing contaminant-related risk to wetland biota, and minimizing impacts to the wetland environment

that would be caused by active soil/sediment remediation (excavation). The first step in this process was accurately characterizing baseline ecological risks and understanding the uncertainties associated with baseline risk estimates. This was accomplished using several different methods, including comparison of chemical concentrations to generic criteria, food-web based risk calculations for upper-trophic level receptors, sediment toxicity and bioaccumulation tests, and field surveys of ecological community structure and population density. Integration of the results of these methods indicated that only limited areas exhibited contaminant-related risks requiring remediation. The second step involved determination of baseline habitat quality and functional value, and the potential disruption (both spatial and temporal) that would be caused by soil/sediment excavation. The results of this assessment indicated that the wetland generally was a healthy ecosystem, and that post-remediation restoration of its functional value to baseline levels would take several years. Based on these considerations, a remediation plan was developed that targeted only the most contaminated and accessible areas for excavation, while leaving large areas of the wetland undisturbed and subject to continuing natural recovery. This approach mitigated contaminant related-ecological risks significantly, while reducing the area of potential habitat disruption from about 150 to 8 hectares.

Keywords: risk management; sediment; ecological risk

ID77

T.1.2

Grabemann, Iris; Grabemann, Hans; Kapitza, Hartmut; Eppel, Dieter P., GKSS-Forschungszentrum Geesthacht GmbH, Germany.

Basic hydromechanical information for risk assessment of coastal defences in the Jade-Weser area (Germany)

Sea level rise and changing wind- and wave climate may pose new challenges for a risk based assessment of climate change. In the joint project "Climate Change and Preventive Risk and Coastal Protection Management on the German North Sea Coast" (KRIM, funded by the Bundesministerium für Bildung und Forschung (BMBF)) the environmental and socio-economic impact of an anticipated climate change on the Jade-Weser region (Northern Germany) will be estimated and the risk-of-failure of defences in selected areas will be investigated.

The adjacent Jade Bay and Weser estuary form a large heterogeneous embayment with deep shipping channels, tidal channels, large intertidal mud flats, sand banks and barrier islands. These different morphological structures are continuously changing due to wind, waves and tidal currents. While the large tidal flats, the sand banks and the islands act as natural protection and lower the risk-of-failure of defences and the flooding of the hinterlands, the deep shipping channels in the Jade Bay and the Weser estuary allow an almost undamped intrusion of the tidal wave up to the cities of Bremen (Weser) and Wilhelmshaven (Jade).

Sea level rise and altered wave climate will change currents and shear stresses acting on the bottom and will thus influence the morphological structures and possibly endanger the coastal defences. Thus, medium and long-term coastal defence measures and sustainable use of coastal areas require estimates on hydrodynamics and morphology in the forelands and their possible future changes.

In the part "Hydrodynamics and Morphology" of the joint project the hydrodynamical changes are assessed which could arise due to altered currents and wave action caused by climate change. Hydromechanical stress on the coastal forelands up to the dike base is a prerequisite to estimate the risk of failure of coastal defences. Its changes are also estimated. Different weather episodes are investigated by numerical modelling with emphasis on severe onshore and offshore winds. This investigation provides basics for studies of risk-of-failure of defences, coastal defence adaptations and ecological consequences as well as for the scientific risk construct in the decision support system which is being developed within the project KRIM.

Keywords: Climate Change; Jade-Weser Area; Hydrodynamics; Hydromechanical Stress; Coastal Protection

ID78

W.3.1

Eremenko, Vitaly A.; Association ACTIS; Yanovskaia, Nina S.; ICC "NUKLID"; Shilova, Elena S., International Association IAES, Russian Federation; Droppo, James G. Jr., Battelle-PNNL, USA.

Application of risk analysis technologies for optimization of administrative decisions in safety when for storage of irradiated nuclear fuel.

Application Of Risk Analysis Technologies For Optimization Of Administrative Decisions In Safety When For Storage Of Irradiated Nuclear Fuel And Radioactive Waste Container Facilities Are Chosen.

It was the first time in Russian practice, when, in 2001, the full-scale risk analysis was held in the frame of a multi-ministries agreement on the "Plan of Acting", which prescribed constructing and inputting in operating of an "accumulative platform" for container storage of irradiated nuclear fuel (INF) extracted from nuclear submarines (NS).

Performance of parallel calculations by two teams of experts on the risk, as a national and also by an independent international team was the first from two main particularities of organization this risk activity. The national team was represented by three leading Russian Research Institutes, which applied computer environmental models approved by Russian regulatory bodies. The international team included experts on Multimedia Environmental Pollutant Assessment System, Russian version - MEPAS-3.11.RV from RF' ACTIS, GE Institute of Ukrainian Science Academy and US DOE PNNL.

Using two-stages of risk analysis was by the second particularity of the investigation. The safety warranties for personnel and population achieved by own "facility resources" was the problem for stage 1. Results obtained by the first team of experts are well fit into the framework of classed as Facility-Centered Risk Assessment method, which deal with local safety optimization of a single hazard facility.

The international experts' team worked out multi-levels of safety warranties when for storage of irradiated nuclear fuel and radioactive waste container facilities are chosen. It was a goal of stage 2, where applied MEPAS-3.11.RV belonged to another class of risk methods, named as a Human-Centered Risk Assessment. Using such methods let to obtain set of essential data for optimization of decisions and safety warranties of the whole region. It because, this analysis is directed on developing protection measures for a concrete subject - for concrete persons and considers impact to them from all hazard facilities of the region in question.

So, the international team of experts, applying MEPAS-3.11.RV in Russia for independent risk assessment and processing of output data by algorithms of Systems Analysis went up to a new order of a global OPTIMIZATION OF ADMINISTRATIVE DECISIONS. The global optimization means consideration not only technical measures for providing safety warranties. Results of such optimization include also needs and opinions local administrations and publics, as well as problems and safety programs of all interested levels, including federal authorities and public.

Thus, a combination of the above mentioned particularities in organization and in management by risk analysis proved to be enough by successful and profitable. As a consequence, exactly such approach has been planned for optimization of decisions and creating of safety warranties for other similar objects in Russia in 2002 and 2003.

Keywords: irradiated nuclear fuel; storage; safety; facility resources; regional resources; independent international team

ID79

T.3.2

de Meere, Freek B. J.; Caljé, H.; Götte, F., Vrije Universiteit Amsterdam, The Netherlands.

Communicating European food safety: British and Dutch newspapers covering the BSE-crisis.

In the last decade governmental bodies responsible for food safety have become more involved with public opinions than they used to be. They are not only responsible for actual safety, they also have to convince the public that this is really the case. This year the EU founded the European Food Authority (EFA) which is, among other things, supposed to inform Europeans about food safety. Transparency is a key-word for the EFA, because public trust is to be restored.

It is an intriguing challenge how the public can be informed adequately on risks, benefits and responsibilities. In our paper we argue that the new EFA is not in an ideal position to restore public trust. The EFA must develop a communication model which addresses all member-states, while national discourses can differ rather dramatically. For example, it is known that in England newscoverage on BSE is for a large part nationally framed. Another example is, that in Great Britain and in Italy people use other frames to assess the risks and benefits of biotechnology.

Especially the mass media are a major source of information on risks of foodstuffs. Most people are for a large part 'symbolically' confronted with risks of dioxins, antibiotics, hormones and BSE through the mass media. As a consequence, the mass media act as an important social arena in which risks are brought to notice and were the viewpoints of social groups, authorities and the general public are exchanged and discussed. In a considerable number of studies on agenda setting in environmental issues, it is demonstrated rather convincingly that media coverage of these issues indeed play an important role to set the public agenda or contribute to the level of concern.

We do not know of a study in which national media-discourses on food safety issues are confronted with each other. We will make a first try by selecting a newspaper from Great-Brittain and one from the Netherlands and compare six years of news about the BSE-issue. Our focus is on the ways in which EU-policies and those of other EU-countries are discussed. We will review our results in discourse-theoretical terms and in the light of the task the EFA is given.

Keywords: Food safety; risk communication; national discourse; mass media; BSE

ID80

T.1.2

Kraft, Dietmar; Wittig, Stefan; Schirmer, Michael; Universität Bremen, Germany.

Scientific Risk Construct: Environmental Aspects

Analysis of the Scientific Risk Construct within the interdisciplinary project "Climate Change and Preventive Risk and Coastal Protection Management on the German North Sea Coast" (KRIM) forms a major part. In this framework, environmental aspects are the focal point of the Subproject "Climate Change and Coastal Ecology" (SP "Ecology").

Ecological systems, consisting of the biotope and its biocoenosis, do not know of any "risks", but only reaction, adaptation and dynamics. Therefore, risk definitions must make use of anthropocentric yardsticks. They should depict the structures and functions of the biotopes appropriately and be sensitive to changes in climate, use or function. In this sense, risks can be change in the existing patterns of biotope types, loss of a protection function for the winter dike, loss of a value-giving quality from a nature conservation point of view, or loss of a use option.

Three issues are subject to the methodical proceedings of SP "Ecology":

- Issue A: Significance and behavior of the dike foreland as an integral part of the coastal protection system under conditions of climate change.

The SP "Ecology" will examine the impacts of climate change on the open tidal flats in front of the main dikes with respect to morphodynamic consequences by the SP "Hydrodynamics and Morphology", and with regard to the biocoenosis of the tidal flats. They are an integral part of the coastal protection systems, and even today this role holds substantial potential for conflicts. Consequently, this requires appropriate attention when developing adaptation measures of the coastal protection system in cooperation with the SP "Coastal protection".

- Issue B: Ecological consequences of a failure of the coastal protection systems for the hinterland.

The by far largest areas of the marshland are predominantly only sparsely inhabited, but they display vegetation and fauna that is sensitive to the effects of seawater. In general the conditions are limnic to occasionally brackish, and they have led to the development of an intensively agriculture with high yield potential. If the protective systems fail and this hinterland is flooded with seawater, severe changes ("damage") will occur in the ecological conditions, depending on the local conditions and flooding intensity. Therefore, the consequences for nature and landscape must be evaluated and assessed within the framework of an ecological risk analysis.

- Issue C: Contributions to monetarization of ecological values.

Based on the ecological structures and functions of the research areas and on their changes due to the effect of climate extremes, especially flooding, damage that has occurred or been avoided and/or advantages will be monetarized and made available for econometric modeling.

Keywords: Climate Change; Ecological Risk Analysis; Ecological Risk Management; Coastal Protection

ID81

W.2.1

Berg, Heinz Peter; Bundesamt für Strahlenschutz (BfS), Germany.

Evaluation of operating experience for early recognition of risks

If operating deviations from safety programmes, prescribed procedures or expected equipment behaviour, are routinely identified and the corresponding corrective actions are taken, then this whole process of identification of anomalies and taking of corrective action serve to identify, anticipate, prevent or rectify degraded safety performance.

Evaluation and in-depth analysis of operating experience should not be restricted to lessons learned from safety significant events but also from situations and events of lower importance which would have the potential to develop into safety important events but for the fact that they were prevented due to plant design and/or timely corrective actions by operations personnel.

One of the most difficult challenges facing nuclear power plants is recognizing the early signs of degrading safety performance before regulatory requirements are imposed or serious incidents or accidents occur. Industry experience has shown that these are typical issues to consider when looking for such early signs.

Therefore, it is important that nuclear power plant operators have the capability to trend, analyse and recognise early warning signs warning signs of deteriorating performance. It is necessary that plant operators are sensitive to these warning signs which may not be immediately evident.

An example of an overall process for the assessment of information on operating experience which can be applied for all types of information, including low level events and near misses, is shown. The main steps such as screening, in-depth analysis (if necessary) using deterministic and probabilistic methods, and criteria are addressed.

Reviewing operating experience is one of the main tasks for plant operators in their daily activities. Therefore, self assessment should be at the centre of any operational safety performance programme. The primary requirement for a self assessment programme is to develop a systematic and continuing process that evaluates the status of the plant, systems, equipment, personnel, procedures, policies and practices. Thus, this self assessment process should be proactive in nature with motivation and support at all levels of plant management and personnel.

In order to provide guidance and recommendations on the use of a self assessment programme, the International Atomic Energy Agency (IAEA) is developing a document which provides information and describes a possible procedure of the review of operational safety performance based on operational experience for plant operators which is planned to be published in the IAEA Safety Report Series.

However, experience has shown that it is useful to supplement self assessment with periodic examinations and independent (peer) reviews, e.g., by the licensing and supervisory body or at international level as they provide broader perspectives on mid- and long-term performance and allow comparison of actual experience with established benchmarks and goals. These reviews also provide an opportunity to examine generic safety issues, update analyses, and evaluate long-term trends that may not be apparent from routine assessments.

Keywords: risk; probabilistic safety assessment; nuclear power plants; early recognition; self assessment

ID82

M.2.2

Mansoux, Hilaire; IRSN; Gadbois, S.; Mutadis Consultants; Heriard Dubreuil, G.; Mutadis Consultants; Oudiz, A.; Institut de Radioprotection et de Sûreté Nucléaire; Schneider, T.; Centre d'étude sur l'Evaluation de la Protection, dans le domaine nucléaire, France.

Stakeholders Involvement in the vicinity of industrial sites

The increasing demand for public participation in decision-making concerning hazardous activities is a well-recognized evolution of this last decade. Many international studies about stakeholders' involvement are currently carried out namely in the field of the control of industrial installations. In France, the regulatory framework setting specific procedures for public consultation of industrial projects is currently being reviewed, namely with the issue of a new law concerning local democracy.

In this context, a study is currently performed in France by a multidisciplinary team (social management of risks, radiation protection, environmental law). The aim is:

- to investigate procedures for public and NGO involvement in the control of nuclear installations (public enquiry, local commissions, set up of pluralistic expertise),
- to carry out a few case studies analysing how the procedures are implemented, in order to get some insights on how to strengthen the dialogue between the conventional stakeholders (industry, regulatory body, institutional experts) and the stake-seekers.

The methodology of this study follows different steps:

1. Literature review of international thoughts (USA, Europe) concerning stakeholders' involvement in the management of industrial activities,
2. Analysis of the French regulatory system for the control of nuclear installations, with references to the more general framework of the environmental law,
3. Description and analysis of case studies related to nuclear installation follow-up. The case studies relate to original processes of consultation. The cases are:
 - The BNFL national stakeholder dialogue in UK,
 - A programme of expertise led by a local commission for the decennial review of a French nuclear power plant,
 - The consultation process concerning the revision of the licensing decree of a French reprocessing plant,
 - The renewal of the discharge authorization of a French nuclear power plant.
4. From the cases studies, identification of good lessons concerning stake-seekers' involvement and proposal of possible improvements to better use the existing regulatory procedures, proposal of possible regulatory evolutions.

The study is currently addressing the last point. Proposals for increasing the stakeholders and stake-seekers dialogue will be discussed with representatives of the different concerned parties (administration, nuclear industry, NGO's, elected representatives).

Keywords: control of nuclear installations; public consultation; stakeholders; stake-seekers dialogue

ID83

T.3.1

Pijls, Loek T.J.; Health Council of the Netherlands, The Netherlands.

An example of weighing the pros and cons of food stuffs: deoxynivalenol (DON) in wheat

Deoxynivalenol (DON) is a toxin formed by fungi of the genus *Fusarium*. These can occur in the soil and can may infect cereals. The Dutch Cabinet Ministers of Health and of Agriculture asked the Health Council of the Netherlands to evaluate the significance for human health of current levels of DON intake, set of against the importance of wheat for public health.

In animal studies the first effect to occur with low exposure to DON is a reduced weight gain during growth. TDIs based on studies on this effect in mice and pigs amount to 1.0 and 0.5 mg.kgbodyweight-1day-1, respectively. In 1999, a year during which wheat had relatively high DON contents, the 50th and 95th percentile of DON intake by children aged from one to four years were 1.3 and 2.4 mg.kgbodyweight-1day-1. Simply concluding that these values exceed the TDI would imply banning a primary foodstuff as wheat; for such a drastic measure a more sophisticated balancing of pros and cons is necessary. In providing building blocks for this process, the Health Council considered the following:

- By deriving a TDI by applying uncertainty factors, one errs on the safe side.
- A slightly reduced weight gain caused by DON is undesirable but not a cause for concern. Results of animal studies also indicate that the effects of DON can be compensated later on in life when exposure is lower or absent.
- Vulnerability for any effects on growth or development will be most noticeable when the rate of growth is highest. During this phase (i.e. the first six months of life), children consume little or no wheat and DON intake is thus absent or low.
- When deriving a TDI it is assumed that exposure is continuous. Yet, in laboratory animals, it has been shown that the effects of DON under changing exposure levels (i.e. the actual situation in humans) are less pronounced than in the case of continued exposure.

All things considered, it can be concluded that exposure up to a few times and incidentally higher than 0.5 mg.kgbodyweight-1day-1 is very unlikely to inhibit the rate of weight gain. Should this effect actually occur in some children, then it will be very minor and (if exposure is not continuously high) can be compensated later on. Set of against an effect on weight gain, effects on the immune system, on fertility and on the foetus - occurring at higher levels of intake in animal studies - are more severe. These effects are not expected to occur at intakes lower than 2.5 to 5 mg.kgbodyweight-1day-1.

Nonetheless, the Council recommended that exposure to toxins such as DON should be kept as low as possible. Accordingly, the value of 0.5 mg.kgbodyweight-1day-1 can serve as a guideline. Reduction of exposure to DON can be reached through reduction of the DON content of wheat. Since the majority of the wheat consumed in the Netherlands is grown in other European countries, international application of certain measures to reduce DON content is desirable. Another approach is the exclusion for human consumption of wheat with a high DON content. Data on the distribution of the DON content of unprocessed wheat show that a limit of 500 mg/kg applied to wheat would prevent exposure to DON to exceed of 1.5 mg.kgbodyweight-1day-1. In order to prevent exposure higher than 0.5 mg.kgbodyweight-1day-1, a limit for wheat of 100 mg/kg would be necessary. Food stuffs containing wheat are staple foods in the Netherlands, and are a good source of a number of nutrients. The Council therefore advises against reduction of exposure to DON by decreasing wheat consumption.

Keywords: **Fusarium; DON; growth; immune function;**

ID84 withdrawn W.2.3

ID85 W.1.2

Hale, Andrew; Heijer, Tom; Koornneef, Floor, Delft University of Technology, The Netherlands.

Are rules safe? A study of rule management in railways.

As part of a European project on railway safety management a study is being made of the way in which the railway industry in the Netherlands uses and manages safety rules. The study is using two case studies, one of the rules for track maintenance and the other for train drivers. It is tracing the way in which rules are made, from the legislator and regulator, through the operating companies and contractors to the workers and operators facing the direct risks. It shows what problems there are in reconciling a number of different objectives of the different players in the system. In particular it reveals how problematic the whole basis of rules is in a system which is being drastically reorganised at present. The system has no adequate way of modelling its own activities and risks in such a way that it can specify what rules are necessary and problems can be expected to arise which require control. The rapid changes in roles and responsibilities and the disintegration of the old stable railway monopolies mean that it is often not clear who has the authority or knowledge to make rules and who they are making them for. These and other problems are expected to emerge from the analysis of the case studies, which will have reached the end of their data collection stage by the early summer. The paper will present the analysis as far as they are available at the time of the conference.

Keywords: **safety rules; process analysis; scenarios; system reorganisation.**

ID86 W.1.4

Rosmuller, Nils; Nibra; Helsloot, I., Dutch Inst. Fire service Disaster Management, The Netherlands.

Classification of concepts of accident scenario's

Constructing accident scenarios is a well-established activity in performing risk analysis. Multiple accident scenario concepts have been developed to facilitate the risk analyst to conduct the scenario development such as fault trees, event trees, hazard pattern development, most credible accidents, worst cases, etceteras. However, which scenario concept to use is not clear at forehand. This is a rather serious issue because the developed scenarios for a substantial part influence the outcome of the risk analysis. In particular in multi actor settings in which stakeholders have various interests it is elementary to select the appropriate scenario concept. In this paper, a framework is described which can guide the risk analysts in selecting the appropriate scenario concept, based upon well-described decision criteria.

The framework has been applied in several cases including a risk analysis for a region in the south of the Netherlands and a railway corridor near the port of Rotterdam.

The framework proved to be useful in focussing the analysts attention on the required scenario's and the developed accident scenarios it selves could be better interpreted within context of the whole risk analyses.

Keywords: **scenario development; most credible accidents; worst case; deterministic scenarios; quantitative risk analysis**

ID87 Poster

Heralová, Renáta, Czech Technical University, Czech Republic.

Decision Making and Bids in Construction Industry

The process of deciding represents one of the basic management activities, that quality and results fundamentally influence effectiveness of operation and future prosperity of economic units. For quality deciding is necessary to have disposable quality instruments, one if these instruments is The Model of Options Assessment.

The Model of Options Assessment is contemplated as a formalised approach of investor or investor and his partner during the process of choosing project and development. The model consists seven key activities:

- Determine Requirements and Goals
- Establish Criteria
- Develop Alternatives
- Cost Analysis
- Assessment Alternatives

- Selection and Argue Alternative
- Analyse and Deliver Results

For each activity a schema of sub-activities and a list and a description of applicable methods was created. Simultaneously documents contemplated as a base for proposed managerial decision. The model also suggested, aside from proposed documents and outputs of individual activities, the processing of a feasibility study.

During the Activity Assessment Alternatives is used the quantifying of CSI - Customer Satisfaction Index. Customer Satisfaction Index reflects total extent how given variant of investment fulfilled or will fulfil required criteria. This approach to evaluation makes easy recognition and concentration on problem fields, it is possible to identify both - where the problem is and how serious is.

The Model is a universal instrument for solving of arbitrary decisions, especially for designing and realising construction projects. Systematic application of the model during the life cycle (from intention to realisation, generally to the liquidation of the construction) of construction is ideal. The model could also be applied only partially, depending on the needs of the individual project.

Keywords: decision making; effectiveness; construction project; alternatives assessment; Customer Satisfaction Index

ID88

W.2.3

Brauchle, Gernot; Institut für Hygiene und Sozialmedizin, Austria.

Managing the risk of secondary traumatization for psychosocial helpers in catastrophes

In November 2000 Austria's worst catastrophe since World War II happened. A funicular train ferrying skiers from the village of Kaprun to the Kitzsteinhorn Glacier at 10,500-foot caught fire in a tunnel. 12 People survived but 155 lost their life among those a lot of children and adolescents. In the aftermath more than 150 mental health professionals, including psychologists, psychotherapists, psychiatrists, clergy, crisis intervention teams and CISM teams supported those who had lost friends or family members.

Trauma counseling, known in Austria as crisis intervention, has become an integral part of the humanitarian disaster response. Thus, in the aftermath of disasters mental health professionals are regularly supporting and helping those who lost friends, family members, or who suffer from severe injuries.

But the exposure to traumatized persons is a largely unrecognized risk by the public and is even underestimated by the professionals themselves. Trauma counseling seems to be a specific stressor different from other highly stressful demands of work. Being empathically engaged with trauma victims may cause a secondary traumatization. That means, counselors themselves often show symptoms very similar to those of victims and relatives such as dissociation, avoidance, anxiety symptoms, disruptions of beliefs, withdrawal, helplessness or depression.

The study, carried out 6 weeks and 6 months after the disaster at the Kitzsteinhorn, shows the first results about stress and symptoms in trauma counselors. 133 mental health professionals were surveyed by questionnaires. The main questionnaires used in this study included measures of psychological stress symptoms, such as a measure for acute stress disorder (ASD-S, Acute-Stress-Disorder Scale, Bryant 1999), a measure for dissociative symptoms, the FDS-20 (Fragebogen zu Dissoziativen Symptomen, Freyberger, 1999), and a measure for the amount of experienced stress (Self-Assessment Scale) in the course of time.

Analysis of the effects of traumatic stress on symptoms indicate, that some primary prevention programs like realistic training, empirical knowledge and positive leadership moderate the effect of the emotional impact and may also protect individuals from long term sequelae.

Keywords: trauma counseling; secondary traumatization; stress symptoms; mental health professional; Kaprun

ID89

W.1.4

Macgill, S M.; Siu, Y. L., University of Leeds, United Kingdom.

The requirements for holistic risk management

There is growing acknowledgement of the need for a holistic approach to risk management. In this paper, the requirements for achieving holistic risk management are formally enumerated, evaluated and illustrated.

The starting point is recognition of the different meanings and interpretations of the term 'risk management' by different societal constituencies: regulators; expert scientists; major stakeholders (including business interests and pressure groups); the media; and the general public. The usual definition of the term 'risk management' in the contemporary risk literature is also acknowledged. It typically refers to the identification, regulation, minimisation, reduction or isolation of physical risk, through approaches which have been compartmentalised as distinct entities - contingency planning, disaster recovery, continuity management, loss minimisation, hazard control, policy-based gaming, social engineering, decision analysis and risk benefit resolution.

In light of this starting point, the initial requirement for a holistic approach to risk management is identification of a common denominator for risk, which has meaning across the full range of different contemporary risk management interpretations and approaches. The traditional approach has been to concentrate on event probability and consequence (and related uncertainties), or perception and value. The preferred approach in the current paper is to focus on discovery and examination of the 'risk knowledge' of each of the various constituencies which are party to a given risk issue (as individuals or as groups of individuals). Risk knowledge is intrinsically evolutionary and dynamic, within defined geographical, cultural and temporal contexts. Risk knowledge (what people know what they know,

whether in terms of scientific knowledge or in terms of social preferences) becomes the core common denominator that is required to link previously disparate aspects of risk management. It leads formally and powerfully to a re-definition of risk management as the management of people's knowledge of risk. This becomes the foundation for a holistic unified paradigm for all risk management activities.

Other requirements of a holistic approach follow from this initial core dimension. They include: harmonisation of risk management approaches with the underlying dynamics of the evolution of risk issues over time; achievement of conditions for effective stakeholder interaction, within appropriate institutional settings; achievement of conditions for embedding risk communication within risk management (c.f. treating them as two separate entities); achievement of conditions for development of collaborative risk knowledge amongst all interested constituencies; availability of effective management tools. Through these various requirements, risk management is formally recognised as a continuous, life-cycle learning and knowledge development process, as distinct from an ad hoc decision measure.

The full list of requirements constitutes a set of necessary and sufficient conditions for the achievement of holistic risk management. They will be evaluated, and illustrated with reference to examples of actual cases where some or all have been satisfied, and where some or all have been violated.

Keywords: **initial requirements; holistic approach; risk management; risk knowledge**

ID90

M.3.4

Macgill, S M.; Siu, Y. L., University of Leeds, United Kingdom.

The knowledge potential of open, integrated societal decision making: the case of waste management facilities in the United Kingdom

The aim of this paper is to develop the meaning of open, integrated societal decision making on risk in the context of potentially hazardous waste management facilities in the UK, and encourage improved practice. Characteristics of open, integrated processes of societal decision making on risk will be identified. Implications of these widely recognised characteristics will be re-evaluated with reference to a novel theoretical framework for understanding risk in a knowledge-based society, thereby substantially increasing the utility of these characteristics. The extent to which the characteristics are currently manifest in actual decisions over the siting of waste management facilities in the UK will be examined. Recommendations will be made for possible improvement to such decision processes in the future.

Characteristics of open, integrated decision making processes can be discerned in principle from the literature on institutional analysis. They include: inclusiveness of stakeholders; agreement to the scope of decision making (an accepted agenda of

issues to be decided); conferment of due respect and standing among participants; transparent procedural rules; effective channels of communication; freedom of available information, coupled with acknowledgement of uncertainties; and accountability to society at large. These characteristics have been widely acknowledged in the literature as fundamental to legitimated systems of governance in western societies, and a perceived fairness in decision making.

There are implications of these characteristics which have as yet not been fully recognised. Uppermost here is their instrumental role in determining knowledge levels and the knowledge development potential within a society for addressing risk decisions. This is considered to be fundamental, but as yet has been relatively neglected. The ultimate characteristic of open, integrated societal decision making on risk is argued to be its instrumental potential to generate risk knowledge which all societal constituencies can be comfortable with. This is referred to in this paper as 'collaborative' risk knowledge, and stands in contrast to the currently dominant creation of individual or, at best, 'collective' risk knowledge.

The creation and development of collaborative risk knowledge is formally presented in this paper as the essential basis for encouraging and promoting co-active decisions between and among different societal constituencies. Such practices in turn lead to the development and recognition of collective accountability among all participants. Issues of social exclusion, misinterpretation, distrust, incertitude, hidden agendas and power struggles, which have troubled other frameworks, are addressed head on within the proposed formulation.

Evidence from actual siting decisions for waste management facilities in the UK is cited, illustrating the extent to which the characteristics of open, integrated decision making have been displayed in practice, and the levels of collaborative knowledge that have been achieved. These illustrations cover each of the key sets of constituencies involved: regulators, lay public, expert scientists, business interested parties, private pressure groups and the mass media. An open, integrated process would mediate the agendas of each of these groups and aid the creation and development of collaborative and co-active risk knowledge and decisions.

Recommendations for improved decision making practice are made. They include: the creation and development of risk knowledge intermediaries which can hold information about risk issue attributes, meanings, values and interpretations (scientific and social) in common, publicly accessible databases; the active roles of Information and Communications Technology (ICT) in conveying, shaping and sharing risk knowledge, and in facilitating open-democratic processes within society; and the deployment of transparent, accountable audit procedures and tools.

Keywords: **essential characteristics; integrated societal risk decision-making; hazardous waste management facilities; collaborative risk knowledge**

ID91

M.3.1

Leiss, William, University of Calgary, Canada.

Ratifying Kyoto: Applying the Precautionary Principle to the Climate Change Issue Controversy in Canada

Beginning in late November 2001, immediately after Canada's federal minister of environment returned from the COP meetings in Marrakesh, an intense controversy over ratification of the Kyoto Protocol has erupted in Canada. In part this reflects Canada's strong trade ties to the United States and the potential economic consequences for Canada of the U.S. position against ratification. But equally it reflects domestic ambivalence about climate change issues as well, which are expressed both as doubts about the validity of the climate science projections and as fears that compliance with Kyoto targets will have serious adverse impacts on Canada's economic well-being. The latter has tended to dominate debate, as a result of well-publicized arguments against Kyoto ratification emanating from Canada's industrial sectors, especially the oil and gas industry, arguments that are supported by many provincial government leaders. One striking result of this campaign is that the risk issue itself, that is, the risks associated with (inaction on) climate change, has been almost totally ignored. In the intense debate now occurring in Canada, which is likely to continue throughout 2002, no clear and concise formulation of the risk/cost/benefit trade-offs involved in action on climate change has been offered to the Canadian public. This paper seeks to provide such a formulation, one that is grounded firmly in an application of the precautionary principle, which is understood here as the key underlying principle of modern risk management as such. Ironically, although the Canadian federal government has endorsed the "Rio version" of the PP repeatedly, and has even enshrined it in some federal legislation, it has not offered a defense of its own position in favour of Kyoto ratification in PP terms. Constructing a sound public policy position supporting Kyoto ratification for Canada in terms of the precautionary principle may turn out to be important in the wider international context (especially for Europe, a strong Kyoto supporter), because it is not yet clear that there is enough current support for the Protocol among Annex I countries to actually achieve the level needed for final ratification.

Keywords: precautionary principle; climate change; risk management; Kyoto Protocol

ID92

W.1.4

Dharmavaram, Seshu; Soczek, C.A., E.I. du Pont de Nemours & Co., USA.

Integrated Risk Analyses to Drive Business Decisions

Typically, businesses manage supply chain risks separately from fixed facility risks. However, where significant fixed site risk reduction can negatively impact a supply chain, an integrated study that addresses both supply chain and fixed facility risks must be conducted. To assure that risks are analyzed in comprehensive

manner, a supply chain risk study must include rare/high consequence events, as does the fixed site study. A case study will be presented for a facility that imports, stores, and consumes large volumes of a highly toxic material, and is located in a highly populated area. In addition the site area is small, resulting in populated areas that are immediately adjacent to the facility. The methods used to identify business risk reduction opportunities for the facility and the supply chain, and the process to determine the most cost-effective solutions will also be described.

Keywords: supply chain; fixed facility; rare events; business decisions

ID93

M.2.2

Sjölander-Lindqvist, Annelie, Göteborg University, Sweden.

Images of local environmental uncertainty and an indeterminable future: A Swedish case study

Risk and siting have mainly focused on economic and property implications for local environments. Large-scale projects can also threaten non-commodified shared community assets. Visual imagery compared to verbal communication has the capacity to communicate intuitive and emotive symbolic meanings. In this study, visual images have been used as a methodological device to probe perceptions of environmental risks. The building of a huge train tunnel through the Hallandsas ridge in the south of Sweden entails a panorama of risk scenarios and has seriously affected the local farming community through a severe sinking of the ground water level and a toxic chemical spill.

This paper reports a study conducted in the spring 2002, in which members of the affected local community on the Hallandsas were given one-time-use cameras and asked to photograph 'their local environment'. The photographs were subsequently discussed in in-depth interviews with each photographer. In these interviews, vital assets of the local environment, such as places associated with childhood memories and family history, constituted a main focus. Those assets, however, are not merely private but are also associated to broader collective contexts relating to nature and social continuity.

Among residents, this tunnel enterprise has introduced uncertainty and given rise both to an intensified recognition and re-evaluation of the local community and its shared social identity, its past, its present, and its future. It has also brought to the forefront an awareness of intangible yet vital assets of the local community. Interviewing people about their own photographs facilitates the verbalization of meanings, values, and traditional knowledge but also taken for granted and collectively shared dimensions of everyday experiences and practices in a traditional community. The device of collaborative photography allows us to capture local interpretations of historically and culturally important aspects of the environment brought into bold relief by a vast infrastructure project entailing an indeterminate future.

Keywords: siting; visual images; local environment; uncertainty; social identity

ID94

T.3.3

Shepherd, Richard; Dean, Moira, University of Surrey, United Kingdom.

Risk communication on organic foods: effects of collaboration between sources

Previous research exploring who is trusted in relation to various technologies has identified government and industry scientists and policy makers as distrusted sources, and non-governmental organisations, environmental groups and consumer groups as highly trusted. However, such groups are not always considered to be high on expertise and knowledge. It has been suggested that communications based on collaborations between experts and highly trusted stakeholders may lead to better and more effective risk communication on controversial food topics. At present there is little empirical evidence on the impact of risk messages in such a context.

This study used a questionnaire-based experimental design with a general public sample (n=179) and was based on the Elaboration Likelihood Model (Petty & Cacioppo, 1984). Changes in perceptions of risks and benefits associated with organic food were assessed when people were presented with a risk message on possible microbiological problems associated with organic foods. This message was attributed to a trusted consumer organisation (Consumers' Association - CA), in collaboration with a government agency (Food Standards Agency - FSA) or an expert committee (Advisory Committee on the Microbiological Safety of Food - ACMSF) acting either as advisors or as co-authors. The independent variables were the identity of message source (CA, CA+FSA, CA+ACMSF) and the type of collaboration (CA on its own, CA in consensus with another source, CA after consulting another source). The dependent variables were perceptions of the message, perceptions of the message sources, thoughts induced by the message, and changes induced by the message in trust and perceived risk and benefit.

Collaboration between the CA and FSA increased ratings of bias of the message (compared to the message from CA alone or from CA and ACMSF) and when CA collaborated with either source the message was rated as less relevant. The number of thoughts listed was dependent on individual difference variables such as need for cognition and involvement but neither the total number of thoughts nor the types of thoughts was influenced by the experimental manipulations. Reading the risk message increased rated risk, for example to the environment, and this increase was greater when the CA consulted the other source rather than produced a consensus message with that source. Being involved in producing risk information reduced trust expressed in the sources involved regardless of the identity of the source or type of collaboration.

In this experimental procedure, consensus and consultation had some effects on the ways in which both the source and the message was seen and in the rated risk

after the presentation of the message. Such effects need to be taken into account in the development of joint messages from those involved in debates surrounding food risks.

Acknowledgement. This work was funded by the Food Standards Agency, UK

Keywords: risk communication; partnerships; food risks; trust

ID98

Poster

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Risk Modified Dynamic Model Creation

The modified dynamic model with build in risk generator is an advanced version of the Modified Dynamic Model (MDM). For basic technically economical problems solving is the class of a dynamic modified model a good instrument. Every problem, however, includes some uncertainty and risk. Every problem cannot exactly determine starting conditions and internal structure interactions. At this point, it is appropriate for solving the right Risk Modified Dynamic Model (RMDM), which eliminated defects of the basic variant of MDM.

If a processor has not values of risk for a solution, for solving, it is necessary to use a model with uncertainty. If we have got these values, we can use it for a solution. Risk interactions are created by means of a random number generator. The generator needs several characteristics for its process. Risk and uncertainty exist in different time periods. The model has to be able to describe the risk in these periods. Risk description contains the following information:

- Starting time (beginning of interval)
- Ending time (end of interval)
- Type of random number (type of distribution)
- Parameters of distribution
- Original value of risk interaction
- Decision about using external influences (YES/NO symptom)

The risk parameters described above are basic for method solving under risk and uncertainty. The system is open and it is possible to add next missing types of a random number distribution. The Risk Modified Dynamic Model is effective tool for confirmation of a manager strategy.

Optimization is able (by means of RMDM) determine critical model states and performance of elements that cause instability in model structure.

Keywords: Simulation of dynamic model; Risk Modified Dynamic Model; feasible strategy; risk and utility; decision making

ID99

M.3.3

Klinke, Andreas; Center of Technology Assessment Baden-Württemberg, Germany.

Democratizing International Risk Decision Making

The increasing internationalization of interactions and exchanges as well as cumulative transboundary and even global environmental risks generate impairments of legitimated problem solving capacities and democratic international governance. New functional spaces beyond the nation state appear in which state and non-state actors horizontally cooperate. Which accounts should provide for a democratic risk decision making process in a functional space? Which qualities do require a deliberative risk decision making process?

The paper covers a model of deliberative politics on the international level being able to ensure central democratic principles such as legitimacy, mediating interests, publicity, transparency, accountability and effectiveness. For this purpose the model will emphasize the following three dimensions:

- Input-oriented dimension: Which actors do constitute a deliberative arena? Which interests should be taken into account? How can reliable cognitive knowledge systematically be involved? Which access and influence to international risk decision-making should be warranted for non-state actors?
- Throughput-oriented dimension: Which prerequisites of argumentative rationality are essential for deliberative risk decision making? How can be succeeded collective preference formation?
- Output-oriented dimension: How can an effective problem-solving capacity be achieved? Which quality of the decisions is required? Which role do factors play such as rationality and common good orientation?

In international risk governance the societies are represented by national governments. So direct participation of affected citizens and interest groups as practiced in the national context is missing. Nevertheless, in the last decade NGOs have gained more access and influence to international risk decision processes representing public interests. NGOs have influenced the agenda setting, agenda building and agenda implementing. Due to the complex and uncertain character of risk phenomena decision-making should systematically integrate scientific expertise in order to provide a cognitive reliable basis. If the process rests upon arguing instead bargaining, it is more likely that the participating actors form collective preferences resulting from their cognitive beliefs. This problem solving capacity becomes effective, if it would be oriented on proportionality and appropriateness to manage the risk internationally as well as on the common good taking into account public interests.

For example, the new Stockholm Convention and the Great Lakes regime illustrate deliberative approaches. In the case of the Stockholm Convention the deliberative quality can be identified in the regime formation process. Due to the driving force of a multiplicity of NGOs the Stockholm Convention could be agreed after an international negotiation process of 2 ½ years. NGOs convinced the participating parties to incorporate rules, norms and principles that aim at reducing and eliminating the most risky POPs and implementing the precautionary principle.

In the case of the Great Lakes regime the International Joint Commission has institutionalized a structure of continuous public participation, science advisory boards and processes of argumentative risk decision-making. This lead to an effective problem-solving capacity so that the level of POP contamination in the Great Lakes Basin has significantly decreased in the last two decades.

Keywords: **deliberative risk decision making; legitimacy; problem solving capacity; NGO; public interests**

ID100

T.1.4

Menoni, Scira, Politecnico di Milano, Italy.

Land use planning and industrial risks: tools for prevention and disaster mitigation

The Seveso II Directive has produced a number of implementation tools in the Italian legislation, one of which is the Decree 151/2001 aiming at providing guidance and criteria for urban planning in the vicinity of Seveso installations. Urban and land use planning is one of the most important arena to pursue the precautionary principle: urban development decided today will last for several decades if not for hundreds years, much longer than the majority of each individual building. On the other hand we face today, especially in countries like Italy, the problem of how to tackle the already consolidated situation, consisting of an incredible mixture of industrial and residential areas sharing rather small surfaces.

The Decree provides a framework to determine what land uses are admitted with respect to expected consequences due to accidents characterized by different probabilities. The main criteria for establishing admitted land uses is exposure: at increasing levels of risk the permitted building index decreases while public places hosting large number of people are excluded.

This way implicitly the Italian legislation sets an acceptable threshold of risk, something that has been very rarely done in the past in this country. First applications of this norm has shown some problems, especially for the fact that exposure is the only parameter used to assess the situation of systems subject to the threat posed by dangerous industries. Other parameters should have been also taken into account, like the age of the exposed population, the features of buildings and urban pattern, the vicinity to health care and rescue facilities, etc. Those are more qualitative elements, which planners are more familiar with, but that are hardly considered by experts in technical fields.

Another limit of the Decree is due to the fact it certainly provides better guidance for future developments but has little to say about already existing facilities located in the middle of residential quarters. The Decree suggests that urban plans should be revised whenever modifications of existing plants or in the urban asset are proposed. This way, however, the only result that is immediately achieved is the complete paralysis of both planning and plants technological

innovation, that may end up by hampering instead of enhance safety. Bad signals are already there, like public administrations suggesting to review accidents scenarios so as to minimize the risk of having to change urban plans or to compel industries to carry out new risk assessments.

The paper discusses these problems and provides some hints for changing the perspective from which the relationship between urban planning and risky plants has been considered until now. The following points will be examined:

- the possibility to integrate within the acceptable level of risk threshold other considerations that do not derive only from technical disciplines, but include also other points of view, related to social, psychological and economical motivations;
- the need for integrating risk avoidance practices with other objectives that land use planning should satisfy, like promoting a safer and healthier environment;
- the need for promoting stronger cooperation among experts of various disciplines, so as to make planners more accustomed to treat numbers and quantitative variables and to make engineers more ready to integrate their quantitative methods into the decision making process.

Keywords: risk prevention; land use planning; tolerable risk; urban vulnerability; Seveso II Directive

ID101

T.1.4

Menoni, Scira; Caragliano, S.; Colombo, S., Politecnico di Milano, Italy.

External emergency plans: a challenging risk management tool for local communities

The Seveso II Directive states that external emergency plans should be prepared in areas where dangerous plants as defined in the appendix of the Directive itself are located.

Countries like Italy are facing several problems in applying this rule, especially as far as coordination efforts among several institutions and with plants' managers have to be foreseen to make those plans efficient and reliable. While some civil protection bodies, like firemen departments are quite well equipped to deal with this kind of emergencies, there is still a lack of a comprehensive coordination and management capacity on the part of agencies like the prefecture and the National civil defence, who should provide instead guidance during large mass emergencies.

While some tools and managerial capabilities that have been developed in European countries can contribute to find ways to improve such situations, there are some peculiarities which must be solved nationally and sometimes even locally, taking into account the specific context where plans are developed and should be applied in case of need.

An interesting real case is provided in this paper, that is the development of an external emergency plan in a municipality close to Bergamo in the Lombardia Region, where the largest number of Seveso installations is located. Several aspects have been considered in a comprehensive fashion in this experience: first a framework to estimate damage scenarios has been developed, considering both expected accidents and the vulnerability of exposed urban systems and of the population. This is a rather dangerous situations, where large public facilities along with residential areas are located at a close distance to plant's fences, thus exposing somewhat like 1000 persons to the potential release of a toxic release.

Second a coordination effort has been attempted by the Prefecture, who involved several actors in the development of such plan. As consultant of the municipality, the working group created at the Politecnico di Milano acted as an independent observer in those collective meetings, showing discrepancies between what every actor thought about its role in a case of emergency and what the others expected him/her to do. This way a more collaborative plan has been proposed, based more on mutual knowledge and information exchange rather than on theoretical expectations, derived from abstract laws and regulations.

The paper discusses some first results of this experience, in the attempt to draw some general conclusions concerning advantages and shortcomings of current emergency management practices in Italy.

Keywords: emergency management; external emergency plans; crises; coordination efforts; Seveso Directive

ID102

M.3.4

Grothmann, Torsten; Potsdam Institute for Climate Impact Research, Germany.

Coping Capacity of People at Risk: Predictors of Households' Coping with the Risk of Flooding

Natural hazards, particularly floods, have become a major concern in risk management and will most probably do so increasingly as climate change is already happening. Enhanced risk awareness and coping capacity of households and businesses can reduce flood damages as well as the costs of public risk management. Based on (a) protection-motivation theory (Rogers, 1983) and (b) research on social capital (Putnam, 1993) this ongoing study compares the coping strategies of households and businesses in flood-prone parts of Cologne (Germany). This is a city that has traditionally been subject to minor and major flood events. It has recently adopted a comprehensive municipal flood protection strategy. The first results of the study focus on individual and collective coping efforts of households. Different predictors of anticipatory and reactive coping with floods are tested in a representative telephone survey: expected severity of damage (including intangible assets), perceived coping capability, social capital and views of nature. The implications for risk communication and management are discussed.

Keywords: Natural Hazards; Adaptive Capacity; Protection-Motivation-Theory; Social Capital; Risk Perception

ID103

M.2.1

Wiedemann, Peter M.; Schütz, Holger; Research Centre Jülich, Germany.

Lessons learned from scientific dialogue on EMF risk assessment

Over the last years a number of international and national expert reports have been published on possible health risks of high frequency electromagnetic fields (HF EMF) of mobile telecommunications. While all reports agree that there is no scientific proof for health risks below the well-known limit values for thermal effects of HF EMF, there is some disagreement as to whether there is sufficient evidence for health risks to justify precautionary measures, including the implementation of lower precautionary limit values.

Such expert disagreements are a major reason for public debates on potential health risks of mobile telecommunications. And they are a serious problem for risk communication about this issue, because they seem indicate that scientific knowledge about health effects of HF EMF is poor, and risk assessments concerning HF EMF may not be valid. Thus, risk communication is faced with the additional problem of having to explain the reasons for disagreements among scientists, and what this means for risk assessment. To facilitate risk communication on this issue, it is therefore important to understand how these expert disagreements come about.

A research project, which was sponsored by German mobile telecommunications provider T-Mobile, tried to investigate the reasons for scientific disagreements on health risks mobile telecommunications. This was done by setting up a scientific dialogue among experts, who had been commissioned before by T-Mobile to provide reports on their risk assessment of HF EMF of mobile telecommunications. The project aimed to make transparent what consensus and what dissent exist between these expert opinions and why. A further goal was to clarify how the precautionary principle in the field of mobile telecommunications is to be understood: on what scientific basis are precautionary measures to be taken?

Some lessons learned from this scientific dialogue will be presented and will be discussed with regard to their implications for risk communication

Keywords: risk perception; risk communication; electromagnetic fields; scientific dialogue; lessons learned

ID104

T.3.3

Cox, Patrick, University of East Anglia, United Kingdom.

Plugging leaks sinking ships

The management of risks to society and the environment of the rapid advances in biotechnology science has been particularly contentious. The findings from an

ongoing study involving plant genetic manipulation and recent attempts to move from a traditional science orientated risk management strategy into a more holistic way of viewing and evaluating the risks of GM crops will be discussed. The study concludes that competing value positions must be reconciled if progress in the development of the technology is to be expected.

Keywords: biotechnology; GM Crops; risk management; public values; rational science

ID105

M.2.4

Boholm, Åsa; Göteborg University, Sweden.

Cultural dimensions of risk perception

During the last twenty five years of research on risk perception a considerable number of cross-national studies have been conducted. Beside explorative aims to probe people's risk perception in other countries than the United States, a strong objective for making comparative cross-national studies has been to test current theories, such as the Psychometric Model and Cultural Theory. One lesson from cross-national research is that perception of risks is both uniform and variable; we find similarities as well as differences. Some reported differences can be explained by the presence or absence of actual risks due to the specific conditions of living in different countries. Poor drinking water, environmental pollution, terrorist deeds or heavy and dangerous road traffic are simply more prominent threats to some populations than to others. Other findings are, however, more puzzling and less easy to relate to the actual conditions under which people live.

In Portugal where there have been nearly as many cases of BSE as in the UK there is a notable absence of public concern or debate about health risks to humans from eating beef. In Spain, on the other hand, where the actual cases of BSE has been comparably few there has been vigorous debate, public distrust in government regulation and concomitant decrease of meat sales. Growth hormones in milk and in beef in the US are permitted by authorities and there is little active consumer opposition. Growth hormones in milk/beef in Europe, on the contrary, appear to be unacceptable to regulators and consumers since such 'additives' are considered a serious health risk. In France the IKEA company has encountered surprisingly little demand for child safety appliances and devices to make the home a safer environment, while in Sweden such products make up an salient segment of IKEA:s sales.

Examples like these indicate that what is considered as a risk in a certain society can not be determined merely from objective criteria. Evidently there is a dimension pertaining to 'culture', to a shared (and relative) system of knowledge about the world and what it consist of. Culture defines categories and contexts, processes meanings and orders information, and makes it possible for people to understand others and to be understood. Culture serves to frame risks by producing contexts

which links an object of risk (a source of potential harm), an object at risk (a potential target of harm) and an evaluation (implicit or explicit) of human consequences. In this perspective we can think of risk as a relational order through which connections between people, 'things' and 'outcomes' are constituted. The introduction of 'culture' into the model means that we allow for variations in how such relationships are conceptualised by different communities.

Keywords: Comparative studies; risk perception; context; meanings; culture

ID106 withdrawn

T.2.3

ID107 M.1.1

Kastenholz, Hans; Renn, Ortwin; Center of Technology Assessment Baden-Württemberg; Hertel, Rolf, BgVV, Germany.

Risk Communication for Chemical Risk Management. An OECD-Guidance Document.

In 1999, OECD initiated a project to identify practical ways to make risk communication an integral and effective part of chemical risk management decision-making and implementation.

The final milestone of this project is the publication of a Guidance Document. The aim of this document is to provide practical approaches to risk communication for chemical risk managers, with a particular focus on communication programs aimed at consumers of chemical products. In addition, it aims to increase understanding among target audiences of the rationale underlying risk management decisions. The document identifies the various stages in the chemical risk management process in which risk communication plays a role; it defines the types of situations faced by chemical risk managers from dealing with non-controversial to highly controversial issues; and then it provides guidelines for responding to these situations.

Although this document focuses primarily on the communication needs of consumers of chemical products, many of the guidelines refer also to other target audiences such as journalists, workers, employees of companies and public authorities, stakeholders, medical community and health care providers and members of risk-related organizations. The major issues addressed are how to:

- provide information to the public about chemical products and their risks;
- provide information to the public about the process for conducting risk assessments and making risk management decisions, including a description of the various actors and procedures involved in both tasks;
- organize effective two-way communication;
- enhance trust and credibility of all actors in the risk assessment and management process; and

- involve stakeholders in the process and resolve conflicts.

This paper deals with the most important results of the OECD project. In a first step it will focus on its different milestones. Then the core elements and the structure of the guidance document will be discussed. Finally some recommendations are given of how to improve the implementation of risk communication programs.

Keywords: risk communication; guidelines; chemical risk management; OECD; consumers

ID108 M.2.3

Huber, Michael, London School of Economics and Political Science, United Kingdom.

Risk management as Internalization. The example of risk management by insurance

Risk literature focuses on the management of rare, highly politicised events and neglects - as far as detailed analysis is concerned -- the routine processes of risk management. Insurance is one important institution of such routines, but considered "a virtually unknown industry" (e.g. Meier 1988, xv). Although most risk management features characteristic for insurance are well researched - e.g. risk spreading, contracting, risk assessment - no comprehensive conceptual framework for the understanding of insurance and its risk management has been developed. This paper outlines first steps towards such a conceptual framework.

One of the things we know about insurance is that the insurance sector revolts around an instrumental notion of risk. Weakness and shortcomings of this narrow instrumental conception of risk have been analysed in many different contexts. The fundamental criticism points to the ambiguity of calculability of events as every step towards more control / higher level of calculability implies the loss of control / calculability in other areas. Hence, to base our understanding of insurance on the accuracy of calculations is too narrow. We have to account for contextual, i.e. economic, political and legal aspects too. The increasingly influential, qualitative approach to risk claims that risk does not exist as such, but risks are risks only insofar they are perceived as such. It opens the debate for the psychological and institutional context of risk, and risk management practices. We assume that a conceptual shift from a quantitative towards a more qualitative risk-concept improves our understanding of risk management by insurance.

Starting from a constructivist risk notion, the paper develops a risk management model of insurance that shifts the main attention from the management of external risks (car accidents, earthquakes etc.) towards internal financial and organisational risks of insurance. Risk management of insurance is characterized by the internalization of external risks. Internalisation marks the process by which insurance transfers external risks into internal, mainly financial risks. The

management of these risks is considered a decisive insurance activity that shapes the overall risk management. The practical and conceptual consequences of internalization are analysed, a particular emphasis is put on organisational aspects of internalization.

Keywords: insurance; risk management; risk; organisational perspective; ambiguity of insurance

ID109

M.3.3

Vari, Anna; Ferencz, Zoltan; Hungarian Academy of Sciences, Hungary; Linnerooth-Bayer, Joanne; Sendzimir, Jan, International Institute for Applied Systems Analysis, Austria.

Stakeholder Views on Transboundary Water Contamination Problems: The Case of the January 2000 Tisza River Cyanide Spill.

In January 2000, a tragic cyanide spill into the Szamos river in western Romania, flowing into the Tisza river in Romania/Hungary and ultimately the Danube river, was caused by the breakage of a tailings impoundment maintained by the AURUL Australian-Romanian joint venture company in the region of Baia Mare in northwestern Romania. Approximately 100,000 cubic meters of water with very high cyanide and heavy metal concentrations were released. Maximum cyanide concentrations were 300 times higher than the limit value of "heavily polluted water," copper concentrations exceeded the "heavily polluted" threshold 40-160 times, the zinc concentration was twice above this standard and the lead concentration 5-9 times greater. Ecological impacts were so extreme that for a brief period all aquatic life ceased in the Szamos and Tisza rivers as far downstream as Tokaj, which eliminated the invertebrate base of the food chain as well. Total fish death was estimated as 1241 tons.

The cyanide spill resulted in extensive damages to fishing, angling, and tourism-related businesses. Since the affected areas are among the poorest in Hungary, the social and economic impacts have been significant. The Hungarian government filed a lawsuit against AURUL in which it demanded compensation for a total loss of 28,5 billion HUF (cca. USD 93 million). However, due to various procedural mistakes, court hearings have not begun.

Since January 2000, a number of further severe heavy metal spills occurred in various tributaries of the Tisza river, indicating that the risk of transboundary water contamination has not been eliminated. As a response to such risks, the European Commission initiated the formation of an international Tisza agreement with the participation of the five riparian countries.

In 2000, the International Institute for Applied Systems Analysis (IIASA), in collaboration with the Stockholm University and the Hungarian Academy of Sciences launched a project aimed at studying flood and water contamination problems in the Upper Tisza region. Within the framework of this project, a series of

empirical studies were conducted, investigating the views of key stakeholders and the general public on the short- and long-term consequences of the cyanide spill, the adequacy of various risk management tools (e.g., early warning systems, communication, economic incentives, legal measures, etc.), and the preferred roles and responsibilities of national and international actors. The studies included semi-structured interviews with key stakeholders and a series of public opinion surveys in affected and non-affected regions. The results indicate significant differences among the views of various stakeholders and the general public (e.g., entrepreneurs and local government officials in affected communities blame primarily the politicians and the media for stigma effects, while other respondents put all blame on the polluting company). Data also indicate that opinions on various risk management tools (e.g., litigation) and actors (e.g., governments, NGOs) are changing over time. The paper analyzes these results and draws conclusions about the necessity of involving stakeholders from the riparian countries in key decisions regarding the management of transboundary water contamination risks in the Tisza river basin.

Keywords: Risk management; transboundary water contamination; Tisza river basin; stakeholder views; public opinion

ID110

W.1.3

Linnerooth-Bayer, Joanne; Ermolieva, Tatianna, International Institute for Applied Systems Analysis, Austria; Vari, Anna; Ferencz, Zoltan, Hungarian Academy of Sciences, Hungary.

Integrated Flood Risk Management for Hungary's Tisza River

In the past decade, floods accounted for over half of the recorded fatalities and a third of the damages from all natural catastrophes world-wide. Economic damages are rising mainly because of increasing concentration of populations and vulnerable assets in high-risk zones, and possibly because of increasing extreme events due to climate change. Hungary ranks only behind countries like Bangladesh and the Netherlands with regard to the extent of its territory exposed to flood risks, and one of the most exposed regions - and one of the poorest in Hungary - is the Upper Tisza basin.

Despite the risks of flooding, the Hungarian government does not have a clear risk-management strategy in place. In the past, the national government has taken full responsibility for flood prevention, mainly through the construction of an extensive system of levees, as well as for the post-disaster compensation of losses. This policy, however, is placing an increasing strain on the Hungarian national budget. Like in many other countries, Hungarians recognize that a national flood program must be developed that effectively links private and public responsibility for reducing the escalating losses from floods and for compensating the victims when losses do occur. The development of an insurance/mitigation program, however, faces distributive-value problems. The Hungarians have conflicting views

on how flood losses should be reduced, whether by expanding and improving the levee system or by non-structural measures, such as the re-naturalization of the river. The Hungarian public also has conflicting views on whether the government should compensate victims as a form of social solidarity, or if those living in the flood plains should protect themselves with insurance. Moreover, if private insurance is to be a policy option, it is necessary to devise improved tools and models for estimating spatially dependent risks in cases of little historical data.

Devising policies for loss prevention and linking this with loss-sharing strategies are the key to the success of an integrated flood risk management system, and both will require acceptance by the many stakeholders involved. These include the national and local governments, the private insurers, environmental groups, industry groups and the public.

This paper reports on the preliminary results of an IIASA-based project on integrated flood-risk management for the Hungarian Upper Tisza river, in collaboration with the Hungarian Academy of Sciences and Stockholm University. To examine stakeholder views on mitigation and loss sharing, we have conducted extensive interviews and administered a questionnaire to 400 persons within and outside of the Upper Tisza region. In addition, we have developed a flood catastrophe model based on Monte Carlo simulation that can be of use in analyzing policy options for reducing the losses of floods in the Upper Tisza region, as well as analyzing options for sharing the losses. These options are being considered by the many stakeholders in the region, and a final stakeholder meeting will examine the terrain for compromise.

Keywords: Floods; Integrated Disaster Management; Catastrophe model; Stakeholder; Risk

ID111

W.1.3

Gazsó, André; Sholly, Steven; Schmidt, Markus; Kromp, Wolfgang, Institute of Risk Research (IRR), Austria.

SERF3 - Socio-economic Research on Fusion. The Narrow Path for ITER.

In July 2000 the French Atomic Energy Commission (CEA) has announced its interest in hosting the International Thermonuclear Experimental Reactor (ITER) at its Cadarache site. The French Ministry of Research is very favourably disposed towards a European site for ITER recognising the vital role of ITER in the development of fusion power and its impact of the fusion programme on leading-edge technology and its importance for the European industry. Cadarache is now evaluated as a site for ITER in terms of technical suitability, safety, social acceptance, costs, and benefits to industry. A decision by the European Commission on an European thermonuclear fusion site will largely depend on these parameters including public acceptance regarding to place the leading European fusion research

within the Sixth R&D Framework Programme budget that begins in January 2003. A site decision (between Europe and its competitors Canada and Japan) is expected by late 2002, with construction to start, at the soonest, in 2003.

Considering a public participation process as a prerequisite of a planned ITER-siting in Cadarache or a part of the licensing process respectively, it would be of some use to transform the results and insights developed from recent public participation projects on other topics (public transportation projects, food safety, gene technology) to more ITER-specific needs. Not all attempts to include the public in a reliable way were successful, but in total (as the latest Eurobarometer study regarding gene technology shows) people are highly capable of distinguishing different applications of the same technology.

Whereas fusion was strongly supported during the oil shock years as new option to gain energy independence by the end of the century (as mirrored by essential increases of DOE and Euratom budgets), the recent discussion of energy shortages is not accompanied by a similar support for advanced nuclear technologies.

Fusion research suffers from several short-comings, which can be regarded as both internal and external deficiencies in portraying science to the public, the unsolved internal self-definition of fusion research (basic vs. applied science, traditional link to nuclear fission vs. renewable energy concepts, commercial energy option vs. industrial spin-offs), and a traditional reluctance akin to nuclear R&D to open research and decision procedures to the public. However, the ongoing efforts to site the so-called ITER (International Thermonuclear Experimental Reactor) in Europe make it necessary to reach out for more public acceptance, whereas the degree of transparency is not yet agreed upon.

Keywords: thermonuclear fusion; technology choice; stakeholder involvement; public participation; risk communication

ID112

W.1.3

Gazsó, André; Schmidt, Markus; Kromp, Wolfgang, Institute of Risk Research (IRR), Austria.

Risk and Sustainability. The Claim of Sustainability.

This contribution has two main goals: firstly, it tries to introduce some of the more risk specific terms to the sustainability related discussion, asserting that there are several similar criteria and analogies to be found in both research fields. Secondly, the presentation wants to show by the case of nuclear power - especially in the course of Kyoto - how the terms "sustainable" and "sustainability" are employed in a manner which might be regarded as rather inadequate or even misleading in certain cases.

The term "risk" indicates both a technical and sociopolitical construct, each covering important aspects of assessing probable damage and/or loss of any kind. Although a consistent system of risk classification has not been achieved yet, there

is some agreement that a multilevel approach to risk definition is suited best to describe the interactions between human action and complex technologies, each level exceeding the level which it is based on (technical, toxicological and epidemiological, psychological, societal, cultural, and ethical approaches). An attempt to arrive at an integrated assessment of possible consequences of any technological (or other) interference has to consider aspects derived from all of the approaches mentioned above.

Sociological perspectives, although consisting of an array of competing approaches, have in common, that they include undesirable events that are socially defined or even socially constructed. The "base unit" in this case is the "real" consequence of human activity, which is always mediated through social interpretation and associated to group values and interests. From a normative aspect, the sociological perspective includes the need to base risk policies on the experience of inequities and theories of fairness and justice. On the other hand the reduction of complexity of the social interaction in modeling the reality bears the danger of subjective selection and ideological reasoning.

Scientific risk research elaborated in the last two decades a set of qualitative factors affecting risk perception and evaluation focusing on psychological, sociopsychological and ethical aspects (voluntariness, controllability, affectedness, familiarity, risk distribution, and many more, Littai & Rasmussen 1980, Covello 1988, Slovic 2000). In selecting risks to be compared, it is helpful to keep these distinctions in mind. Risk comparisons that ignore these distinctions are likely to have negative repercussions on the process unless appropriate qualifications are made.

Taking account of these specific qualitative aspects in lay risk evaluation, the German Council on Global Change (1998) adds one more sociological criterion to its risk assessment set of criteria (mobilization potential), whereas still laying the greater emphasis on quantitative and semi-quantitative aspects (probability of occurrence, extent of damage, certainty of assessment, ubiquity, persistency, irreversibility, delay time).

Further discussion might reveal that the application of some of the criteria introduced are of certain interest for the development of a social value system valid for sustainable development, and that some of these criteria cannot be utilized to support a the claim by nuclear energy to appear as sustainable as aspired recently (NEA 2000).

Keywords: Nuclear energy; sustainability; vulnerability; public concern, participation; expert-lay-conflict

ID113

M.1.1

Dürrenberger, Gregor, Res. Coop. „Sustainable Mobile Communication“, Switzerland; Kastenholz, Hans, Center of Technology Assessment in Baden-Württemberg, Germany.

Pagination or animation? Examples of emf risk information tools for the public

One of the main objectives of risk communication is to foster understanding of risks among different constituencies (customers, workers, consumers, interest groups, environmental groups, and the general public), including risks pertaining to human health and the environment taking into account the dominant risk perception patterns of the target audiences. Providing useful and explanatory risk information to the general public or parts of the public, plays a crucial role in this process.

Written material is still the most popular form of communicating with different audiences on a large scale. The material should be designed in a way that it corresponds with the audience needs, concerns and level of knowledge. So the first steps in preparing a written material are

- to define the major messages that one would like to convey;
- to determine the types of audiences that one likes to address;
- to get a feeling of the social and political context in which the issue is placed;
- to articulate the messages in a way that they fit the needs of the audience and correspond to the social and political context;
- to compose the appropriate communication package;
- to determine the channel of transmission;

In addition to written information new channels of multimedia presentations are increasingly used as means to communicate with the audience. All the steps listed above also apply to multimedia presentations, but there is a set of additional requirements that one needs to take into account:

- be fast, responsive and brief when using the opportunity of the new media;
- use interactive features to make the information more attractive;
- make sure that the main search engines register your entry;
- provide sufficient links to other organisations and information sources that deal with the same issue;
- be sure for reviewers to respond

This paper first presents a written information document (in preparation) on emf-risks designed for decision makers and interested people from the general public. Then, we will present an Internet information platform about emf-risks designed for the general public. We will introduce into its structure, explain its handling and demonstrate how it is used. We will then focus on the mobile phone sector and describe the current status and the likely development of risk communication activities in Switzerland. Finally some recommendations are given of how to improve the implementation of emf risk information tools.

Keywords: EMF; risk information tools; risk communication; Internet; mobile phones

ID114

T.2.3

Renn, Ortwin; Center of Technology Assessment Baden-Württemberg, Germany.

Attitudes towards Genetically Modified Food in Six European Countries

Genetic engineering has become one of the most controversial topics in contemporary societies. On one hand, many representatives of industry, science and politics believe that major economic and technological advantages will result from a fast generation and dissemination of genetically altered products; on the other hand, many observers from all parts of civil society warn public officials about potential side effects of this technological innovation and alert the public to the social, political and ethical consequences. The public is somehow caught in the middle. What do people in Europe think about genetic modifications in agriculture and food? What expectations do they have when they are confronted with the issue of genetically modified organisms (GMOs), what do they fear and how do they perceive this issue within the whole context of modernization and lifestyle changes?

A research team from five European countries directed by Prof. Brian Wynne from Lancaster University (UK) has been asked by the European Commission to conduct an in-depth study on public attitudes, perceptions and evaluations of genetic modifications in agriculture and food processing. In order to get an accurate and comprehensive impression of public understanding of GMOs, the team selected the method of focus groups interviews, a recently developed tool of empirical research that promises far more valid and relevant results than the usual instruments of polls or surveys. A total of 55 focus groups were organized in the five participating countries: United Kingdom, Spain, Italy, France and Germany. In addition to the focus groups, the researchers made personal interviews with the key actors and organized several workshops with "stakeholders" in the debate.

The results of the four year investigation included many surprises. If one attempted to summarize the main conclusion from this comprehensive study, the main message would be: Almost all popular opinions on the alleged attitudes and perceptions of the public turned out to be simple myths. Most of these myths provide many key actors in industry, politics and NGOs a convenient justification for pursuing their own interest. Most stakeholders in the GM debate misunderstand and misrepresent public responses to GMOs. Much of today's impasse in this issue is due to common misperceptions about the alleged view of "the man and woman on the street".

Keywords: biotechnology; public perception

ID115

M.2.4

Gilbert, Helen; Pidgeon, Nick F., University of East Anglia, United Kingdom.

Public Concepts of the Health Impacts of Air Pollution: Comparing Hazards.

Numbers of fatalities have often been considered by decision makers to be the main concern in allocating resources to policies for reducing health risks. The public, however, are thought to have a variety of other concerns which may be equally important, but these are more subjective and harder to quantify than excess numbers of deaths which can be linked to observable fluctuations in the hazard. This paper examines some of the underlying factors involved in formation of value judgements relating to air pollution. Self-administered questionnaires were completed by 143 participants, 73 female and 70 male, aged from 18-80, in urban and rural locations. The questions were chosen on the basis of findings from previous studies, exploratory interviews and focus groups. Public concepts of the health risks of air pollution were compared to those of road accidents and smoking. Initially the participants were given some statistical details about these hazards in a health risks information table. This outlined aspects of the risks to drivers and passengers in road accidents, air pollution from bad air days and smoking showing annual deaths, years lost, age of victims, injury/illness. This was followed by questions to assess the participants' personal exposure to the three hazards. The possible effects these hazards could have on the respondent were rated on a scale of 1-4 using 12 risk attributes. These were then analysed in relation to the levels of unrealistic optimism, overall risk and acceptability of the risks. Factor analysis was used to find underlying dimensions that explain the correlations between the variables. This reduced the 12 risk attributes into 4 categories of Vulnerability, Control, Knowledge and Equity. Despite AirPollution proving to be low on unrealistic optimism and the least risky of the three hazards, it was considered to be more unacceptable. The Vulnerability factor showed a positive correlation with optimism and riskiness: this was also true of optimism and the Control factor. People expressed less feelings of vulnerability to AirPollution, although less control over avoiding or preventing it and more concerned about future risk. Qualitative analysis is being used to explore the more subjective meanings attached to these results.

Keywords: health risks; psychometric dimensions; air pollution

ID116

W.1.1

van 't Klooster, Susan; van Notten, Philip, Maastricht University The Netherlands.

'We didn't see it coming' : the subjective nature of signal detection

Change often occurs where it is not expected. Fifteen years ago few Europeans would have predicted the upcoming upheavals on their own continent: the collapse of communism, Berlin as the capital of a reunited Germany, and a single European currency, for example. Beyond Europe, changes have been no less dramatic and

unforeseen: the fall of the Asian tigers, the emergence of internet and mobile telecommunication, the presidency of Nelson Mandela, and more recently the attacks on the Pentagon and the World Trade Center, and their aftermath.

The exploration of seeds of change and the signals of their development are relatively uncharted territory for decision-makers and researchers. The limited research that has taken place has assumed that the concepts such as wild cards, weak signals, and surprise, can be defined objectively. The presumption is therefore that the concepts exist independently of the observer. However, the objective view narrows the scope for signal detection since it fails to acknowledge a number of socio- cultural and psychological factors that influence the early detection of new societal developments. These factors include various types of cognitive biases, cultural and value diversity that influence the perception of our surroundings.

New societal developments sometimes catch us off guard when we are first confronted with them. However, they rarely come from out of the blue and the seeds of change are often sown long before their impact is felt. The fact that new developments are often not anticipated is more attributable to the failure to detect seeds in the early stages of growth, rather than to the nature of the new development itself. The role of the observer and the socio- cultural and psychological factors that influence him/her thus come to the fore. Furthermore, the factors' varied nature helps explain why new developments are detected by some observers and not by others, and why different meaning can be attributed to the same societal phenomena.

The recognition of socio- cultural and psychological factors is crucial to the successful detection of signals of change without denying the relevance of objective approaches. A more inclusive method to signal detection would involve collecting a multitude of plausible perspectives on new societal developments. Those developments that are not detected in one perspective might be detected in another. Thus, a more subjective approach can complement other approaches and establish as comprehensive a view of our surroundings as possible.

A presentation at the risk analysis meeting would provide theoretical reflection on the socio- cultural and psychological factors that influence early detection of seeds of change and the signals that warn of their arrival. The theoretical reflection is supported by on-going research on projects on water management and uncertainty management amongst other activities. The presentation would close with a research agenda based on preliminary research insights. The agenda includes questions that address foresight methodology, especially scenario analysis, in the early detection of seeds of change.

Keywords: Signal detection; socio-cultural and psychological factors; scenarios

ID117

T.2.2

Heinrichs, Harald; Peters, Hans Peter; Research Centre Juelich, Germany.

Public Opinion as Constraint for Coastal Risk Management: The Role of the Media

This paper explores the possibilities of analyzing the "public risk construct" of global climate change and its consequences for the German North Sea Coast. It describes the methodological approach of the subproject "Climate Change in the Public Sphere" of the interdisciplinary joint project "Climatic Change and Preventive Risk and Coastal Protection Management at the German North Sea Coast (KRIM)".

Global climate change will cause a raising sea level and thus a higher risk caused by storm tides. Especially in coastal regions politics and society have to adjust to the impending threat before disasters are unavoidable. Risk management, however, cannot solely focus on technical measures but has to take into consideration the political, social and cultural framework.

The described project analyzes, how the public perceives and interprets climate change and its consequences for coastal protection at the German North Sea coast. It is assumed that the public risk construct emerges from the public communication process which - in a media society - is strongly structured and influenced by the mass media. How are opinions and images formed? How are those influenced by experts and mass media? How do individual perspectives of media consumers intervene? The project implements three interconnected methodological approaches to examine the complex meaning production and communication processes between experts, journalists and the public:

- The coverage of the press, of radio and of television about climate change and coastal protection is analyzed in detail: Which images about global climate change do the media broadcast and are these images at all connected to problems of regional coastal protection?
- The relationship of experts and journalists during the production of the media coverage is investigated by surveys of both actors: How do journalists select, edit and reinterpret statements of experts?
- How readers, listeners and viewers receive and process the information offered by the media, is analyzed with an experimental approach. Test subjects read articles about climate change and coastal protection and are asked to verbalize their thoughts: Do the readers take over the arguments of the articles or do they generate their own thoughts?

Expected results of the project are threefold: First, project results can be used to improve the quality of coastal risk management. The problem from the risk management perspective is: Will the public accept expensive and otherwise adverse measures to reduce risks that are not experienced yet but are claimed for the future? The analysis of opinion-formation will make it possible to identify factors influencing the acceptance of a foresighted coastal protection planning. Secondly, project results can be used to improve communication with the public. Thirdly, the analysis of the entire communication chain from journalistic inquiry up to media consumption by the audience will help to understand better the various processes, in

which meaning is constructed. This study, thus, is of relevance not only for climate change and coastal protection but for environmental risk communication in general.

Keywords: climate change; coastal protection; public risk construct; public communication

ID119

T.3.4

Grutsch, Markus A.; Research Centre Juelich, Germany.

The Perception of the Galtür Avalanche Disaster

Shortly after an avalanche that hit the Austrian village Galtür in 1999, a risk perception study was conducted in Northern Tyrol (Austria). The sample consisted of 424 Germans and Austrians. The study aimed at highlighting how people perceived the risk for an avalanche disaster in terms of estimated victims. A further topic of the survey was how people attribute the causes of the avalanche and what measures should have been taken to prevent the disaster. Testing whether interpersonal differences of adventure seeking had influenced the attribution of various causes of the disaster, Zuckerman's (1964; 1994) thrill and adventure seeking subscale (TAS; in German: Unterweger, 1980) was applied in the survey. The results of the study will be presented and discussed with special emphasis on the impact of interpersonal and cultural differences on the perception and appraisal of the Galtür avalanche disaster.

Keywords: risk perception; risk comparison; attribution of various causes; hazardous situation; survey

ID121

T.1.4

Salvi, Olivier, INERIS, France.

ARAMIS project : development of a accidental risk assessment methodology in the context of the Seveso II directive

The problem of risk estimation, assessment and control is necessary to be discussed in every decision level of an activity. In this way it qualitatively assess the performances of a system, action or technology, by indicating the possible consequences on environment, people or property.

The main objective of the paper is to develop regional strategies for risk assessment the aim of: establishing the areas that must be investigated and their particular characteristics, identifying the industrial activities in the area, determining hazards, establishing the analysis criteria and prioritizing the studied areas, evaluating the continuous emission, studying the major accidents, studying the population health, classifying the risk, establishing a global strategy, implementing politics/actions, directions/measures.

The paper expectation is to provide a decision tool for risk managers and authorities in order to limit the industrial pollution.

Keywords: risk assessment; SEVESO; methodology

ID123

T.1.1

Mekel, Odile C. L.; Kosta-Rick, Reinhard, University of Bielefeld, Germany.

Predicting exposure concentrations of cadmium in vegetables and fruits by probabilistic modelling: Improved selection of input variables and plausibility check

For the cadmium exposure of the non-smoking normal population the food pathway is of prime importance. Vegetable food accounts for about 65 - 80% of all cadmium exposure. 31-53% of the cadmium uptake from nutrition can be attributed to vegetables and fruits alone, 18-48% to cereals. Elevated cadmium levels via the air and/or soil pathway mainly affect the population's exposure to cadmium via its uptake through vegetables.

As part of a health impact assessment, a probabilistic modelling of the cadmium exposure of allotment gardeners was carried out, based on a terrestrial exposure model [1]. Main focus of the modelling was on the compartment plants (food crops, vegetables); model input variables were selected as realistic as possible. Input data were provided by topical data from air quality and soil monitoring programs in North Rhine-Westphalia (wet and dry deposition; soil background concentration); transition factors (interception and retention factors, bio-accumulation factors soil ? plant) were to some extent newly analysed with the help of an extended database and applied. Also cultivation data (e.g. biomass-yield, vegetation length) of the various vegetable groups were updated based on data from everyday's practice.

Cadmium concentrations in 6 different vegetable groups (leafy vegetables, legumes, vegetable fruits, fruits, root vegetables, potatoes) were predicted by probabilistic modelling and compared with measured concentrations (food monitoring). The predicted cadmium concentrations generally correspond well to the topical data gained from food monitoring studies in European regions, both in terms of concentration levels and variability. To a less degree the predicted concentrations are slightly overestimated by the probabilistic model.

For average values and 5 - 95 percentile values the probabilistic model of cadmium exposures based on an terrestrial exposure model can provide a realistic assessment of cadmium concentration levels in vegetables. This however requires a careful and realistic selection of input variables.

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Furanen. Eigenverlag, Ministerium für Umwelt und Naturschutz, Landwirtschaft und Verbraucherschutz (MUNLV) NRW (Hrsg.), Düsseldorf.

Keywords: Vegetable Foods; Probabilistic modelling; Validation; Cadmium

ID124

T.1.1

Heinemeyer, Gerhard, BgVV; Dürrkop, Jutta, UBA; Gundert-Remy, Ursula, BgVV, Germany.

Exposure assessment for children: Is there a greater risk than in adults?

It is generally believed that children represent a population that is at special risk when they are exposed to chemicals. It is also said that children may be more "sensitive" than adults, because maturation is developing, effects may be more pronounced and the load may be generally higher than in adults.

To clarify these questions and to comprise the knowledge of children's exposure, the BgVV and the UBA have organized a workshop (Sept. 26th-29th, 2001, Berlin) and invited international experts with different backgrounds to discuss the special features. The topics were directed towards differences in anthropometrics of children vs. adults, characteristics of specific behaviour of children modifying exposure and to age related toxicokinetics and -dynamics, with special focus on pesticide exposures.

The most important results of the workshop can be concluded as follows:

- a) Children may limit their own exposure due to hand-to-mouth contact, which leads to oral intake of dust and soil during different periods of childhood. This can be referred to crawling on the floor which may lead to exposure from substances which are used to care for carpets, floor coverings etc. This type of exposure is due to indoor dust load. During later years, children play outside which leads to a qualitative and quantitative shift of exposure. Contact with pets may also lead to considerable exposures particularly when the animals are treated with chemicals against vermin and pest.
- b) Toxicokinetics and toxicodynamics (effects) underlie a permanent change in the development during childhood. During the first year maturation of the organs that eliminate substances takes place. In general children have a greater volume of distribution than adults. Additionally, the capacity of metabolism can exceed that of adults until the age of 6. Thus, clearance of substances may be greater in children than in adults. Formation of toxic metabolites, however, may lead to increased toxicity in children. Toxic effects may be expressed differently due to organ development. For instance, CNS-effects are of special interest during the first years of life due to CNS-growing, while effects affecting sexual organs are of concern during later years. It remains open whether toxic effects acting during

developmental periods are irreversible even though they are reversible in adults.

- c) Toxic doses are generally referred to body weight. It is discussed whether this approach should be changed to body surface because many physiological processes do relate more to surface than to body weight.
- d) The fourth item of the workshop was directed to the variability and uncertainty of data. This is of specific interest in children due to the variations with age. It has been discussed whether distribution based approaches may be helpful for exposure assessments in children.

In conclusion, children represent a population of their own. Exposure assessments performed for adults should not be transferred to children. Separate risk evaluations should be given preference, which should always be referred to age categories.

Keywords: children; exposure modelling; pesticides

ID125

T.1.1

Mosbach-Schulz, Olaf, University of Bremen, Germany.

The principle of two-dimensional probabilistic modelling - taking extrapolation factors as an example

The extrapolation of toxicity data from animal studies to humans is an important part of risk assessment for new chemicals. In cases where specific data are missing, the regulatory authorities take standard factors in a rough multiplicative extrapolation model for deriving human limit values.

The empirical verification of such standard factors shows much variability. Therefore seems a probabilistic approach to be appropriate. The talk presents a two-dimensional probabilistic model for extrapolation between different applications times (subacute / semi-chronic, semi-chronic / chronic).

The causes and differentiation of variation and uncertainty are important for the construction and interpretation of a probabilistic model. The variation in the population of interest builds the first dimension, the uncertainty of the model the second. The talk deals with variation between chemicals and the uncertainty from animal study design and model structure. The data are taken from Kalberlah, Schneider [1998]. The principle of two-dimensional modelling will be explained and the consequences for the application discussed.

Literature:

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Keywords: Probabilistic modelling; Uncertainty; Extrapolation factor

ID126

T.1.1

Schümann, Michael, Univ.-Clinics Hamburg-Eppendorf, Germany; Neus, Hermann, Behörde für Umwelt und Gesundheit (BGU), Germany.

Uncertainty analysis in population based environmental risk assessment with respect to traffic noise related cardiovascular mortality

Environmental health impact assessment might contribute to public health priority setting and environmental decision-making. Since it is very difficult and costly to measure the impacts of environmental risk factors by specific epidemiological studies, probabilistic risk assessment techniques based on epidemiological knowledge are applied. In our present study we investigate how different assumptions on exposure conditions affect estimated population risk. For this purpose, we transferred empirically observed epidemiological results directly into a general model to estimate the population risks. The results are evaluated with respect to uncertainty.

Epidemiological evidence suggests that cardiovascular risk is increased by noise exposure, resulting in individual lifetime risks that exceed cancer risk induced by air pollutants. The aim of this study is to determine the influence of traffic noise levels on population cardiovascular risk (ICD9: 410-414) and total mortality (attributable risk and life years lost). Estimation of population risk strongly depends on the assumptions on dose-response relations and exposure prevalence. Therefore we combine assumptions on (a) exposure duration necessary to elicit the effect, (b) dose response relation and (c) exposure prevalence modified by selected aspects of sound propagation. To assess the uncertainties, this study examines as well the influence of variation in population structure, variation in the age dependent mortality and assumptions about the relative risks. Dependent on the present input and the risk assessment models it is estimated that the population attributable risk range between 2.6:1,000 and 6.7:1,000. Life expectancy is reduced by 9.5 - 25.2 days.

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Keywords: Life expectancy; Probabilistic modelling; Uncertainty; Traffic noise

ID127

M.1.3

Straumann, Hugo, Swisscom AG; Fischer, Andreas, University of Applied Sciences, Switzerland.

Fast and dynamic security risk assessment and presentation for telecommunication: (Security Risk Radar)

Swisscom, like other telecommunication companies operates complex networks in a rapidly changing environment. While new services and products are being introduced faster and faster, new technologies are the cause for changes of network architecture. Group Security (GSE) defines directives and security standards for all companies at Swisscom. While each company is responsible for their security aspects, GSE is setting and verifying the guidelines. In this dynamic environment, it is not possible to use sophisticated risk analysis tools. Therefore, we developed our own method: the "Security Risk Radar" (SecuRiRa). The goal was to establish a screening mechanism for security risks in a very short time (max. 2 hours). Additionally, the results can be presented immediately to the management, to facilitate decision making.

SecuRiRa focuses on 6 main risk categories. Each of them are further divided into 3 or 4 sub-categories. The reason for this, is the underlying security risk model. We found, that two dimensions of a risk map (impact and likelihood) are not sufficient. With 6 criteria and one object we achieve a much better view of the situation. For each category, the risk indicators were determined, and out of these the questions were compiled. The indicators and the questions incorporate all security risk factors. Especially the soft risk factors are very important. Several case studies and best practice standards were taken into consideration, such as FMEA, ISF Survey, FIRM and Rapid. Finally, the questionnaires were split into 6 object types: business unit, project, system, application, product and service. For these peculiarities, the questions had to be adapted accordingly.

This SecuRiRa questionnaires are implemented through an Excel tool. To each question an evaluation scale was assigned. Each sub-category and main-category were allotted a weight to merge the evaluations of the questions. This mechanism is very specific to telecommunication and Swisscom. The calibration of these coefficients was made through an elaborated trial period. The experts who worked on this method, together with the evaluation and optimization period make it a unique tool. The specification for SecuRiRa were very demanding. And the gap between specific risk analysis or system modeling tools and broader business risk assessments is very wide. Therefore we had to invent a totally new approach. With the cooperation of the Institute for Energy Technology -Laboratory for Safety

Analysis- ETH Zurich we succeeded in making a complex and cumbersome analysis, through this method, into a simple task.

The reaction in the trial period was all very positive. Especially the presentation of the risks, through the radar chart, made it very easy to communicate with management and to take measures. Moreover, in a few minutes you can change the radar chart with the measurements taken in account, showing the result of the risk situation after the measures are implemented. SecuRiRa is a well adapted tool for Swisscom for quick and easy evaluation of the security risks, in our fast changing environment. It allows us to take immediate steps to improve reliability in most cases, and to do specific risk analysis where it is necessary.

Keywords: Fast system screening; telecommunication reliability; security risk evaluation; risk assessment method; security risk presentation

ID128

W.1.3

de Marcellis-Warin, Nathalie; Sinclair-Desgagné, Bernard; Peignier, Ingrid, CIRANO, Canada.

Informational regulation of major industrial accidents: The case of the U.S. LEPCs

Since the Bhopal disaster and the Basel incident, there has been renewed interest in industrial safety. The regulation of industrial risks to human health and the environment now relies increasingly on making relevant information available to all stakeholders. In Europe, for instance, the SEVESO II Directive gives more rights to the public in terms of access to information as well as in terms of consultation. The Canadian Council of Major Industrial Accidents also recommends the creation of joint committees with municipalities and industries. And more than a decade ago the United States government introduced the legal concept of "community right-to-know," which stipulates that all U.S. residents have access to specific information concerning the hazardous chemicals in use or in storage in their neighbourhood. The Emergency Preparedness and Community Right to Know Act (EPCRA) mandated formation of organizations at both state level (State Emergency Response Commission - SERCs) and local level (Local Emergency Planning Committees - LEPCs) to develop emergency plans for catastrophic releases of toxic chemicals and give information from covered facilities.

The U.S. Environmental Protection Agency (EPA), other federal agencies, state agencies and the chemical industry are cooperating with local communities to make EPCRA and related state laws effective. However, the ultimate responsibility for the success of EPCRA rests with the LEPCs which are the link between citizens, industry and the government. They were established to be broad-based membership groups with the responsibility to receive information from local facilities about chemicals in the community, to use this information to prepare a comprehensive emergency response plan for the community and to respond to public inquiries about

chemical hazard and releases. There are approximately 3500 established in the US ranging from single big city to state wide organisations.

In 1990, section 112 (r) was added to the Clean Air Act Amendments. It requires the EPA to establish requirements for facilities to reduce the likelihood and severity of major accidental chemical releases. EPA implemented its Risk Management Program. Facilities that are covered by this program had to summarize their program activities (facility hazard assessments and five-year accident history, prevention program, emergency response programs and plans) in Risk Management Plans (RMPs) by June 21, 1999. EPA has made the RMPs available to the public. LEPC will increasingly be a source of information about chemical risks in the community, as information under the RMP regulation becomes available to the public.

After the terrorism attack of September 11 in the United States followed by the chemical accident in Toulouse (France), information disclosure and public participation in the management of technological risks were again in the middle of all discussions in the United States and in most of countries. A recent project of law in France propose the creation of local committee of information and prevention around each SEVESO facilities (as LEPCs in the US). In Quebec, a law on civil protection, adopted in December, 2001, will be writing bylaws during the next 2 years. The Quebec government's interest in LEPC functioning (for example, how citizens and municipalities are involved, through the LEPC) is obvious too.

The purpose of the paper is to examine the informational regulation of major chemical accidents through the example of the US LEPCs. Regulations under ECPRA and under the 1990 CAAA impose significant requirements for facilities handling hazardous chemicals. We investigate the role that LEPCs can play in information disclosure and emergency response. To show informational regulatory effectiveness and to understand the difficulties imposed by the regulation, we interviewed several selected LEPC's in Vermont and Maryland and we sent a questionnaire to each LEPC chair in several others states. To have a comprehensive analysis of LEPC activities (and specifically for information disclosure), data were collected about LEPCs staffing, activities, resources, community hazards, training and information and relationships with EPA, state agencies, industries, local communities and citizens. We also discuss the changes after September 11.

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Keywords: Chemicals accidents; Information disclosure; Local committees; Emergency planning; Risk-management

ID129

W.1.1

Merad, Myriam Mokhtaria, Paris IX – INERIS; Samy, Kouniali, INERIS; Thierry, Verdel, ENSMN; Bernard, Roy, Paris – IX, France.

Post mining management in the Lorraine region: Multi-criteria decision-aid method for the hierarchization of mining subsidence risk

The end of mining operations in the Lorraine region raises the problem of post mining management. A methodology for the long-term management of mining subsidence under buildings and infrastructure is therefore proposed. This methodology is based on the management and use of data provided by the geographical information system set up for this purpose and the development of mapping of the risk of mining subsidence, based on a multi-criteria decision-aid method ELECTRE TRI, with a view to setting up adequate monitoring system. In January 2002, the methodology has been applied to almost 320 zones under building and infrastructure.

Keywords: Risk of subsidence; public safety; uncertainty; multi-criteria; classification with ELECTRE TRI

ID130

M.3.3

Sjöberg, Lennart, Stockholm School of Economics, Sweden.

... "then we take berlin". Terrorism as a generalized threat

The events of 11 September 2001 illustrate a case of an extremely salient threat, comparable to only a few others, such as the Chernobyl disaster in 1986. Such events can be assumed to affect risk perception in many and profound ways. The present paper is a discussion of how extreme threats arising from disastrous events have a tendency to become generalized and form a basis for the interpretation of many subsequent (and even prior) events, which may or may not be in fact related. The September 2001 attack on WTC, thus, has something in common with other hazardous events, but it also has its unique features, among them the existence of a malevolent actor. It is likely that the existence of such an actor adds to the extent of generalization of the threat. Results will be presented where these hypothesized

processes are empirically tested, and related to current work on risk perception and trust, and the Theory of Social Amplification of Risk.

Keywords: risk perception; terrorism

ID131

W.3.1

Feofanov, Konstantin A., Moscow State Technological University, Russia.

Social aspects of risk management: Integrated perspectives after the first ten years

The paper considers approaches to risk management developed at different stages of risk analysis in Russia. Interest to risk management as a research direction was initiated after the Chernobyl catastrophe. Since the late 80s, risk management has gone through several key stages. First, the principles and approaches to risk management were formulated; this was followed by a stage of differentiation from the other directions of risk analysis. All the other directions of risk analysis have also been developed. The process has been mutual and parallel; the borders between the directions have not been so obvious before.

Following the publication of the author's programme paper in a leading Russian sociological journal ten years ago, the necessity to take account of social or 'mild' aspects of risk management has been generally acknowledged. Afterwards, a large number of applied research projects have been undertaken. The continued differentiation has also touched the sphere of the 'mild' risk management.

Achieving the new level of research after setting its own borders and possibilities, 'mild' risk management has entered its new, integrative, phase. It expanded the range of data and disciplines used in the analysis and in real emergencies. Emergencies of different origins, be it technological, natural or social, came to be considered integratively; technical aspects were not separated from organizational and strategic ones. Despite this new attained level of risk management, 'technocratic realms' still take place with characteristic obstructive military and bureaucratic traditions preventing the practise of the integrated risk management. In the coming years, it is going to be a drive for both science and society to improve the situation in the direction of integrated management, even in the provinces where it seemed to be far more difficult. The transition to integrated approaches will take decades as it has to overcome the old traditions incorporated in people's mentality.

The paper also describes the problems appearing at different stages of risk management, such as diagnostics of the situation, finding the optimum measures to be taken, and realization of the elaborate measures. The role of key organizational actors capable of optimizing the management is also analysed; these are companies' leaders and managers, municipal or regional bosses or heads of departments, ordinary employees, their families, population of the areas in the neighborhood, emergency services, sociologists or social workers, management consultants, and

mass media. Obstacles on the way of a well-coordinated optimization of the situation are characterized in detail. The important role is given to the concept of 'risk communication profile' as an analytical tool for the integrated risk management. Prospects and possible ways of optimum movement to better integration in risk management are highlighted in the paper.

Keywords: Risk analysis; integrated risk management; social aspects; risk communication profile; key organizational actors

ID132

M.2.3

Dmitruk, Vitaly I., IndEcoExpert Ltd., Russia; Rozlog, B. P., Volynsky State University, Ukraine.

Scientific and Practical Aspects of Risk Analyses and Management on Oil and Gas Production Enterprises

This article observes some actual questions of risk analyses and management connected with emergencies of hazardous industrial enterprises of oil and gas exploration. These questions appeared within the solution of practical tasks, which were given by customers, such as increase of financial stability of enterprises based on the perfection of industrial and ecological safety management and complex insurance.

The Expert's system approach to Risk Analyses gives the possibility to carry out Risk Management Program for enterprises. This Program devotes to provide the ability of enterprises to perform their function independently of any accidents and their cumulations. This program includes recommendations about preventive action leading to decrease and elimination of potentially-controlled risks and complex insurance of non-controlled risks. Payments for prevention of accidents may be many times cheaper than accident losses. There is the determinate level of investment to industrial and ecological safety. Exceeding this level makes this approach non-effective in comparison of insurance as tool for indemnity of non-planned financial losses. The programs of risk management must take in consideration the dialectics of these basic principles of enterprises financial stability increase. Methodological aspects of determination of Normal Maximal Estimated Loss (Normal EML) and Catastrophic Maximal Estimated Loss (Catastrophic EML) are also considered as approach to the evaluation of liability limits for different types of insurance.

The items considered are demonstrated on practical examples.

ID133

W.2.2

Yasukawa, Fumiaki, Hiroshima International University; Tsuru, Satoko, Hiroshima-shi, Japan.

Estimating quality-quantity risk trade-off value: Decision-making in hospital management

The purpose of this paper was addressed to estimate numerical trade-off value generated between sustaining fiscal performance and improving medical quality in private hospital management in Japan. We employed two steps of investigation. First, we analyzed how the hospital manager who faced to the fiscal pressure tends to distribute the hospital cost for getting out from the hospital management risk. From 15 hospitals panel data collected by questionnaire survey, we obtained the result that the manager preferred the allocation of the money to increase the number of physician for growing revenues to the distribution for avoiding malpractice by estimating the cross elasticity in hospital expenditure; 0.9 v.s.0.5 valued coefficient in terms of profession's training for risk management and 0.5 v.s.0.2 in terms of setting permanent risk manager in hospital. After that, considering our first analytical findings, we tried to identify hospital manager's subjective evaluation for such quality (improving medical safety) –quality (increasing medical income) preference as the value of risk trade-off in private hospital through employing Contingent Valuation Method (CVM) and Conjoint analysis. We sent advanced questionnaire survey to more than 200 private hospitals in Osaka metropolitan area with asking manager's willingness to pay in proportional term to install the system in which we can secure the patient's safety in medical care deliveries. At present, after receiving about 10% of responds, we are carrying out the valuation to identify the magnitude of subjective risk trade-off value, and we have an observations concern to the difference of manager's evaluation to which the level of hospital scale (the number of beds) and fiscal performance of income and expenditure reflect. Now we are estimating the determinants of such valuation with binary probit estimation model by extending our sample size. Expected result would be; the manager in small or medium size hospitals will respond less sensibly to the trade-off between income oriented performance and the loss of patient safety in terms of CVM evaluation and the conjoint analysis, than those in large and high-tech hospitals. And also we expect that our investigation will imply the establishment of actual health insurance payments for stabilizing hospital quality assurance as capital cost reimbursement.

Keywords: quality -quality risk trade-off; hospital manager; risk management; contingent valuation method; conjoint analysis

ID134

W.3.1

Hourtoulou, David; Plot, E.; Prats, F.; Vince, A. S., INERIS PB2, France.

MIRIAM : an integrated approach to organise major risks control in hazardous chemical establishments

In the field of risk prevention, research is often divided or partial. Research work -achieved or in progress - focuses on topics like technical risk assessment,

organisation management or human factor : ergonomics, sociology, etc. But little work is dedicated to a functional integration of all these disciplines into a same methodology.

It is yet obvious that an effective control of major accident risks depends on the ability of an organisation to consider and integrate every aspect of prevention. A separate control of either human factor, or safety technical barriers, or safety management is of course necessary, but does not guarantee a sufficient prevention level on its own. Effective prevention requires the control of every means available.

From this statement, INERIS has started developing an original integrated method to control major accident risks of hazardous establishments under the scope of Seveso II directive. This method is called MIRIAM, which stands for "Maîtrise Intégrée des Risques d'Accidents Majeurs" and means "Integrated Control of Major Accident Risks". "Integrated" indicates that the developed approach gathers in an extensive way a risk assessment of the technical installations and a sociological analysis of the actors in charge of the installations.

The method is currently tested with voluntary French SEVESO II establishments. MIRIAM is actually made up of a specific interview technique both for managers and workers, and of a particular assessment method both of the informal organisation and of the formal means dedicated to risk prevention. MIRIAM aims at giving tools or indicators to the managers in order to improve the pointed out weaknesses of their safety organisation. The approach helps also the operator of a Seveso plant to demonstrate to the Competent Authorities that a relevant safety management system is implemented.

This operational but young method needs now to be compared to others, then tested again and assessed, and finally enriched.

The authors propose to present in a first stage the originality of the MIRIAM method, then in a second stage the pros and cons inherent to the approach. This second set of remarks is also highlighted by the feed-back collected from the first experimented establishments.

Keywords: Safety management; Sociology; Human factor; Risk assessment; SEVESO II establishments

ID135

M.2.3

Labbi, Abderrahim; IBM Research - Zurich Lab., Switzerland.

Predictive Analysis for Project Portfolio Risk Management

In today's highly dynamic environments, most organizations, especially businesses, have to adapt their strategies to deal with various agents of change, such as customer requirements, technology, marketplaces, etc.

Any business decision under such constraints inevitably requires taking some inherent risks. Therefore, effective decision making requires extensive use of adaptive models which are able to exploit various data sources for risk

identification, assessment, and management. In this paper we focus on statistical models for I/T project risk analysis which are intended to support business managers who usually have to make critical investment decisions under uncertainty. We present an adaptive system for project portfolio risk assessment and management using statistical and machine learning models for data analysis. The system consists of a series of processes which can be summarized in three steps:

- 1) Risk factor identification and scoring: this step consists in analyzing historical project data and extracting a set of risk factors which reflect variability of, and impact on, project profitability and/or quality. These risk factors (dimensions) define a risk space where every project is represented by a risk vector. The risk space is partitioned into homogeneous regions defined by clusters (or categories) of projects with similar risk factors. A utility function is then associated to each cluster.
- 2) Probabilistic estimation of project category and utility: we introduce a probabilistic classification system, using boosted decision trees, which allows to estimate project category distribution given project description (defined by several variables such as project financials, scope, schedule, etc.). The estimated distribution is then used to estimate expected project utility.
- 3) Project portfolio optimization: this step presents a portfolio analysis using a loss/profit function which allows to estimate the expected return of a portfolio of projects given their risk and utility characteristics. A stochastic optimization procedure (based on a Markov Chain Monte Carlo process) is introduced and used for simulation of portfolio performance.

The output of the system is used to set up mitigation plans and to suggest quantitative support to management actions for project portfolio selection and monitoring.

The overall system behaviour is illustrated by several experiments using proprietary project management data.

Keywords: Project portfolio risk; Adaptive Models; risk identification; Machine Learning; Stochastic Optimization

ID136

Poster

Mironyuk, Sergey G., IndEcoExpert Ltd., Russia.

Conditions and development analysis for maximum environmental accidents at oil industry units.

The evaluation of accident environmental risk for the oil - and - gas system objects has been fulfilled. The objects were the following: a littoral derrick site, oil-, gas- and water- pipelines, oil bulk plants, oil-gas processing plants. The environmental risk is the frequency and the scale of the aftereffect of initial emergency exposure to the environment. The risk estimation includes the investigations of the direct chemical and physical influence upon abiotic water, air,

soils and biotic (forests) environmental compounds. The specific economic damage values have been used during the estimation of economic loss as a result of environmental pollution. The specific values were reduced to the mass of contaminants. The risk investigations proved that oil- and water-pipelines of the on-line types are the most dangerous in case of the environmental contamination. The economic loss for an aquatic object caused by an intertrade pipeline breakdown is equal to 7 mln \$. The frequency of accidents for the intertrade pipelines is $4,0 \cdot 10^{-3}$ 1/km/ year in Western Siberia .

During the borehole drilling the maximum loss may be caused by its accidental oil gusher. This accident leads to dramatic consequences: soil, sea water and air contamination. The probability of the worst scenario is approximately 10^{-5} 1/year. It is related to rare accident according to the Russian classification of the types of consequences.

The maximum tank depressurization on an oil-processing plant is the most dangerous accident. The great amount of liquated hydrocarbon gas leaves the tank. Than this air-fuel cloud blows and the fire begins. Air and soil pollution of the industrial side occurs because of the accident. The frequency of this type of the accident is $1,6 \cdot 10^{-4}$ 1/year.

Maximum and individual risk evaluated in the result of the environment simulation of the oil-processing plants is equal to 10^{-4} - 10^{-5} 1/year. This value is more than 10^{-6} -1/year within this zones of an enterprise itself or its sanitary-shielding zones.

The most dangerous scenario is the development of the chain reaction of an accident. When all energy supplies of a system suddenly release the chain effect occurs at the adjacent industrial objects, the fire frustrates residential districts. There can be three trigger-reasons that cause the accident described above:

1. The fire with the chain effect when all fuel reservoirs are involved in it. The realization frequency is contemptuous small.
2. The submersion of an oil tank yard in the result of a dam break. The realization frequency is $5,5 \cdot 10^{-9}$ 1/year
3. The thoroughly planned terrorist act. The value of the realization frequency was obtained with the help of expert opinion. It is equal to $1 \cdot 10^{-7}$ 1/year.

The recommendations concerning the reduction of the value of realization frequency are developed and proposed.

Keywords: environmental risk; oil-gas enterprise; frequency of an accident

ID137

Poster

Sitek, Eugeniusz; Gorzen, Iwona; Technical University of Czestochowa, Poland.

Export transactions insurance instruments for Mid-East Europe

Export transactions insurance is the dominating instrument used in nowadays export supporting systems, particularly in high-risk markets areas. Variety of the

instrument influence on shaping of export volume and competitiveness of particular countries.

The components of the instrument are, among others, demands made to exporter, insurance transaction type, its largeness, kind of country where transaction is realised, risk insurance type, insurance character (individual, global), insurer liability level, time of insurance applications examining, flexibility in detail terms shaping. Analysis of the components, particularly among insurance type offered for at high-risk markets, determines insurance effectiveness and exporter security as well. Identification of characteristic elements in particular export supporting systems permits transaction security effectiveness and ,simultaneously, active shaping of export intensity in analysed regions.

The comparison of insurance instruments supporting export to Mid-East Europe regions, research of export transaction insurance specific and trial of characteristic features identification for the instrument in particular countries will be the subject to the poster.

Keywords: export; insurance; risk; Mid-East Europe

ID138

T.2.1

Watabe, Hiroyuki; Matsumoto, Masaru, The Tokio Marine & Fire Insurance, Co. Ltd. Japan.

A Study of Quantitative Risk Analysis for Business Interruption due to Fire & Explosion in the Oil & Petrochemical Process Plants

Some property & casualty insurance companies provide the fire insurance coverage to the Oil & Petrochemical Process Plants. However their potential of fire & explosion risk is quite high, once unconfined vapor cloud explosion (UVCE) event occurred, insurer suffered the huge amount of property and business interruption (BI) loss. And sometime downstream plant operations are also affected by upstream incidents. Insurance historical claim data says BI loss is normally higher than property damage. Therefore we should evaluate BI risks with much careful attention for our underwriting. However so huge and complex petrochemical plant make us not to easy to estimate BI losses. In this study, we have developed the loss estimation model to evaluate BI loss to obtain the risk curve which shows the relation between the frequency and severity of the BI loss.

Firstly, the frequency and severity of property damage data were statistically analyzed for various types of process units such as naphtha cracker, polymerization unit, crude distillation unit etc. And also the restoration period for each units were analyzed for property damage states of each process units.

With these statistic data, various severity of fire or explosion scenarios randomly generate on any process units in the typical petrochemical complex using monte-carlo simulation method. To simply evaluate BI loss, petrochemical complex are carefully modeled not to ignore the existing back up process capacity or

intermediates stocks etc. After that BI loss to the whole petrochemical complex are estimated for each generated loss scenario. Based on these results, we evaluate BI loss scenarios with certain return periods.

Keywords: Insurance; Business Interruption; Monte-Carlo Method; Quantitative Risk Analysis

ID140

W.2.2

Tsuru, Satoko; Yasukawa, Fumiaki, Hiroshima International University, Japan.

Consciousness difference between doctors-nurses on the medical information that affects the risk assessment of the ward

On the relation between risk reduction and medical information, we clarify the consciousness difference of the nurse with the doctor. **METHOD:** The questionnaire for nurse and doctor of 63 hospitals was carried out. The investigation was carried out in June, 2000, and we obtained the reply from 54 hospitals among 63 hospitals (the 85.7% response rate). The effective matching data was 315 nurses and 144 doctors. We prepared 62 items as a candidacy for the medical information that is effective for risk reduction. The breakdowns were medical care information of the 22 items, patient attribute information of the 10 items, patient life information of the 13 items, human resource information of the 16 items. From these 62 items, 3 items were finally chosen in respect of the information that seemed to be the importance for the diminishing of a risk. **RESULT:** It was information on human resources that doctor and nurse had the difference in the simple comparison. It was confirmed that patient attribute information and human resource information were emphasized, when the nurse carried out the medical care assistance. On the other hand, it was confirmed that the doctor emphasized patient life information. Doctor and nurse tended to emphasize the information that was not the information which each mainly produces. It is considered that the information that distinguishes the patient is important information for the risk reduction by the nurse.

Keywords: hospital; medical information; risk assessment; risk reduction; medical care assistance

ID141

Poster

Chao, Mu-Rong; Wu, Kuen-Yuh; Chang, Louis, National Health Research Institutes, Taiwan.

Sensitive Factors Associated with Cancer Risk due to Inhalation Exposures to Volatile Organic Compounds in Drinking Water during Showering

Although contaminants in tap water have been regulated, epidemiological studies have continuously reported that consumption of drinking water might be associated with the increase in cancer risk. Only oral ingestion was considered in

risk assessment for setting regulations, which multiple routes of exposures and cumulative risk were not considered. Inhalation exposures to the mixtures of volatile organic compounds (VOCs) in tap water have contributed significant body burden of these chemicals and potential health risk to consumers and have not been critical assessed, which are particularly important for countries like Taiwan whose people drink boiling water. In this paper, cancer risk assessment was conducted for seven carcinogenic VOCs (1,2 dichloroethane, 1,1 dichloroethylene, tetrachloromethane, chloroform, benzene, vinyl chloride, trichloroethylene) regulated by Taiwan Environmental Protection Agency. The current regulations, the maximum concentrations detected, and detection limits of analytic methods were evaluated. A two-resistance theory and the plug flow model were applied to simulate evaporation rate of each VOC tap water. The simple mixture method was used to assess cancer risk from inhalation exposures to these VOCs. Most of distributions of model parameters and exposures factors were collected and used for Monte Carlo simulation and sensitivity analysis using Crystal Ball. Results show that a skewed distribution of cancer risk from daily inhalation exposures to the seven VOCs in tap water at the average showering time 12.7 min was $(1.70 \pm 1.24) \times 10^{-6}$ at the Taiwan EPA current regulations, $(1.47 \pm 1.04) \times 10^{-7}$ at the levels of detection limits, and $(1.47 \pm 1.04) \times 10^{-7}$ at the maximum concentrations detected. Parameters, showering time, bathroom volume, inhalation rate, body weight, water flow rate, and nozzle number of a sprayer are more sensitive to total cumulative cancer risk than contaminant levels. Therefore, control of some these parameters may be more effective than the reduction of contaminants in tap water to protect from the exposures to VOCs in tap water.

Keywords: tap water; cancer risk; VOCs; sensitivity analysis and showering time

ID142

M.1.4

Orton, Brian, Brunel University, United Kingdom; Üрге-Vorsatz, D., Central European University, Hungary; Drottz-Sjöberg, B. M., Norwegian University of Science and Technology, Norway.

Paradigmatic study of risk perception from three student groups specialising in radiation and environment studies leading to new views of optimistic bias

Intangible assets of any group of individuals are their attitudes to risks when the risks forms part of their work or field of study. When these attitudes become known, management or pedagogic feedback is possible to take positive action to acknowledge these affects. Aggregated and individual analyses of paradigmatic risk perceptions are obtained from three groups. (1) Forty-six female student radiographers studying in UK at Cranfield University situated at Royal Military College, Shrivenham (RMC); (2) forty females and (3) thirty-six males recruited

from over sixteen different East European countries attending the postgraduate environmental science course at the Central European University, Budapest (F-CEU, M-CEU). These students study two different science ‘cultures’, radiography and environmental science, which we show has a dominant effect on their risk perception. A five-question questionnaire uses the ‘psychometric paradigm’ to assess their collective and individual attitudes to various risks including radiation and environmental problems. Questions cover their (1) ability to protect themselves from certain risks (AB), (2) personal risk (PRISK), (3) risk to people in general (GRISK), (4) threats to society (THREAT), and (5) confidence in sources of information on ionising radiation (CISIR). Aggregated analysis of responses to each of the five questions (Cronbach’s α in the range of 0.69 to 0.96) show that as questions change in nature group membership conferred higher variability. Aggregated average risk perceptions (Questions 1-3) show AB is the same for all groups. PRISK and GRISK for M-CEU students are the same as female RMC students, a rather unusual result. PRISK for M-CEU students is less than F-CEU students, a finding repeated in other empirical studies. Comparing averages, GRISK with PRISK (GRISK-PRISK = OB), gave a significant optimistic bias (OB) for all groups. M-CEU students have an average THREAT that is the same as UK female RMC students. Confidence expressed by CISIR is lower for RMC students who are involved with radiation in their training and future work. Analysis of all risk topics show AB is correlated with optimistic bias (OB). OB is found for all groups and risk topics, except for radiation for RMC radiographers, where ‘pessimistic bias’ is observed. Individual analysis indicates that although negative OB is significant for a group, it is not the same for each member of the group. It is, however, universal for AIDS for both CEU groups, but not for RMC, who will work in hospitals that contain AIDS patients. This shows that risk perception from AIDS for this group has to be managed. A further distinction between groups is that positive OB is not significant for RMC in environmental topics, but is for CEU students. Where OB is large and positive for life-style risks a reason for OB can be found in the field of social comparison, with ‘schadenfreuden’ being a cause.

Keywords: Risk perception application; psychometric paradigm; radiation; environment; ‘schadenfreuden’

ID143

Rohrman, Bernd; University of Melbourne, Australia.

Assessing websites for risk information and disaster preparedness

Preparedness for the hazard of fires - that is, house fires, fires in industrial or transport facilities, and forest fires - is obviously very important, given that not only the belongings but the very lives of humans are at risk. Therefore risk-exposed people need to be optimally informed about the hazard characteristics, preventative measures and appropriate behaviors during the onset of an

W.2.4

emergency situation; authorities have to communicate the relevant information effectively. A variety of audio-visual communication means are used for enhancing disaster preparedness, mostly printed material (e.g., brochures) but also videos and occasionally CD-ROMs; only recently Internet and WWW resources have been utilized as well. However, systematic effectiveness evaluation is still rare, and especially websites have not received much attention in this regard.

The current project - conducted in Melbourne/Australia - aims at overcoming this gap. In several sub-studies, brochures for the general public, videos for residents of fire areas and the websites of relevant fire or emergency authorities were analyzed. The conceptual basis is the socio-psychological risk communication model outlined in Rohrman 2000.

In the website study, 6 websites were systematically assessed with respect to accessibility, completeness, comprehensibility and visual appeal. For the ratings, a catalogue of substantive and procedural assessment criteria was developed (standardized instrument, using scales and open-ended question to add qualitative information). The inspected websites include three main Australian fire authorities, Emergency Management Australia, the (US)American Redcross and the Canadian Forest Service. The assessments were conducted by a group of 6x3=18 raters: fire researchers, experts from fire authorities, disaster researchers, website specialists, cognitive psychologists, and residents of fire-prone areas. The results available so far identify strengths and shortcomings of these websites and elucidate the major requirements from a residents' point-of-view. Regarding content features, the following topics are seen as especially important: information on how to prepare for fire events, on decision-making re evacuation, and on fire safety in public places such as schools and the workplace; also, contact details should be complete. Regarding presentation features, appealing graphics, large easy-to-read text and pictures to add visual appeal and enhance the salience of fire hazards were stressed. Regarding the website design, a clear frontpage structure, fast downloading, efficient navigating within the website and links to related institutions are main requests.

The findings will be very valuable for recommendations towards improving the utility of WWW-based risk and disaster preparedness information.

Keywords: hazard information; risk communication; websites; fire; evaluation

ID144

Wiedemann, Peter M.; Clauberg, Martin; Research Centre Juelich, Germany.

The Baycol/Lipobay Issue - a case study - The Politics of product recall

This paper discusses the corporate crisis of the Bayer AG in 2001 commonly known as the Lipobay/Baycol disaster. The paper starts with a description of the drug’s most important pharmaceutical characteristics and of Bayer’s Baycol business. Second, the chronology of the crisis is outlined as well as the context in

M.2.4

which the crisis happened. Third, after a short risk issue assessment of Lipobay/Baycol, the possible causes of the crisis are considered. Fourth, the impacts on Bayer as well as additional ripple effects on the pharmaceutical industry are evaluated. In the remaining part, the "lessons learned" are presented.

Keywords: Lipobay; Baycol; Bayer; corporate crisis; perceived risk

ID145

Poster

Dumitrescu, Maria; Lazar, Roxana Elena; Stefanescu, Ioan; Trancota, Dan, National Institute of Cryogenic and Isotopic Technologies, Romania.

Reduction of pollution using technologies and methods for identification, estimation and limitation of industrial risk

The problem of risk estimation, assessment and control is necessary to be discussed in every decision level of an activity. In this way it qualitatively assess the performances of a system, action or technology, by indicating the possible consequences on environment, people or property.

The main objective of the paper is to develop regional strategies for risk assessment the aim of: establishing the areas that must be investigated and their particular characteristics, identifying the industrial activities in the area, determining hazards, establishing the analysis criteria and prioritizing the studied areas, evaluating the continuous emission, studying the major accidents, studying the population health, classifying the risk, establishing a global strategy, implementing politics/actions, directions/measures.

The paper expectation is to provide a decision tool for risk managers and authorities in order to limit the industrial pollution.

Keywords: hazard; loss; risk; management; decision-making

ID146

M.1.4

López-Vázquez, Esperanza; Universidad de las Américas-Puebla, México.

Risk acceptability, feelings of insecurity and coping strategies of people living in a seismic and industrial risk zone

Living in a risk zone leads people to adopt psychological strategies that allow them to live with dangers. The reasons to accept this situations are very different and vary in each person according to the evaluation they make. This study analyses the reasons of acceptance to live near a risk zone, the reasons of insecurity and risks perceived affecting directly individuals living in a seismic zone and near an industrial area. Furthermore, we analyzed the strategies of these persons to cope with the environmental perceived risks and anticipation strategies to face seismic and industrial risks. Open questions were utilized in 206 individuals of three neighborhoods of Mexico City. People have negative and positive reasons to accept to live near risk. Most of people have more feelings of insecurity than security

feelings; risks perceived affecting individuals directly are not always related to extreme risks they are exposed. To cope with risk situations, different adjustment strategies are utilized, as prevention measures, but there are also many passive strategies, as passive acceptance, refuse and withdrawal, that are utilized with the most part of the individuals interviewed. People in general, try to optimize the fact of living near to risk and they prefer to refuse the situation than doing something to prevent possible events.

Keywords: risk acceptability; seismic risk; industrial risk; coping strategies; anticipation strategies

ID147

W.1.1

van 't Klooster, Susan; van Notten, Philip, Maastricht University, The Netherlands.

'We didn't see it coming': the subjective nature of signal detection. II.

The search for discovery consists not of seeking new landscapes, but in having new eyes. (Marcel Proust)

How can we improve understanding of socio-cultural and psychological factors in signal detection so that we might use them to search our surroundings for seeds of change? In addressing the concept of surprise, which is a common symptom of the flawed signal detection, Mike Thompson has suggested 'collecting' cases of past surprises. A historical case analysis can shed light on how socio-cultural and psychological factors might lead to perverse decisions when warnings are disregarded as illustrated by cases in the European Environment Agency's recent report Late Lessons from Early Warnings. Similarly, historical cases of successful signal detection also point to ways to improve our foresight. For example, much can be learned from the anticipation by some organisations of events such as the oil crises and the fall of the Berlin Wall. Furthermore, historical analysis stimulates us to look to the future: Which issues harbour seeds of tomorrow's societal change?

Historical analysis serves to highlight the challenges for foresight methodology in the search for seeds of societal change and the detection of signals of impending developments. Societal issues are often complex and thus difficult to fathom. In addition, perspectives on these issues differ because of a variety of socio-cultural and psychological factors, and despite the fact that our interpretations are bounded by the evidence available. Foresight for signal detection therefore demands a pluralistic methodology that analyses societal issues from numerous perspectives if we want to approach as near a comprehensive view of our surroundings as possible. Of all the foresight approaches, scenario analysis seems best suited to the search for seeds of change although to date the approach has rarely been used specifically for this purpose. Further experimentation with pluralistic scenario techniques such as those that focus on surprises, wild cards, and weak signals is desirable if we want to improve our capacity for signal detection.

Our first abstract describes the need for a pluralistic or structured intersubjective approach that explicitly addresses the influence of socio-cultural and psychological factors on signal detection. We propose to follow up on the ideas of the first abstract through the discussion of historical cases where early warnings were picked up and responded to with varying degrees of success. The case of aquaculture would be proposed as an area harbouring seeds of future societal change due to its potential for environmental damage. The cases would be described from the vantage point of the socio-cultural and psychological factors involved. We would close with the proposal of recommendations for the improvement of pluralistic foresight techniques, especially scenario analysis, based on lessons learned from past foresight studies.

Keywords: Signal detection; socio-cultural and psychological factors; scenarios

ID148

M.2.1

Thalman, Andrea T.; Research Centre Juelich, Germany.

The impact of information frames on the laypersons' risk appraisal

In several experimental studies it has to be tested whether information frames have influence on the laypersons' appraisal of risk.

In a main experiment the influence of different ways of presenting uncertain scientific knowledge was tested. Whether radiofrequency electromagnetic fields (EMF) exposition cause cancer is controversially discussed between experts. Therefore, this tension-filled issue represents an appropriate example of uncertain scientific knowledge. Accordingly, uncertain knowledge was presented in different formats: e.g. table, text. Firstly, it is assumed that scientific results presented in a compressed way (table version) provoke a higher appraisal of risk than the identical results presented in a written frame (text version). Secondly, it is assumed that laypersons rate scientific knowledge coherently if scientific results are presented in a compressed way (table version).

In a subordinated experiment it was tested how different labels of uncertainty are perceived by laypersons. As it was used different labels of uncertainty (e.g. "plausible hint" or "strong hint") in different information frames in the main experiment, it is assumed that laypersons perceive labels of uncertainty differently from labels that the experts have used in their presentation.

Backed up with the experimental findings, conclusions will be drawn for communicating unclear risks (e.g. radiofrequency EMF) to laypersons.

Keywords: Risk perception; risk communication; electromagnetic fields; information frames; experimental study

ID149

M.3.1

Barbet, Jean-Francois; Durand, Julien; Sector Consulting, France; Picard, Jean-Marc, Universite des Technologies de Compiègne, France.

An advanced strategic risk management solution: The inclusion of precautionary principle in the strategic decision process to enhance global risk management and foster sustainable development: Concepts, tools, methodology and results

With the evolution of markets, regulations, business models and stakeholders behaviors, companies definitely need efficient solutions to manage their risks globally at a strategic level. The Precautionary Principle is both a risk reduction principle and, mostly, an efficient global resources management tool [1]. The extended concept of Strategic Precautionary Principle express a company's will to adopt a global protection policy, aiming at lowering the global level of risk at a strategic level. The methodology consist in applying the Precautionary Principle to all steps of the strategic decision process to foster early detection and mitigation of all risk types. This allow companies to set a sustainable development path and to survive both minor and major external aggressions. One of the main innovation lies in the transfer and adaptation of risk analysis and reduction tools from the operational level to the strategic level. The obtained results show a logarithmic increase in the rate of efficiency of risk management.

Keywords: Precautionary Principle; strategic decision process; sustainable development; global risk-based decision-making; advanced risk management tools and methodology

ID150

T.1.4

Salvi, Olivier; Hourtolou, D.; Gaston, D., INERIS, France.

Consequence-based approach for land-use planning: a precautionary principle in accidental risk control?

The European project ASSURANCE (ASSessment of Uncertainties in Risk Analysis of Chemical Establishments - ENV4-CT97-0627) in which 6 European organisations performed a benchmark exercise for the risk analysis of a specific plant has shown discrepancies between the risk assessment results from European experts. The discrepancies are both on the evaluation of the consequences of accident scenarios and on the estimation of their probabilities. This observation express the uncertainty in the risk assessment used for decision making like for instance the residual risk acceptability, the definition of emergency plans and the definition of zones for land-use planning. The partners in ASSURANCE used various hazard analysis techniques and arrived at quite different conclusions with respect to the scenarios that are relevant for the safety assessment.

On the other hand, the major accidents that occurred recently (Enschede, Baia Mare, Toulouse...) are undoubtedly unacceptable for the public, who believed that such accident couldn't occur in developed countries.

The policies and procedures for risk based decision making seems to be influenced by the risk culture in the country (linked with the risk perception of the public) and by the difficulty to make the decision under uncertainties. In France, the approach in risk control implemented by the public authorities for chemical plants is based on a deterministic approach. The underlying philosophy is based on the idea that if sufficient measures exist to protect the population from the worst accidents, sufficient protection will also be available for any less serious incident. The approach is made explicit with the definition of the zoning in land use planning according the consequences of accident scenarios with high consequences. The consequence-based approach for land-use planning seems to be the application of the precautionary principle in accidental risk control. The distances between risk generators (hazardous plants) and risk receptors (public, sensitive environment) appear to be a deep line of defence.

The paper propose to analyse some principles behind the application the precautionary principle in accidental risk based decision making.

Keywords: risk assessment; SEVESO; land-use planning; precautionary principle

ID151

T.1.3

Renn, Ortwin; Center of Technology Assessment Baden-Württemberg, Germany.

Trust in Science and Regulation: The Case of Biotechnological Risks

With the advent of ever more complex technologies and the progression of scientific methods to detect even smallest quantities of harmful substances, personal experience of risk has been more and more replaced by information about risks and individual control over risk by institutional risk management. As a consequence, people rely more than ever on the credibility and sincerity of those from whom they receive information about risk. Thus, trust in institutional performance has been a major key for risk responses. Trust in control institutions are able to compensate for even a negative risk perception and distrust may lead people to oppose risks even when they are perceived as small.

It is obvious that modern societies face difficulties in providing sufficient trust for reaching consensus on its complex and differentiated activities. All public institutions have lost trust and credibility over the last two decades except for the news media. Trust and credibility losses are high for industry, the political system, and many government agencies. Science still has a high degree of credibility although much less than two decades ago. Most sociologists believe that the decline of confidence in public institutions is partially a function of better education and the increase of public aspirations with respect to their share of public resources and welfare. In addition, the complexity of social issues and the pluralization of values

and lifestyles may have contributed to a growing dissatisfaction with the actual performance of institutions.

The paper will address the issue of trust with respect to genetic engineering. Based on a German and European study on public attitudes towards genetic engineering trust in science and regulatory agencies is at an all time low. Most respondents believe that scientists are not trustworthy because they allegedly place more weight on scientific discovery than on responsible management. Even less confident are respondents in the power of regulators to manage risks. In contrast to the nuclear power debate where regulators were seen as forming a secret coalition with the nuclear technocrats, the political systems is now seen as powerless and incapable of regulation in spite of good intentions. The balance between the economic growth system and the political control system is seen as biased towards the economic side.

Lack of trust in science and regulators does not indicate, however, a declining relevance of trust for governing modern societies and managing technological risks. The contrary is true. The reliance of the technological society on trustful relationships between and among its subsystems has never been stronger than today. However, such a need for trust makes people more and more sensitive towards situations in which their investment of trust has been factually or allegedly misguided. The more trust is needed for implementing cooperative efforts or for coping with external effects of social actions, the more cautious are people in assigning credibility to those whom they are supposed to trust. The date of modern technologies will primarily depend on the ability of the proposers of these technologies to provide trustful relationships with those who are asked to accept these technologies.

Keywords: trust; credibility; risk perception; institutional performance; genetic engineering

ID152

T.1.3

Zwick, Michael M.; University of Stuttgart, Germany.

Risk as Perceived by the Public: Disparities of Qualitative and Quantitative Findings

Facing globalized markets and international competition, the German public is thought to be risk-timid, opposing to innovative but probably risky technologies, and is sometimes made responsible for economic deficiency.

Findings of the Baden-Wuerttemberg Risk Survey, carried out in 2001, however indicate rather scepticism, uncertainty and ambivalence towards technologies and their risks than resentments or even hostility. In particular, nuclear power plants, genetically modified food, BSE, and the global climatic change seem to evoke some public demurs.

Qualitative analyses however indicate, that survey findings on risk perception and valuation may lead to overestimation and misleading consequences. Answers to open questions show that the public's focus on risks relies much more on "normal risks" than on hazards emerging from new "external" technologies: The center of public attention come across everyday-life risks like traffic accidents, hazards to economic re-production, health risks or dangers to primary social networks, people belong to. The public's semantic of "risk" is related rather to these few omnipresent hazards than to more distal and somehow abstract risks. Particularly, in qualitative interviews, technological risks play a marginal role.

The disparity between qualitative and quantitative risk semantics is caused first by economic and political interests and funding of specific studies: The interest of these institutions is mainly focussed on the perception and the publics' acceptability of social and in particular technological risks. The second reason is related to the design of questionnaires: External framing of risk-topics combined with listwise query of evaluating risks will evoke judgements even if certain risks are hardly relevant to an interviewee. This observation leads me to talk of >switch-on-switch-off risks<, that are only set to one's agenda if externally framed: for instance by tv news, within a discussion amongst friends, during an election campaign, or if somebody asks to respond a questionnaire. On the other hand, risk semantics emerging from open questions or qualitative interviews refer to everyday-life experience: In most cases the encompass omnipresent threats, affecting people deeply and are not likely being displaced voluntarily. Worries about health, unemployment, instability of primary networks, hazardous mobility, these and similar ubiquitous risks I like to title "pervasive risks", insofar as they affect the personality as a whole.

Coping with risks, people tend to "normalize" and understate - willy-nilly - everyday-life's risks. Some of them are held as unavoidable and acceptable. Concerning social and technological risks, the public tends to refuse responsibility and often claims "zero-risk"! Subsequently, to a considerable extent, industry and politics were made responsible for regulating, controlling and reducing such hazards. In the public's eyes however, these institutions fail handling risks in a reliable way, and as a consequence, people express little confidence in institutions and their protagonists. Maybe this loss of trust could also be caused by insufficient risk communication and rights to participate directly, when risk-related decisions are to be made. Improving risk-management, communication on risk and fulfilling the public's demands for direct participation could increase the acceptability of social and technological risks within the public.

The disparity of risk semantics derived from qualitative and standardized data, corroborates the necessity to integrate different methodical strategies, to obtain valid knowledge on risk perception: standardized, listwise questions as well as ranking of risks and open questions - best combined with qualitative interviews. Only multime-

thodism seems to guarantee valid and comprehensive understanding of public risk perception and evaluation.

Keywords: Risk perception; qualitative research; Baden-Wuerttemberg Risk Survey 2001; risk semantic

ID153

T.1.3

Hampel, Jürgen; Center of Technology Assessment Baden-Württemberg, Germany.

Consumers as Guinea Pigs? The Relative Importance of the Risk Dimension in Public Discourses and Individual Evaluations of Biotechnology

Biotechnology has caused severe societal debates, not only in Germany, but also in Europe and other parts of the world. These debates, whose dominant actors were NGOs on the one side and industry and science on the side, are focussed mainly on risk issues. In the discussions between these actors, we can observe different framings of what is meant by using the term "risk". While scientists and industry focus on a sound science risk assessment, where the existence of risks has to be proven by scientific research, NGOs emphasize a more open understanding of risk which is similar to the sociological concept of risks - from Ulrich Beck's "new risks" to Brian Wynne's "unknown unknowns". These differences in the understanding of risks show effects even to the international arena: They become evident in conflicts between the United States and other producer countries of GM-food and the European Union at the WTO-level dealing with GM-food.

While the risk dimension and its different interpretations are dominating the social and political debates on biotechnology, the importance of the risk dimension in the evaluation of biotechnology is only limited. Dominant are moral and utilitarian considerations rather than risks. Up to 50% of the supporters of biotechnology are "risk-tolerant supporters" (Gaskell), they support an application of biotechnology even when they assume that it is risky. Amongst the public, is not the unwillingness to accept any risks, that is causing rejection of some of the applications of biotechnology. Do these results imply, that we have to reconsider the role of risk in individual decision making processes on new technologies?

Analyzing quantitative and qualitative material, the presentation deals with the complicated relation between risk perception and the evaluation of biotechnology. What are the risks which are associated with biotechnology? How are risk perception and other evaluative dimensions linked with each other? Which concept of risk is appropriate to understand the public's risks semantic of biotechnology? Is the public's perception of biotechnological risks reflected in political discourses on biotechnology in an adequate way?

Keywords: genetic engineering; risk perception; public discourse on technology; acceptability of GM-food

ID154

T.1.3

Ruddat, Michael; Sautter, Alexander, Universität Stuttgart, Germany.

Adored and Feared? The Public's Perception of Mobile Telephony

In the risk project carried out in 2001 by the Center of Technology Assessment, qualitative and quantitative data about the public's risk perception of mobile telephony in Baden-Wuerttemberg (Germany) were collected. The combination of the two different inquiry methods offers the chance to describe the risk semantic as well as to gain representative findings of different characteristics of how mobile telephony is perceived by the public. In particular, research on risk acceptability seems to be of interest, since on the one hand sales and use of mobile phones are booming amongst the German public, while on the other hand, voices of citizens' action groups protesting against base stations become louder. Quantitative analyses however indicate a comparable low level of disapproval and lacking stigmatization of mobile telephony and its radiation risks. At the same time, survey data show a high extent of uncertainty about risk potentials, and surprisingly moderate benefits perceived by the interviewees. The integration of qualitative and quantitative data analyses help discovering comprehensive insights of how the public perceives mobile telephony and which resources are mobilized to gain judgement ability.

Our analyses indicate the existence of four "columns" the perception is based on: Personal control, uncertainty about the risk, assumed health risks and usefulness. Surprisingly, all but the health risks led rather to positive judgements: Under uncertainty, many people - in particular those who actually use a mobile phone - tend to normalize its risk potentials. Furthermore questions about the dynamic of the risk and its acceptability were asked. Despite of perceived technological improvement of mobiles and reducing their radiation risks, most people expect increasing risks due to the booming dissemination of mobiles and base stations. Surprisingly, neither technological risks - e.g. interference of other technical systems -, nor social risks - e.g. getting into debts - were mentioned. All in all positive judgements predominate and there is considerable risk acceptability. Although the interviewees were presented a visual stimulus, showing as well a mobile phone as a base station, our results indicate, that in the perception of most people, risks emerge rather from mobile phones than from base stations. Compared to other risks, most people ascertain similarities due to the characteristic of personal control, like riding bicycle, smoking, or bungee-jumping, and only a small part of interviewees refers to "external" risk, similar to nuclear power. This finding underlines the necessity to carry out data analyses based on a typology of interviewees. Detailed knowledge about the public's perception and valuation of risk potentials emerging from mobile telephony may help to facilitate risk communication and decision-making, when new products are designed and base stations are set up.

Keywords: risk perception; mobile telephony; risk acceptability; risk semantic

ID155

W.2.2

Gonçalves, Graca, Palma-Oliviera, Jose; University of Lisbon, Portugal.

Bloody Work'': Where is the risk on the hospital waste? risk perception hospital waste environmental behaviour

"This paper aims to describe a small part of a larger research focused in hospital settings (in the context of a Ph.D. research of the first author). After a preliminary research presented in the last SRA-E Conference, it aims to present the results of a larger study about the risk perception of hospital waste and its relation with the behaviour patterns of health professionals.

The study was undertaken in six hospitals and with a diverse array of health professionals and the sample was chosen in order to contrast various factors: type and dimension of health centres (large spectrum and specific care), hospital divisions, geographic location (North, South) and health professionals (medical doctors, nurses, technical assistants and "auxiliary staff").

Thus the study design was orthogonal and aims to provide a meaningful comparison between factors using a tested (in the preliminary study) measurement instrument.

We will present the main results comparing the above-referred factors. It was detected a high perception of risk in all professional groups mainly towards dangerous hospital waste although with clear variations among groups. It was also studied the relationship among the separation of the waste according to the Portuguese legislation and the perception of the professionals' risk. It was also noticed disparities in the professionals risk perception towards different types of waste and regarding the waste separation determined by Portuguese legislation.

Keywords: risk perception, hospital waste, environmental behaviour

ID156

W.2.2

Druzhinina, Irina; Palma-Oliveira, Jose M., University of Vienna, Austria.

Radioactive contamination of wild mushrooms: A cross-cultural risk perception study using World Wide Web

Edible fungi are well known in modern society - far beyond their value as a food supply. The collection of wild mushrooms is one of a few opportunities that urbanised humans have to satisfy their often-hypothesized drive as hunters and gatherers in nature; this pastime is therefore an important part of our cultural heritage. Deprivation of this recreational, cultural and sometimes economic activity due to the dread of radioactive contamination is considered to be a significant loss of life quality.

Recent investigations of the wide range of polluted environments, however, including the broad territory of Europe contaminated after the Chernobyl accident (1986), have proved that different toxic elements, specially long-lived radionuclides

of caesium and strontium, can be accumulated in fruit bodies of fungi. Therefore, consumption of wild mushrooms can be regarded as a risky activity.

The global aim of the present research was to determine the public's mental model of radioactive contamination of wild mushrooms, to confront this model with the expert opinion, and to determine those factors that are perceived differently by specialists and amateurs.

The Internet appeared to be a useful tool in attaining these goals by finding the appropriate people across the world. The statistically significant differences in the perception of various aspects of mushrooms pollution were revealed between respondents from three world regions, which were differently affected by Chernobyl accident. Moreover, the majority of people have demonstrated a considerable difference in the perception of the global contamination of the environment versus the pollution of their local counties. The socio-psychological explanations of data are given.

In general, there is a steady consistency in the perception of factors, which may control the radioactive contamination of fungi, by majority of respondents. However, experts (radioecologists) rank the factor of fungal species as the extremely important parameter while other people perceive the factors of distance from the source of the pollution and the time after as the most important parameters. Such discrepancies between professional and unprofessional opinions are discussed and some recommendations for the risk communications are presented

Keywords: risk perception; radioactive contamination; fungi; mental models

ID193

T.2.3

Tait, Joyce, University of Edinburgh, United Kingdom.

Biotechnology: the Perennial Challenge

This paper links several aspects of our current research, on new approaches to governance in Europe, on GM crop risks and the precautionary principle and on globalisation. At EU and national levels a great deal of innovative thinking is taking place about new modes of governance. One of the defining characteristics of these new approaches is an emphasis on more integrated approaches to policy ('joined up' policy in the phraseology of the UK government). However, most of the innovation and integration is taking place in social policy areas such as social security, the provision of health services, education, etc. There is a glaring gap between these social policies and policies related to science and technology. This gap is particularly damaging to effective governance of risk, nowhere more so than in relation to GM crops where science and technology related aspects have, over the past ten years, become increasingly over-shadowed by societal concerns, with little sign as yet of a resolution. Local protests about GM crop trials have taken place in many European regions; some nation states are still refusing to comply with relevant European Directives; and the internationally organised consumer boycott of GM

crop products has become a new instrument of global governance. Also, the next round of WTO negotiations seem likely to generate vigorous debate between Europe and the USA.

To deal with these problems, to date we have only two weapons in our armoury, neither of which has been very effective. One is the provision of information to increase public understanding of the science involved in the development and regulation of GM crops, part of the top-down science and technology driven agenda which ignores good advice based on social research over the past fifteen years or more.

The other is greater involvement of public representatives in focus groups and discussion fora, an approach which so far has seemed to delay decision making indefinitely, rather than facilitate it. This paper will discuss approaches to resolving this impasse.

ID194

W.1.4

Rakel, Horst, Motorola Corporation, Germany.

Classifying corporate occupational safety cultures: lessons learned from six case studies in Germany and the UK

Risk management is increasingly becoming a key corporate objective. Issues such as crisis management, loss prevention and, in particular, occupational health and safety are now a regular item on executives' meeting agenda. For many corporate leaders safety, quality and efficiency are largely different sides of the same coin. Furthermore, being considered a "safe" company is an essential asset for marketing of products and services and the corporate reputation.

Particularly in the context of business approaches such as lean management and public policy objectives of industrial self-regulation, the concept of Safety Culture has frequently been cited as synonymous with successful corporate health and safety management. However, besides some generic, but unspecified, "how to" trade literature manuals little scholarly investigation has been conducted on safety culture in industrial organisations. For example, there are varying opinions on what represents a safety culture and how it can be identified. Although there are a number of, largely theoretical, excursions on the topic, no attempt has been undertaken to investigate and systematically characterise safety cultures "at work" in representative industrial settings.

This paper reviews the results of fieldwork conducted with six companies in Germany and the UK. The companies were selected on a matched pair basis from food, construction and energy supply industries. The case studies are predominantly large national - but not multi-national - corporations. For several companies being a "safe company" was an important aspect of their business strategy. The research found that "risk culture" represents a more appropriate description of corporate behaviour. The case study material led to the identification and characterisation of four "ideal types" or styles of corporate occupational risk cultures. It also showed

that quantitative, as well as qualitative economic considerations play an important part occupational health and safety risks. On the other hand, criteria of nationality were an insufficient factor in explaining and characterising corporate response to occupational risk

Keywords: **safety culture; health and safety; risk; industrial self-regulation; image**

ID270

M.1.1

Schmid, Gerhard; Münchener Rückversicherung, Germany.

Communication - As necessary as it is useful - a short guideline

In a crisis, a lack of communication - or incorrect communication - will usually have fatal consequences for a company. Loss of image among the general public leads to a loss of acceptance and waning confidence in products or services of the company affected. This could possibly result in falling orders, loss of market shares and problems with capital. Regardless of a company's size and line of business, in situations which will alter the structure of an existing system with an uncertain outcome - this is one definition of "crisis" - a company will be faced with uncertainty or even insecurity due to a lack of information or (un)avoidable mistakes. Crises have repeatedly arisen as a result of:

- hazardous incidents involving serious property damage, casualties or fatalities,
- hazardous incidents impacting on the population and the environment,
- spectacular product liability cases,
- recall operations,
- liquidity problems,
- takeovers,
- management disputes,
- criminal acts (extortion, arson, attacks),
- walkouts,
- government measures (enforcement of environmental regulations, plant closures, investigations by the public prosecutor's office),
- activities of pressure groups,
- mass redundancies.

A crisis and its consequences can adversely affect a company for years; a similar incident, even if not remotely related to the regional or sector in which a company operates, may stir up memories that can tarnish the company's image. Although there is no instant recipe for success where risk communication is concerned, it is nevertheless imperative that the preparation be as intensive and comprehensive as possible. Statutory regulations stipulate the need to draw up a concept for risk communication. The legislator lays down - sector for sector and in some cases in great detail - a company's duties vis-à-vis third parties.

For example, the German Commercial Code (Handelsgesetzbuch - HGB) and the German Stock Companies Act (Aktiengesetz - AktG) specify what documentation and information is required for companies' balance sheets, these requirements being dependent on a company's legal form and the number of employees it has. The Law on Corporate Control and Transparency (Gesetz zur Kontrolle und Transparenz im Unternehmensbereich - KonTraG) is intended to safeguard and increase the credibility and comprehensibility of management action. Comparable laws exist throughout the world.

In the interest of third parties, the federal and state supervisory offices for the various branches of the economy establish norms and standards of behaviour for companies. Risk communication has a close functional link with a company's risk management. It supports risk management in identifying, analysing and assessing risks, and also in developing suitable measures to prevent or reduce losses. In particular, risk communication is used to convey successful risk management to the public at large. Conversely, excellent risk management is the basis for credible risk communication.

Credibility generally proves to be the key factor. Just acting prudently in an actual crisis situation already makes a company credible in the public's eyes. Companies project competence by having long-term strategic concepts for their dealings with quite different manipulators and supporters of public opinion - from local residents and pressure groups to public authorities and, above all, the media.

Since every crisis meets with public interest, the main focus of the approaches to risk communication presented here lies on interaction with the media. This first part is based, on the one hand, on the findings of research into risk communication and, on the other, on the practical principles of media activity. To provide theoretical support, the second part outlines the complex structures of such crises and how they are dealt with from the point of view of economics, social sciences and communications studies.

ID271

M.2.2

Simmons, Peter, University of East Anglia, United Kingdom; Walker, Gordon, Staffordshire University, United Kingdom.

Beyond stigma? Risk, encroachment and sense of place

Studies of the relationship between hazardous installations and local communities have largely focused either on siting controversies or on local reactions following an accident or discovery of environmental contamination. A growing number of studies have documented the stigmatization of place and community, typically resulting in avoidance by outsiders and consequent psychosocial impacts on local residents. However, little attention has been paid to the impact of the encroachment of gradually enlarging hazardous facilities, often accompanied by

'low level' accidents that have no measurable environmental or human impact, on a locality. Yet this unremarked situation, rather than that typified by the drama of Bhopal or by silent toxic contamination, is part of the everyday reality of 'host' communities all over the world. As the closed circle of policy-makers, regulators and risk managers is opened to admit the voices and concerns of those anonymous publics whose lives and localities are touched by the presence of such hazardous facilities, new and challenging issues are forced onto the risk policy agenda.

Traditionally, the focus has been upon technological risk management and ensuring the conditions for human safety. Once we begin to attend to the experience of those living in the shadow of hazardous facilities, we find evidence not only of a degree of 'everyday stigma' but also of a conflict between the social and economic values embodied in the operation of such a facility and those values which attach to place itself. These values find expression in the local 'sense of place'. Such apparently intangible properties are far removed from the calculability of technological risks or of socio-economic consequences, yet when compromised they have profound implications for quality of life and wellbeing within such communities.

In this paper, we explore these issues through a case study of a community living around a chemical installation in northern England. This installation has existed at its current location for nearly 50 years but in response to commercial success grew from a small site employing 50 people to a major complex employing nearly 2,000 people. We draw primarily on group discussions and documentary evidence to analyse the experience of local residents on the siting, growth and impact of the installation, with particular attention to the interconnected questions of risk perception, stigmatization, sense of place and place values. We conclude with a discussion of the implications of these emerging issues for risk policy in the context of more participatory decision-making processes.

Keywords: hazardous industries; encroachment; stigma; sense-of-place

ID272

M.2.3

Quartieri, Giuseppe; OMEGADATI Srl; Alfaro, Guido Degan, Terza Università di Roma, Italy.

Innovative Packaging Methodology Construction

After having reviewed the main objectives of the development of an Appropriate Quality System in the Mediterranean Area (AQSMA) for Food Technology, the general methodology for innovative packaging constructions is presented. At this stage of the AQSMA project, hardening packaging of food (horticultural) products is one of above mentioned main objectives. Consequently, proper packaging analysis process techniques, simulation procedures, circumvention guide lines and cost of hardening are briefly considered to meet Customer Satisfaction. Packaging safety analysis methodology and specification is later considered or the new deal of

the Mediterranean Way to Quality. Since the general AQSMA programme is a long term goal, deeper analysis based upon specific test results is only planned to be executed all over the Mediterranean Countries Laboratories.

ID274

Poster

Plapp, Tina, University of Karlsruhe, Germany.

Affected people's flood risk perception and local experience of disaster management

So-called old, natural risks (earthquake, storm, flood, landslides, avalanches etc.) have not been the major topics of interest in risk perception research. Yet, increasing losses from natural disasters, the relation between more frequent extreme natural events and climate change, and the growing vulnerability of modern societies necessitate scientific engagement also in this field of risks. Risk perception research (stake-seekers), hereby, can and should integrate affected people's (stake holders) views more intensively into risk perception research.

The poster presents results of a survey on the perception of risks from storm, flood and earthquake conducted in summer 2001. All five survey areas in West and South Germany have been affected by flood, storm and/or earthquake within the last 30 years. Issues addressed in the questionnaire are (among others) personal risk ratings, perceptions of risk characteristics and experience of persons living in affected regions. In addition to the psychometric programme, also the cultural theory of risk perception was tested.

Quantitative data analysis of the 450 filled questionnaires show remarkable differences in the views of the 273 respondents from flood regions: while the respondents living in areas flooded almost regularly (Passau, Köln) regard the flood risk as quite low, the flood risk in the views of those persons living in a small town being inundated the first time since the 1950ies is rather high (Neustadt/Donau). These results cannot be explained by familiarisation or emotional blunting effects alone. The local history of flood events and the disaster management of these events has to be taken into account: while experience in the sense of damage experience seems to increase risk ratings, the experience of a functioning disaster management, at the same time, seems to put risk perception into perspective.

Keywords: risk perception; natural risks; questionnaire survey in affected regions; quantitative data analysis;

ID275

W.1.1

Clauberg, Martin; Wiedemann, Peter M.; Karger, Cornelia; Research Centre Juelich; Henseler, Gernot; Gundert-Remy, Ursula, German Federal Institute for Health Protection, Germany.

Early Risk Detection in Environmental Health -- Is it feasible? A German Perspective

Early risk detection is essential for being able to address the most important environmental health risk-topics in a persistent and prospective manner. In Germany, the need for the development of a detection and evaluation system for the timely recognition of emerging risk problems has been recognized by the action programme "Environment and Health" [APUG] of the German Federal Ministry for Health and the German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety.

Early risk detection serves to provide a timely recognition, characterization, and, if feasible, quantification of emerging risks so that options for risk management measures can be developed early, which provide the basis for decisionmaking to be able to react swiftly and appropriately to the situation at hand.

Early risk detection includes the identification of relevant information, the collection, the scientific characterization, and the evaluation of data and knowledge, as well as the development of risk management options in the form of an assessment report for submittal to the risk managers. Consequently, early detection of risks can serve as an instrument for the implementation of the precautionary principle.

Through insights gained in a series of workshops with experts from governmental agencies, academia, and industry that employ early warning / early detection systems and through development of exemplary case studies, a feasibility study was conducted. Results are a framework for construction of an early risk detection system, recognizing that three distinct risk contexts require different tools or trains of tools to be applied. Results include the differentiation and presentation of a risk typology, methods, tools, and suggested organizational processes required to develop an early risk detection system.

[This work was supported by the APUG, #200 61 218/9, under the project lead of BgVV. Numerous contributions of the project's advisory board are gratefully acknowledged.]

Keywords: Early risk detection; environment; health; case studies; precautionary principle

ID276

Poster

Göktepe, B. Gül, Turkish Atomic Energy Authority, Turkey

Risk of Maritime Traffic Accidents at the Turkish Straits

The Turkish Straits Region (TSR) is a natural formation of water route through the Bosphorus (Istanbul Strait) the Sea of Marmara and the Dardanelles (Canakkale Strait). This region is the historical marine trade route between the former Soviet countries and the western world. In recent years as a direct result of the economies in transition, market conditions of energy has been changing with increasing energy intensity in the Black Sea and Caspian region. As oil and gas reserves of Azerbaijan,

Turkmenistan and Kazakhstan developed and open up to the world energy market, TSR became the heaviest energy transport route in the world.

Maritime traffic through the TSR presents a complex structure due to rough geographical, meteorological and oceanographic conditions of the region. These conditions for the marine vessel traffic endanger not only the residents of the region but also the marine environment. Increasing vessel traffic also increases the oil tanker traffic carrying crude oil, petroleum products, inflammable and explosive chemicals which impose a great risk for health, property and the environment safety.

TSR with increasing load of marine transport has been facing to various accidents and incidents in the past. Accidents encountered are as high as 500 over the last 50 years. Main consequences of the accidents encountered are loss of hundreds of lives, destroy of sea vessels, damage of seashore residences and series pollution of environment.

Some of the Marine Casualties of Oil Tankers and their consequences are reviewed briefly.

Further exploitation of new oil and gas reserves in Western Asia will continue to impose even more challenges for energy/ environmental issues in the region since this area became attractive with rich oil and gas reserves and ranks among the most productive and economical oil reserves in the world. Concluding remarks are on the multi-nationality of the problem involving many other countries using this marine way. Current situation and near future energy, environment and economic interactions in the region presents a complex risk management issues and a challenge for the national as well as international organizations and the environmental NGOs.

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