
World Congress on Risk

Society for Risk Analysis

and the following participating organizations:

- SRA-Europe
- SRA-Japan
- American Chemistry Council
- American Physical Society
- German Commission on Harmonizing Risk Standards
- German Foundation for Environment and Risk Management
- International Association for Probabilistic Safety Assessment and Management
- Int'l Council on Systems Engineering
- International Union of Toxicology
- National Science Foundation
- Society of Environmental Toxicology and Chemistry
- Society of Toxicology
- UK Safety and Reliability Society
- US Department of Energy
- US Environmental Protection Agency
- US National Institute of Environmental Health Sciences
- World Business Council on Sustainable Development

Final Program

Sheraton Brussels, Belgium - June 22-25, 2003

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SRA World Congress Workshops

Sunday 22 June

Half Day AM = 8 AM-Noon; PM = 1-5 PM Full Day = 8 AM-5 PM

Euros will be accepted on site (cash only)

Workshop 1

Pre-registration fees: **\$295 US**; On-site **\$345 US**

Methods and Guidance for Health Risk Assessment of Chemical Mixtures

Organized by Linda K. Teuschler (teuschler.linda@epa.gov, U.S. EPA/NCEA-Cin, 26 West Martin Luther King Drive (MS-190), Cincinnati, Ohio 45268 USA, 513-569-7573, fax 513-569-7916) and Moiz Mumtaz (Science Advisor, ATSDR, Research Implementation Branch, Division of Toxicology)

This **morning** workshop presents scientific principles and risk-based methodologies for assessing cumulative health risk from exposure to chemical mixtures, including descriptions of current methods, discussions of the mechanistic basis for interaction effects, and the introduction of state-of-the-art approaches. Humans are typically exposed to chemical mixtures via irregular exposure patterns and variable doses. In recognition of this, the United States Environmental Protection Agency, Agency for Toxic Substances and Disease Registry, National Institute of Occupational Safety and Health, National Center for Toxicological Research and others have conducted research since the early 1980s to develop chemical mixture health risk assessment methods and assessments. More recently, the Food Quality Protection Act and Safe Drinking Water Act Amendments were passed in 1996, raising awareness of chemical mixtures health issues. This workshop presents chemical mixture health risk assessment topics including: procedures and definitions for use in selecting among risk assessment methods; component-based approaches: response-addition, dose addition, relative potency factors; procedures using whole mixture data; and approaches for incorporating toxicological interactions data. The content of this workshop includes a general overview of chemical mixture health risk assessment data evaluation and procedures, a discussion of the mechanistic bases for toxicological interactions; a detailed description of several new methods, and hands-on exercises with test data sets. Discussions include real world examples, exercise results, issues for application of the procedures, and general questions and comments. Participants are asked to bring a calculator. This course is for anyone interested in chemical mixtures risk assessment. However, basic knowledge of this area is helpful, (e.g., understanding of additivity concepts, application of the Hazard Index, etc.) An overview of the basic tenets and scientific principles will be given, but emphasis will be on additional development of these tenets and presentation of new ideas and approaches. More information is available at <http://www.ramas.com/mixtures.htm>.

Workshop 2

Pre Registration: **\$320 US**; On site **\$375 US** or **325 euros** on site cash

Beyond Monte Carlo: An Introduction to Imprecise Probabilities

Organized by Gert de Cooman (Gert de Cooman, Professor in Uncertainty Modelling and Systems Science, Universiteit Gent, Belgium) and Scott Ferson (scott@ramas.com, Senior Scientist, Applied Biomathematics, Setauket, New York)

This **full-day** tutorial introduces the notions of interval-valued probabilities and imprecisely specified probability distributions and their uses in risk analysis. It reviews five practical and quantitative approaches based on these elementary notions. The simplest approach uses the idea of interval probability, in which the probability of an event can be specified as an interval of possible

values rather than only as a precise one. This provides a convenient way to assess the reliability of fault-tree risk analyses. This idea is generalized by probability bounds analysis, which propagates constraints on a distribution function through mathematical operations, and Dempster-Shafer theory which recognizes that uncertainty attending any real-world measurement may not allow an analyst to distinguish between events in empirical evidence. These approaches are related to robust Bayes methods, in which an analyst can relax the requirement that the prior distribution and likelihood function must be precisely specified. The most general approach comes from the theory of imprecise probabilities in which uncertainty is represented by closed, convex sets of probability distributions. These five approaches redress, or comprehensively solve, several major deficiencies of Monte Carlo simulations and of standard probability theory in risk assessments. Although the five approaches arose from distinct scholarly traditions and have many important differences, the tutorial emphasizes that they share a commonality of purpose and employ many of the same ideas and methods. They can be viewed as complementary, and they constitute a single perspective on risk analysis that is sharply different from both traditional worst-case and standard probabilistic approaches. Each approach is illustrated with a numerical case study and summarized by a checklist of reasons to use, and not to use, the approach. The presentation style will be casual and interactive. Participants will receive a CD of the illustrations used during the tutorial. More information is available at <http://www.ramas.com/ipbrussels.htm>.

Workshop 3

Pre-registration fees: **\$220 US**; On-site **\$327 US** or **275 euros** on site cash

Introduction into Risk Communication: Thriving and Surviving in an Age of Risk

Organized by Peter M. Wiedemann (Head, Programme Group MUT, Research Center Juelich, Germany, and President, Society for Risk Analysis – Europe) and Martin Clauberg (University of Tennessee, Knoxville, USA)

This **morning** workshop will provide an introduction into the field of risk communication, with a special focus on the organizational challenges commonly faced within companies, regulatory bodies, and administrative agencies. The course goal is to provide both a basic understanding of the underlying principles as well as an appreciation of the challenges faced and addressed by risk communication. Specific case-study examples will be used to convey real-life lessons. Thus, this workshop is of potential benefit not only to newcomers to the concepts of risk communication, but also to practitioners seeking an integrated understanding of the whys & hows of risk communication. For some of the concepts and topics to be discussed, please see the online guidebook and reference *Risk Communication for Companies* at http://www.fz-juelich.de/mut/vdi/vdi_bericht_e/index_e.html and the web resource *Risk Communication in Print and on the Web* <http://www.fz-juelich.de/mut/rc/inhalt.html>. Further information about the workshop is available at http://www.sra.org/risk_communication_workshop.htm.

Workshop 4

Pre-registration fees: **\$330 US**; On-site **\$416 US** or **350 euros** on site cash

Online Tools for Risk-based Decision Making

Organized by *Martin Clauberg, Fred Dolislager, Leslie Galloway, Tom Purucker, JJ Roberts-Niemann, Robert Stewart, and Debra Thomas*

This **afternoon** training course will provide quick detailed overviews of at least 10 online risk assessment tools. The course will be in lecture format with participants following along in User Manuals or similar instructional materials (CD to keep). Participants will be able to keep the User Manuals. All the online tools being discussed are free to the general public. This course will explain the intended uses of these sites as well as the assumptions in the programming not readily apparent. This course will be excellent for environmental risk assessors, risk managers, project managers, toxicologists, environmental engineers, and regulators. Further information about the workshop is available at http://www.sra.org/training_workshop_world_congress.htm.

Workshop 5

Pre-registration fees **\$250 US**; On-site **\$300 US**

A Science-based Risk Communication Revolution: Applications and Case Studies in Military Settings

Organized by *Marilyn K. Null and Lori S. Geckle (U.S. Army Center for Health Promotion and Preventive Medicine, Health Risk Communication Program at Aberdeen Proving Ground), Rebecca T. Parkin (Department of Environmental and Occupational Health at The George Washington University), Gordon Butte and Sarah Thorne*

This **afternoon** workshop will address risk communication. Communication efforts often fail because those responsible for doing the communication are not familiar with the diversity of audiences interested in an issue, and have not clearly identified the communication and involvement needs of those audiences. Fortunately, a revolution worldwide in risk communication is afoot. From "educating and informing" audiences, the professional practice of risk communication is fast evolving toward a process orientation, one that takes advantage of current understanding in the relevant disciplines and is true to the best principles and practices of science and communications. Rather than being seen as an event, or task, risk communication planning and implementation is being seen as integral to an effective risk management process. The U.S. military can offer many examples of leading edge risk communication efforts. Over the past few years, the military has been adopting and applying basic risk communication principles to a variety of health, environmental, and safety risk challenges. Basic risk communication training is now included in several military leadership schools, as well as in medical, safety, health, and environmental courses. Soldiers and employees with professional credentials are offered credits upon completion of risk communication training. Alliances with universities known for risk communication research have been developed, and contentious issues are discussed and debated with stakeholders nationwide. At the same time, the U.S. military continues to face unique risk communication challenges, ones that often require a delicate balance among the need for citizens to be informed, the need to involve citizens in the decision-making process, and the need to protect national security. These challenges are faced on many fronts, both at home and abroad. This session will explore some steps the U.S. military is taking to meet such risk communication challenges. It will provide a forum for dialogue about the paradigm shift in the field of risk communication, and provide participants an opportunity to practice effective risk communication planning and strategy development through hands-on exercises. Case examples of successful applications from around the world will be offered. Participants will be encouraged to share examples of their past or current risk management and risk communication challenges to stimulate

"real time" applications of the process. A focal point of the session will be the illustration of the process in current efforts with the U.S. military to systematically identify effective health benefits and to produce risk communications strategies for vaccines, including anthrax and smallpox vaccines. Simple in structure but powerful in application, the process deals explicitly with the knowledge and judgments of the technical experts and non-experts involved in a communication "transaction." It enables appropriate strategies and salient messages to be developed from a mapping of the information and views held by both groups. Also, it takes advantage of simple measurement methods to enable communicators to adjust strategies and messages in ways that can also improve their overall process for developing both. Presenters will explore the process in detail in a highly interactive manner.

Workshop 6

Pre-registration fees: **\$430 US**; On-site **\$490 US** or **425 euros** cash

Building Bridges: Risk and Emergency Management

Organized by *Gillian Osborne (Due Diligence Management Inc., Canada)*

This **full-day** workshop will focus on a major risk problem facing governments at all levels, and particularly local governments - reducing risk from emergencies from natural hazards, accidents and intentional acts. The workshop is intended to bridge the two disciplines to explore a risk-based approach to reduce risks from emergencies

This workshop will be organized around a discussion exercise. Before the exercise, speakers will describe current experience and practice for risk management and emergency management by local governments. During the exercise, participants will receive an emergency scenario and related questions. They will discuss the questions and agree on answers. As part of the discussion, participants will have to consider the relevance and usefulness of current risk management experience and practice for reducing risk from emergencies.

Following the exercise, speakers will summarize the key findings from the exercise, especially bridges between the risk and emergency management fields. The final speaker will present a collage of case studies that illustrate the consequences of emergencies.

Factors such as urbanization, climate change and technology suggest emergencies will be a more obvious feature for governments to deal with in the future. This is compounded by the fact that we are still struggling to understand and manage conventional natural hazards. Hence hazard and risk managers are facing issues of increased depth as well as breadth.

In this environment, we need to optimize tools to protect what is important to people - their access to goods and services, economic health, human health, human rights, integrity of their relationships and the sustainable natural environment. This workshop focuses on bridging the risk management and emergency management disciplines to explore a risk-based approach to reduce risk from emergencies. The workshop considers the issues from the perspective of both developed and developing nations.

Workshop participants will receive the following:

- Copies of presentation slides
- Exercise guide with the scenario and questions
- Reference list

A summary of the workshop activities and findings will be produced and distributed to persons attending the main conference. Further information about the workshop is available at <http://www.ramas.com/bridges.htm>. (Decision Partners), and **Igor Linkov** (ILinkov@icfconsulting.com, Senior Risk Assessor, ICF Consulting)

Monday, 23 June

8:30 - 10:00 am Salles des Nations Ballroom	Plenary - Chemical, Biological, Radiological and Cyber Risks				
10:30 am - Noon	Breakout A <i>Room: Watteau</i> Risks from Novel Sources of Biodiversity		Breakout B <i>Room: Tintoretto</i> Radiological Risks and Long-Term Waste Management		
2:00 - 3:30 pm M-MS.1 <i>Room: Holbein</i> Assessing the Human Health Risks Following the Collapse of the World Trade Center Towers (Part 1)	2:00 - 3:30 pm M-MS.2 <i>Room: Watteau 1</i> Social Amplification of Risk: Implications for Risk Policy and Governance (Part 1)	2:00 - 3:30 pm M-MS.3 <i>Room: Watteau 2</i> Responding to the 2001 Anthrax Bioterrorism Attacks: Addressing the Risk Issues (Part 1)	2:00 - 3:30 pm M-MS.4 <i>Room: Tintoretto 1</i> Responding to the 2001 Anthrax Bioterrorism Attacks: Addressing the Risk Issues (Part 1)	2:00 - 3:30 pm M-MS.5 <i>Room: Tintoretto 2</i> The Challenge of Terrorism - Examining Psychological and Cultural Factors Affecting Risk Management	
4:00 - 5:30 pm M-MS.11 <i>Room: Holbein</i> Assessing the Human Health Risks Following the Collapse of the World Trade Center Towers (Part 2)	4:00 - 6:00 pm M-MS.12 <i>Room: Watteau 1</i> Social Amplification of Risk: Implications for Risk Policy and Governance (Part 2)	4:00 - 5:30 pm M-MS.13 <i>Room: Watteau 2</i> Responding to the 2001 Anthrax Bioterrorism Attacks: Addressing the Risk Issues (Part 2)	4:00 - 6:00 pm M-MS.14 <i>Room: Tintoretto 1</i> Radiological Risks in Varying Environmental Contexts	4:00 - 5:30 pm M-MS.15 <i>Room: Tintoretto 2</i> A Retrospective 20 Years After on the Red Book ("Risk Assessment in the Federal Government")	

Tuesday, 24 June

8:30 - 10:00 am Salles des Nations Ballroom	Plenary - Global And Trans-Boundary Risks				
10:30 am - Noon	Breakout A <i>Room: Watteau</i> GMOs and International Trade		Breakout B <i>Room: Tintoretto</i> Global Climate Change?—Extreme Events		
2:00 - 3:30 pm T-MS.1 <i>Room: Holbein</i> Perceptions and Policy Responses	2:00 - 3:30 pm T-MS.2 <i>Room: Watteau 1</i> The Management of Uncertainty in Risk Science and Policy (Part 1)	2:00 - 3:30 pm T-MS.3 <i>Room: Watteau 2</i> Integrated Environmental Strategies: Mitigating Global Risks while Obtaining Local Benefits (Part 1)	2:00 - 3:30 pm T-MS.4 <i>Room: Tintoretto 1</i> Risk Assessment in the Context of Trade Disputes; The Resolution of Science Based Trade Disputes (Part 1)	2:00 - 3:30 pm T-MS.5 <i>Room: Tintoretto 2</i> Adaptation as an Approach for Managing Climate Risk (Part 1)	
4:00 - 5:30 pm T-MS.11 <i>Room: Holbein</i> Problems of Precautionary Governance	4:00 - 5:30 pm T-MS.12 <i>Room: Watteau 1</i> The Management of Uncertainty in Risk Science and Policy (Part 2)	4:00 - 5:30 pm T-MS.13 <i>Room: Watteau 2</i> Integrated Environmental Strategies: Mitigating Global Risks while Obtaining Local Benefits (Part 2)	4:00 - 5:30 pm T-MS.14 <i>Room: Tintoretto 1</i> Risk Assessment in the Context of Trade Disputes; The Resolution of Science Based Trade Disputes (Part 2)	4:00 - 5:30 pm T-MS.15 <i>Room: Tintoretto 2</i> Adaptation as an Approach for Managing Climate Risk (Part 2)	

Wednesday, 25 June

8:30 - 10:00 am Salles des Nations Ballroom	Plenary - Sustainable Development with Acceptable Risks				
10:30 am - Noon	Breakout A <i>Room: Watteau</i> Public Health Priorities		Breakout B <i>Room: Tintoretto</i> Globalization and Cultural Integrity		
2:15 - 3:45 pm W-MS.1 <i>Room: Holbein</i> Risk Communication and Public Policy	2:15 - 3:45 pm W-MS.2 <i>Room: Watteau 1</i> New Insights of Risk Perception Research: The Role of Trust and Credibility	2:15 - 3:45 pm W-MS.3 <i>Room: Watteau 2</i> A New Perspective of Flood Disaster Management: Asia Monsoon World and Resilient Society (Part 1)	2:15 - 3:45 pm W-MS.4 <i>Room: Tintoretto 1</i> Can Genetically Modified Crops Promote Sustainable Agriculture in the Developing World? (Part 1)	2:15 - 3:45 pm W-MS.5 <i>Room: Tintoretto 2</i> Partnership for Strengthening Science-Based Decision-Making in Developing Countries	
4:00 - 5:30 pm W-MS.11 <i>Room: Holbein</i> Decision Analytic Approaches for Structuring Stakeholder Involvement	Moved to T-MS.16 Slot	4:00 - 5:30 pm W-MS.13 <i>Room: Watteau 2</i> A New Perspective of Flood Disaster Management: Asia Monsoon World and Resilient Society (Part 2)	4:00 - 5:30 pm W-MS.14 <i>Room: Tintoretto 1</i> Can Genetically Modified Crops Promote Sustainable Agriculture in the Developing World? (Part 2)	4:00 - 5:30 pm W-MS.15 <i>Room: Tintoretto 2</i> Legislation and Risk Management as Tools in Sustainability	

10:30 am - Noon	Breakout C <i>Room: Rembrandt/Permeke</i> Early Warning Systems for Chemical Risks		Breakout D <i>Room: Alto/Mezzo/Tempo</i> Terrorism and Extreme Events	
2:00 - 3:30 pm M-MS.6 <i>Room: Willumsen</i> Where Are the Research Frontiers in Decision-Making and Risk?	2:00 - 3:30 pm M-MS.7 <i>Room: Rembrandt</i> Risk Analysis and Society: Interdisciplinary Perspectives on the Field	2:00 - 3:30 pm M-MS.8 <i>Room: Permeke</i> NATO Science Programme: Objectives and Support in Risk-Related Areas	2:00 - 3:30 pm M-MS.9 <i>Room: Mezzo</i> Children's Environmental Health— Risk Assessment Issues (Part 1)	2:00 - 3:30 pm M-MS.10 <i>Room: Tempo</i> Comparing Regional, Regulatory and Disciplinary Methods for Defining and Managing Uncertainty
4:00 - 5:30 pm M-MS.16 <i>Room: Willumsen</i> Selecting Chemicals for Regulation	6:00 - 7:00 pm SRA Europe Business Meeting <i>Room: Permeke</i>	4:00 - 5:30 pm M-MS.17 <i>Room: Permeke</i> Spatial Methods for Environmental Sampling, Risk Characterization, and Management	4:00 - 5:30 pm M-MS.18 <i>Room: Mezzo</i> Children's Environmental Health— Risk Assessment Issues (Part 2)	4:00 - 5:30 pm M-MS.19 <i>Room: Tempo</i> Defining Specifications for Integrating Data in Environmental Health Investigations; Barriers, Stakeholders and Solutions
10:30 am - Noon	Breakout C <i>Room: Rembrandt/Permeke</i> Risk Analysis and the Precautionary Principle		Breakout D <i>Room: Alto/Mezzo/Tempo</i> Systemic Risk and Interdependencies	
2:00 - 3:30 pm T-MS.6 <i>Room: Willumsen</i> Guiding Risk Communication: The EMF Case	2:00 - 3:30 pm T-MS.7 <i>Room: Rembrandt</i> Work-Induced Risks and Their Effects on Health, Environment and Economic Viability	2:00 - 3:30 pm T-MS.8 <i>Room: Permeke</i> Environmental Risk Transition Profiles in Asia Reconsideration from Global Environmental Risk Aspect	2:00 - 3:30 pm T-MS.9 <i>Room: Mezzo</i> Fiber Risk - A Unified Approach (Part 1)	2:00 - 3:30 pm T-MS.10 <i>Room: Tempo</i> Spatially Explicit Risk Assessment: Blending Landscape Ecology with the Ecological Risk Process
4:00 - 5:30 pm W-MS.12 (Moved) <i>Room: Watteau 1</i> Risk Assessment and Environmental Decision Making in Mediterranean Region (Poster Session)	4:00 - 5:30 pm T-MS.17 <i>Room: Rembrandt</i> Early Risk Detection I. Weak Signal Detection + Early Risk Detection II. Implementation Challenges	4:00 - 5:30 pm T-MS.18 <i>Room: Permeke</i> Managing Natural Hazards. The Role of Insurance and Liability	4:00 - 5:30 pm T-MS.19 <i>Room: Mezzo</i> Fiber Risk - A Unified Approach (Part 2)	4:00 - 5:30 pm T-MS.20 <i>Room: Tempo</i> Case Studies in Risk and Governance
10:30 am - Noon	Breakout C <i>Room: Rembrandt/Permeke</i> Sustainable Resources		Breakout D <i>Room: Alto/Mezzo/Tempo</i> Protecting Biodiversity	
2:15 - 3:45 pm W-MS.6 <i>Room: Willumsen</i> A New Initiative: IRGC (International Risk Governance Council)	2:15 - 3:45 pm W-MS.7 <i>Room: Rembrandt</i> Harmonization of Environmental Risk Assessment Methods	2:15 - 3:45 pm W-MS.8 <i>Room: Permeke</i> Support for Businesses Seeking Sustainable Practices (Part 1)	2:15 - 3:45 pm W-MS.9 <i>Room: Mezzo</i> Risk Perception and Communication, Key Concepts for Environmental Sustainability	2:15 - 3:45 pm W-MS.10 <i>Room: Tempo</i> Risk Management in Hospital: Lessons from Industry
4:00 - 5:30 pm W-MS.16 <i>Room: Willumsen</i> Harmonization of Risk Standards: Results of the German Risk Panel	4:00 - 5:30 pm W-MS.17 <i>Room: Rembrandt</i> Comparative Human Health Risk Assessment	4:00 - 5:30 pm W-MS.18 <i>Room: Permeke</i> Support for Businesses Seeking Sustainable Practices (Part 2)	4:00 - 5:30 pm W-MS.19 <i>Room: Mezzo</i> Risks, Vulnerability, Sustainability, and Governance - A New World Reality Landscape	4:00 - 5:30 pm T-MS.20 <i>Room: Tempo</i> Reviewing Acceptable Risks and Approval of Redevelopment Plans for Sites Under Long-term Remediation

Background

The "World Congress on Risk" is an International Conference held 22-25 June 2003 at the Sheraton Brussels in Belgium.

This is the first of a series of World Congresses on Risk that will be important, logical steps to further develop the field of risk analysis and its applications. In partnership with other professional societies and organizations, the Society for Risk Analysis (SRA) is launching the first of this series in 2003.

The unifying theme for the First World Congress is "Risk and Governance," which reflects the worldwide trend toward making better use of risk-oriented concepts, tools, and processes (derived from both research and practice) in public decision-making and risk management. SRA is co-sponsoring the Congress with other scientific and professional organizations interested in risk.

Conference Organization and Sponsors

Organizations participating with SRA for the First World Congress on Risk include SRA-Europe (SRA-E), SRA-Japan (SRA-J), American Chemistry Council (ACC), American Physical Society (APS), German Commission on Harmonizing Risk Standards (GCHRS), German Foundation for Environment and Risk Management, International Association for Probabilistic Safety Assessment and Management (IAPSAM), International Council on Systems Engineering (INCOSE), International Union of Toxicology (IUTOX), National Science Foundation (NSF), Society of Environmental Toxicology and Chemistry (SETAC), Society of Toxicology (SOT), UK Safety and Reliability Society (SARS), US Department of Energy (US DOE), US Environmental Protection Agency (US EPA), US National Institute of Environmental Health Sciences (US NIEHS), and World Business Council on Sustainable Development (WBCSD).

Conference Organizers: Robin Cantor, Rae Zimmerman

Planning Committee:

SRA	John Ahearne, Richard Belzer, Gail Charnley, Bernard Goldstein, Yacov Haimas, Igor Linkov, Timothy McDaniels, Mitchell Small,
SRA-E	Roger Kasperson, Joanne Linnerooth-Bayer, Ragnar Lofstedt, Ortwin Renn, Joyce Tait
SRA-J	Saburo Ikeda, Michinori Kabuto
SETAC	Anne Fairbrother
SOT	Michael Dourson
NIEHS	Chris Schonwalder

Conference Coordinator: Society for Risk Analysis, 1313 Dolley Madison Blvd., Suite 402, McLean, VA 22101, 703-790-1745, Fax: 703-790-2672, email: SRA@BurkInc.com

Financial Support

Through the generous support of the **National Science Foundation, US EPA, US DOE, and NIEHS**, we have ensured substantial participation by young investigators and researchers and policy makers from developing countries. The conference organizers are grateful for their generous support.

Program

The First World Congress will consist of meetings over a three-day period. Each of the three days will begin with a plenary session to launch a set of issues or methodological "views." Speakers for the plenary sessions have been selected by the planning committee to provide broad participation by, and representation of, the physical, environmental, engineering and social science communities, and to reflect different international perspectives.

Each plenary session will be followed by breakout sessions that will combine groups of participants to consider the issues and methods raised in the plenary in the context of specific deliberation problems, such as energy planning, hazardous waste management, and genetically modified organisms. Participants, or their designated rapporteurs, will reconvene to share and document insights across groups about risk and governance.

Specific objectives of the Congress are to (1) stimulate dialogue on emerging risk issues of worldwide interest, (2) share insights about analytic methods and decision processes used in different regions of the world, (3) demonstrate and disseminate recent advances in risk assessment, management, and communication, and (4) build an organized, international community of individuals dedicated to advancing the state of the art and promoting appropriate use of risk-related tools, concepts, and procedures.

Three "sub-themes" have been developed by the planning committee for purposes of identifying plenary programs and breakout sessions. Each sub-theme will also guide the selection of symposia for the afternoon concurrent sessions.

These sub-themes are:

- a) Chemical, biological, radiological, and cyber risk
- b) Global and trans-boundary risks
- c) Sustainable development with acceptable risks

An important goal of the First World Congress is to foster the sharing of information and ideas in the risk community.

Distinctive features of the First World Congress include:

- Assessment of the state-of-the-art in various subfields of risk analysis made available to each participant
- Presentation of disciplinary advances in risk analysis that are relevant to scholars and decision makers interested in integrated, multi-disciplinary approaches to problem solving
- Demonstration of how solutions to risk problems can be sensitive to the differing needs and cultures in the developed and developing world
- Specialized treatment of major risk problems such as national and corporate security, food safety, energy production, chemical regulation, natural hazard control, environmental protection, transport safety, and radiation protection
- Comparative information on how different countries and regions of the world are addressing the same risk, including the success and limitations of any efforts at international harmonization and the roles of international organizations
- Information on the growing number of scientific and professional journals dedicated to risk-related tools and issues as well as the growing number of educational opportunities.

Mini-Symposia

The afternoon sessions are concurrent mini-symposia sessions selected by the program committee. Ten concurrent mini-symposia to take place in each of two afternoon meeting periods per day for a total of more than 50 mini-symposia sessions and dozens of poster presentations, to begin an international dialogue on a wide variety of current risk issues.

World Congress- Final Technical Program

Sunday, 22 June

Welcome Reception

(cash bar)

7:00 -9:00 pm

Introduction to the Congress, program committee, and sponsors

Congress Co-organizers:

Robin Cantor (LECG)

Rae Zimmerman (New York University)

and

SRA-E President Peter Wiedemann (Research Center Juelich, Germany)

SRA-J President Iwao Uchiyama (Kyoto University)

and representatives of participating and sponsoring organizations

Monday, 23 June

Plenary Session – 8:30 - 10:00 am

Salles des Nations Ballroom

Chemical, Biological, Radiological and Cyber Risks

Sub-theme Leader: John Ahearn, Sigma Xi and Duke University

Trends at the Intersection of Risk Assessment and Policy

Christopher Whipple (Environ International Corporation)

Some Lessons from Japan in Early Detection, Precaution, and Informed Choice in the Risk Divided Society

Saburo Ikeda (University of Tsukuba)

Assessing Risks: Yesterday, Today and Tomorrow

William Farland (US Environmental Protection Agency)

10:00 - 10:30 am

Poster Session/Coffee Break

Ballroom Foyer

Breakout Sessions – 10:30 am - Noon

Room: Watteau

A. Risks from Novel Sources of Biodiversity

Anne Fairbrother (US Environmental Protection Agency)

Speakers: *Janet Anderson (US Environmental Protection Agency), Pim Martens (International Centre for Integrative Studies), William Pardee (Cornell University)*

This breakout session has been organized by SETAC and focuses on the biological risks of invasive species, biotechnology, and other novel genetic material. Globalization has increased the capacity for spread of genetic material around the world, with potential risks to both human and the environment. Invasive species of plants, invertebrates, and aquatic life threaten the stability of ecosystems, as well as economies based on agriculture or natural resource harvest. The need for methods to assess and prioritize risks of invasive species is becoming more urgent and will be one of the topics of

discussion at this session. Aggressive, invasive species also might occur as a result of escape of transgenes from bioengineered crops, which might result in human health risks associated with ingestion of novel proteins produced by the plants. These and other potential risks associated with bioengineering require new approaches for risk analysis, which will be discussed during the session. Similarly, movement of disease agents into susceptible human and wildlife populations, as exemplified by West Nile Virus and SARS, is occurring with greater frequency and rapidity due to an increasingly global economy. Understanding causative factors that facilitate movement of pathogens will allow better methods for predicting risks of emerging diseases. The session will look for commonalities in methods for analyzing risks of novel genetic material to humans and the environment, whether the material is introduced as whole organisms (invasive species), novel genes (through genetic engineering), or as new or re-emergent pathogens.

Monday Breakouts 10:30 am - Noon (continued)

Room: Tintoretto

B. Radiological Risks and Long-Term Waste Management

Robert Budnitz (Lawrence Livermore National Laboratory)

Speakers: *Steve Barlow (Nirex Ltd., United Kingdom)*, *Roger Kaspersen (Stockholm Environment Institute)*, *Piet Zuidema (National Cooperative for the Disposal of Radioactive Wastes, Switzerland)*

The objective of this breakout session is to discuss the role of risk analysis, including both realistic risk analysis and various other forms of risk analysis, in assessing the risks over the very long term of managing high-level radioactive waste and spent nuclear-power-plant fuel. The emphasis is on risk-analysis methods for deep-geological disposal, as well as risk analysis methods for long-term surface management of these wastes. The principal questions include (a) whether currently available risk-analysis methods are adequate to support realistic risk analyses; and (b) what types of applications (regulatory; public-participation; facility design) can be supported by either realistic risk analyses or various other forms of risk analysis. The perspective is intended to be "international", meaning that it should be quite general rather than focused on a particular national program.

Room: Rembrandt/Permeke

C. Early Warning Systems for Chemical Risks

Lesley Onyon (International Programme on Chemical Safety, World Health Organization, Geneva Switzerland)

Speaker: *Stephen Palmer (University of Wales College of Medicine)*

Many tens of thousands of chemicals play vital parts of our daily lives. The sound management of these chemicals requires an assessment of the hazards and risks posed by these chemicals. Much has been done internationally to harmonize assessment methods and significant efforts are underway on work to cooperatively assess chemicals used worldwide in high production volume. International authorities agree however, that much remains to be done, particularly to fill outstanding information gaps and improve the accessibility and availability of information on which to prioritise further assessments. Much also remains to be learnt from the types of chemical exposures taking place, chemical accidents and near-misses to

improve preparedness and response and evidence-based risk management. Can systems in place in other areas, e.g. disease-surveillance and the post-marketing surveillance of pharmaceuticals be used as models to improve feedback systems for chemicals? What are the systems for reporting of adverse events in place and how can they be improved? What can we learn from lessons of the past to improve the safety systems we have in place? This session will review current systems for the assessment of chemicals and potential improvements for chemicals management to try and answer these questions and others about the need for early warning systems for chemical exposure.

Room: Alto/Mezzo/Tempo

D. Terrorism and Extreme Events

Vicki Bier (University of Wisconsin)

Speakers: *Keith Florig (Carnegie Mellon University)*, *Ortwin Renn (Center for Technology Assessment)*, *Torbjorn Thedeen (Royal Institute of Technology)*, *Rae Zimmerman (New York University, Wagner Graduate School)*

Protecting human health and critical infrastructure against threats from an intelligent and adaptable adversary (including chemical, biological, and radiological weapons, as well as other terrorist threats) is different from many other types of risk management. For example, even the existence of a threat assessment may provide an organization's adversaries clues on effective sabotage methods. Similarly, reducing the vulnerability of some systems may cause intelligent and knowledgeable adversaries to attack other systems that have not yet been "hardened." Thus, risk management in this context may require tools such as game theory, in addition to the traditional use of decision theory. In addition, risk analysis methods likewise may need to be adapted to help in characterizing the changing nature of terrorism risk. However, the results of such analysis can yield useful insights.

The session will cover such questions as: How does terrorism risk management differ from protection against accidents or acts of nature? What new risk analysis methods, models, and theories (if any) are needed to address terrorism risk? What is known about the ability of systems to rebound after a terrorist attack? How has the public responded to the threat of terrorism? Are there tradeoffs between terrorism risk management and the preservation of basic values, such as protection of individual freedoms?

Luncheon – Noon - 2:00 pm

Salles des Nations Ballroom

Reflections on Risk and Governance

12:40 pm - Session Begins

Chair: John Ahearn, Sigma Xi and Duke University

12:45 pm - Speakers

Commissioner David Byrne, European Commission
Dr. John Graham, US Office of Management and Budget

1:50 pm - Adjourn

Monday Mini Symposia – 2:00 - 3:30 pm

Room: Holbein

M-MS.1 Assessing the Human Health Risks Following the Collapse of the World Trade Center Towers (Part 1)

Organizer: Matthew Lorber, US Environmental Protection Agency
Speakers: Lorber, M., Gibb, H., Grant, L., Gavett, S. (US Environmental Protection Agency); Geyh, A. (John Hopkins School of Public Health)

In the hours and days following the September 11, 2001, terrorist attack on New York City's World Trade Center (WTC) towers, many federal, state, and local agencies, including the Environmental Protection Agency (EPA), were called upon to assist in addressing this national emergency. Limited sampling of dust collected on that day and in the next few days proved useful in understanding the content of the dust cloud that engulfed the populace. Toxicity testing on this dust with laboratory mice demonstrated its potential effect on the respiratory system. Ambient air monitoring stations were quickly established within days by EPA, other federal, and New York Agencies. Using these ambient air concentrations, the EPA conducted a comprehensive inhalation exposure and risk assessment. Also, EPA conducted complex air dispersion studies to evaluate the movement of emitted contaminants and study potential exposures in neighborhoods surrounding the WTC site. By the spring of 2002, reports began surfacing of a persistent cough associated with fireman and rescue workers. Through 2002, compilations of data on these respiratory effects made it clear that close exposure to the emissions from the Ground Zero site, and particularly exposures that may have occurred during the very first days after September 11, resulted in documented health effects. Also documented was evidence of stress and other effects that could be directly correlated to the WTC disaster. Along with outdoor exposures, there was concern about the indoor environment. In the spring of 2002, the EPA began a program of free clean-ups of residential apartments. At the same time, they initiated a sampling program to evaluate the indoor air quality, the presence of contaminants on surfaces and carpets, and the effectiveness of their clean-up methods. This mini symposium will address these topics and also discuss lessons learned from this unprecedented disaster.

Room: Watteau 1

M-MS.2 Social Amplification of Risk: Implications for Risk Policy and Governance (Part 1)

Organizer: Nick Pidgeon, University of East Anglia, United Kingdom
Speakers: Pidgeon, N. (University of East Anglia, United Kingdom); Gowda, R. (Indian Institute of Management, India); Niewoehner, J. (University of East Anglia, United Kingdom); MacGregor, D. (Decision Research); Rothstein, H. (London School of Economics, United Kingdom); Barnett, J. (University of Surrey, United Kingdom); Frewer, L. (University of Wageningen, The Netherlands)

The social amplification of risk framework (SARF) aims to examine in social and historical context how risk events interact with psychological, social, and cultural processes in ways that amplify or

attenuate risk perceptions and shape risk behaviour and consequences. This double symposium brings together papers from international authorities on SARF, showing how it has developed since its inception, and referencing this to new theoretical insights and comparative case studies (including environment and climate, technological controversies, food safety, health care, public policy). The symposium also explores implications of SARF for risk governance in the 21st Century. Questions that the papers address include the following. What theoretical models (political, sociological or psychological) might be used in conjunction with SARF such that conceptual explication can be advanced? What contemporary social sites exist where messages about risk are constructed, communicated and transformed? How are issues of trust and blame bound up in both amplification and attenuation effects? How does analysis of the interaction of local experiences, politics and symbolic linkages raise key conceptual issues for the original amplification framework? Can risk assessments for new technologies explicitly incorporate secondary consequences (stigma effects, economic impacts) as a legitimate part of the consequence analysis? How can an understanding of SARF help agencies better meet their governance responsibilities to society? Twelve papers will be presented across two sessions by: Pidgeon, Kasperson and Slovic (UEA/Stockholm/Decision Research); Renn (CTA Stuttgart); Flynn (Decision Research); Poumadère (Institut Symlog); Petts (Birmingham); Horlick-Jones and Walls (Cardiff/UEA); Gowda (Bangalore); Niewöhner (UEA/Max-Delbrueck-Centrum); Rothstein (LSE); Leiss (Ottawa); Barnett (Surrey); Frewer, Miles and (Wageningen/IFR Norwich). The symposium coincides with the publication of a major new volume - Pidgeon, Kasperson and Slovic (2003) *The Social Amplification of Risk* Cambridge University Press - to which many of the presenters have contributed.

Room: Watteau 2

M-MS.3 Responding to the 2001 Anthrax Bioterrorism Attacks: Addressing the Risk Issues (Part 1)

Organizer: Dorothy Canter, US Environmental Protection Agency
Speakers: Canter, D. (US Environmental Protection Agency); Martinez, K. (National Institute for Occupational Safety and Health/Centers for Disease Control); Kempter, C., Voltaggio, T. (US Environmental Protection Agency); Sgroi, T. (US Department of State); Princiotta, F. (US Environmental Protection Agency); Gillen, M. (National Institute of Occupational Safety and Health/Centers for Disease Control)

In 2001 three bioterrorism attacks occurred in which anthrax spores were sent through the U.S. mail system. Since then 23 persons contracted anthrax, and five died of inhalational anthrax. Numerous mail facilities were contaminated, particularly those processing mail for the US government in the Washington, D.C. area. Some cleanups have been completed; others are ongoing, with ultimate costs in the hundreds of millions of dollars. This symposium will examine the numerous risk issues related to the attacks. A brief background on the attacks and cleanups will be presented.

Monday Mini-Symposia 2:00 - 3:30 pm (continued)

Then the risk assessment issues addressed in the cleanup of the Capitol Hill Anthrax Site will be considered, from selection of the fumigant, to the extent of the cleanups, and finally the important national security and policy issues. The role of environmental sampling in identifying and characterizing anthrax contamination at sites and in testing the efficacy of the subsequent cleanup(s) will be discussed, with emphasis on advances made in sampling since the attacks, and current recommendations for sampling. The review process for chemical agents to treat anthrax contamination will be discussed, including the safety and efficacy issues that must be considered, with a comparison of the three agents used to fumigate sites. The safety issues that must be addressed in the treatment of very large sites will also be addressed. The roles of two independent, multi-disciplinary expert panels in the cleanup process of the Department of State mail facility will be summarized, including the value they add to the process. The evolution of the clearance process for productive re-use of the sites will be presented, including the significant risk assessment and risk communication issues considered. Finally, the data base for assessing risk of contracting anthrax and the current criteria for judging how clean is safe will be addressed.

Room: Tintoretto 1

M-MS.4 Risk Assessment and Decision Making Related to Major Accident Hazards

Organizer: Olivier Salvi, INERIS, France

Speakers: Hourtolou, D. (INERIS); Lacoursiere, J.-P. (University of Sherbrook); Zugman Do Coutto, R. (UNEP); Turney, R. (EPSC)

Recent major technological accidents (Enschede, 2000; Toulouse, 2001; Lagos, 2002) have shown that politicians and risk-decision makers are facing difficulties to manage technological risk. This situation is probably due to, on one hand, the complexity of the issue, and on the other hand, citizens loss of trust in politics. Indeed, in our knowledge-based society, citizens want to be informed and require transparent decision-making processes. But the decision-makers behaviour regarding risk-related problems is not convincing. The solutions to change the situation seem to be both scientific and societal. The increasing complexity of industrial systems and the conscience that the role of humans is a key issue to control major accident hazards have strongly emphasised the need for approaches that integrate a holistic vision of the industrial systems with the concepts, models and tools from various sciences : engineering, psychology, sociology, management etc. There is a real scientific challenge to develop risk assessment methods that take into account this complexity. Concerning the societal aspect, the efforts must focus on the information and participation in the risk management processes of all stakeholders, including the public. It has long been recognised that increasing public participation is an essential element in improving environmental and risk-related decisions. When the various stakeholders are aware of risk issues and involved in decision-making, the solutions inevitably become more sensible and legitimate. The selected talks of this symposium present several initiatives in the World to better assess major accident hazards

and to help decision-makers to deal with risk issues. In particular, the symposium will describe the achievement of works that integrate the complexity of the systems in risk assessment, and that improve the public comprehension and awareness. Olivier SALVI (INERIS, France) Chairman David Hourtolou (INERIS, France) ARAMIS Project : Development of an Accidental Risk Assessment Methodology in the Framework of the Seveso II directive. Jean-Paul Lacoursière (University of Sherbrook, Canada) Implication of the public in risk-related decision making in Canada Ruth Coutto (UNEP APELL Programme, International) The strategy for the community involvement in emergency prevention and preparedness programmes Robin Turney (European Process Safety Centre, UK) Role of the industry in major accident prevention

Room: Tintoretto 2

M-MS.5 The Challenge of Terrorism - Examining Psychological and Cultural Factors Affecting Risk Management

Organizer: Bill Durodie, King's College London

Speakers: Wessely, S. (King's College London); Furedi, F. (University of Kent at Canterbury); Gearson, J. (UK House of Commons); Durodie, B. (King's College London)

The need to achieve a balanced and coherent response to the events of September 11th 2001 poses significant dilemmas for governments. In the United Kingdom this has been encapsulated in the phrase alert but not alarmed. Yet, despite warnings as to the adverse consequences of acting upon general or vague information, responsible authorities have come under tremendous pressure to be seen to be responding to speculative concerns in order not to be complacent. Such actions can in turn drive public concerns and in some instances have necessitated policy U-turns that undermine public confidence. This suggests an urgent need to understand and incorporate the psychiatric literature examining the limitations of providing reassurance without challenging fundamental beliefs, as well as the risk communication literature that points to the need for clarity, consistency and engagement, into the new policies. Amongst the common problems and assumptions to be explored in this session are; How new is the so-called new terrorism? What are the psychological consequences of living in a state of heightened concern? To what extent have pre-existing fears been reinterpreted and reinvigorated through the prism of terrorism? Why is society identifying its vulnerabilities and not its strengths? And, are there cultural asymmetries relating to risk-taking and risk-aversion that terrorists make use of? In particular we seek to examine the limitations of responses to terrorism that focus primarily upon technical change. These can take the form of demands for better intelligence, detection instruments, protection equipment and new structures of governance such as the Department of Homeland Security or the Civil Contingencies Secretariat. Most commentators agree that real resilience depends on a human element. How then, can we re-engage the publics hearts and minds in a period of mistrust, with a view to re-forging a more positive vision of what advanced societies have to offer?

Monday Mini-Symposia 2:00 - 3:30 pm (continued)

Room: Willumsen

M-MS.6 Where Are the Research Frontiers in Decision-Making and Risk?

Organizers: Sally M. Kane, Robert O'Connor, National Science Foundation

Speakers: Kane, S. (National Science Foundation); Kroger, W. (Swiss Federal Institute of Technology); Lofstedt, R. (Kings College, University of London); Muresan, L. (EURISC Foundation); O'Connor, R. (National Science Foundation); Rogers, M. (European Commission)

Last summer, 24 experts participated in a workshop on "Integrated Research in Risk Analysis and Decision-Making in a Democratic Society" at the U.S. National Science Foundation. They concluded that, despite the explosion of innovative empirical, theoretical, and analytic methods and tools for analyzing risks and for making decisions under conditions of uncertainty, unnecessary and unhelpful divisions remained across researchers. Research communities in risk analysis, decision sciences, extreme events, and hazards are not working closely together, and this holds as well for topics spanning the more traditional disciplinary fields, impeding scientific progress. In addition, the group highlighted the seeming lack of appropriate risk analytic methods in many public sector decisions. The workshop produced a number of recommendations.

The purpose of the mini-symposium is to examine the workshop recommendations in an international context. We hope to facilitate active discussion on the nature and scope of the research frontiers facing the risk and decision communities, with an eye toward identifying the most important research investments for the next five years. This topic is of direct interest to the U.S. National Science Foundation and other research sponsoring agencies; evolving research programs in decision-making and risk will be described.

Room: Rembrandt

M-MS.7 Risk Analysis and Society: Interdisciplinary Perspectives on the Field

Organizer: T.L. McDaniels, University of British Columbia; M. Small, Carnegie Mellon University

This new book from Cambridge University Press, forthcoming June 2003, provides an interdisciplinary characterization of the state of risk analysis and its relevance for society. Its contents comprise ten commissioned chapters by leading writers and scholars in the field of risk analysis, along with introductory and concluding chapters. Its intent is to provide interdisciplinary views on key issues in the current state of risk analysis and society. Topics of the chapters range from issues regarding the role of efficiency, to environmental risk and justice, to analysis of variability, to the role and limits of quantitative analysis, to transboundary risk issues, to analysis for extreme events, and several others.

This session of the World Congress will involve an introduction to the book and its contents. The chapters of the book were commissioned as background papers for the first Symposium on Risk Analysis and Society, which was held outside Washington DC in June, 2000. The chapters are intended as an appraisal of the state of the field of risk analysis from various interdisciplinary perspectives,

to lay a foundation for a series of World Congresses on Risk, of which the meeting in Brussels is the first.

The session will involve an introduction to the structure and themes of the book. Each of the authors attending the World Congress will be asked to give a brief presentation about their chapter. Finally we will hold an open discussion involving the audience about how the book could be used for teaching and for structuring future discussions about risk analysis.

Room: Permeke

M-MS.8 NATO Science Programme: Objectives and Support in Risk-Related Areas

Organizer: Igor Linkov, ICF Consulting

The NATO Science Programme was founded in 1958, with the establishment of the NATO Science Committee. The Science Committee immediately recognized that the training of young scientists and engineers was of paramount importance, and introduced a group of support mechanisms which in essence remain today - Advanced Study Institutes, Collaborative Research Grants and Science Fellowships. The predominant characteristics of the Programme have continued to be an emphasis on cooperation and catalysis, support for high scientific quality, and a capacity for rapid response to new developments. Since the early 1990s the NATO Science Programme has served a wider scientific community, as scientists from NATO's Partner countries of the Euro-Atlantic Partnership Council have become eligible for support, while at the same time a proportion of the Programme has been reserved for the traditional collaboration between scientists in NATO countries. 1999 was a landmark year, in that, with the exception of a small number of Fellowships, the Science Programme was transformed so that support is now devoted to collaboration between Partner-country and NATO-country scientists or to contributing towards research support in Partner countries. About 10,000 scientists are currently involved in the Science Programme each year, as grantees and meeting participants, or as referees and panel members.

The NATO Science Program has supported a number of workshops and conferences related to environmental risk assessment. Dr. Alain Jubier will summarize several projects related to environmental risk assessment.

The NATO Science Committee is currently engaged in discussion on the implications for civil science of the fight against terrorism, and how the NATO Science Programme might best be employed in combatting terrorism and other new threats to security and stability. Dr. Fernando Carvalho-Rodrigues will present available funding mechanisms and research priorities in this area.

Dr. Linkov will share experience in participating and in organizing several NATO workshops in the areas related to risk assessment.

Monday Mini-Symposia 2:00 - 3:30 pm (continued)

Room: Mezzo

M-MS.9 Children's Environmental Health— Risk Assessment Issues (Part 1)

Organizer: Dale Hattis, Clark University

Speakers: Sonawane, B. (US Environmental Protection Agency); Thompson, K. (Harvard University); Sips, A. (Netherlands, National Institute of Public Health and the Environment); Hattis, D. (Clark University); Faustman, E. (University of Washington)

It is now a truism that people from life stages between fertilization and adolescence cannot always be accurately represented by simple scaling rules as “little adults”. This symposium will bring together researchers involved in quantification of chemical health risks during fetal life and childhood. An introductory discussion will be given by Bob Sonawane of the USEPA, “Children's Environmental Health Risks, a Global Problem of Concern.” Early life stages are particularly of interest for a World Congress that must include concerns for less developed countries in part because of a younger age structure in developing countries. Subsequent presentations will follow the causal chain from exposure to response, followed by a panel discussion on risk management perspectives involving all the presenters plus Dennis Paustenbach of Exponent Corp.: Kimberly Thompson of the Harvard School of Public Health will speak on “Characterization of Children's Exposures to Environmental Health Hazards.” She will focus on the risk assessment issues posed by the fact that children have distinctive behaviors not present or much less prominent than in adults. Loeckie de Zwart will present a paper covering work by herself and colleagues at the National Institute of Public Health and the Environment of the Netherlands on “Risk Assessment in Children: Role of Pediatric PBPK Models.” Case studies from pharmaceuticals should be seen as a first step in developing tools for assessing the relationships between external and internal dose rates in children vs adults. Dale Hattis of Clark University will then report on his work modeling interindividual variability in parameters affecting toxic susceptibility in children. Finally, prior to the panel, Elaine Faustman will discuss the importance of “windows of vulnerability” during fetal and child development and other aspects of the toxicodynamics of early life biological responses. Terry Damstra of WHO and Bob Sonawane of USEPA will chair the symposium.

Room: Tempo

M-MS.10 Comparing Regional, Regulatory and Disciplinary Methods for Defining and Managing Uncertainty

Organizer: David Hassenzahl, University of Nevada - Las Vegas

Speakers: Hassenzahl, D.M. (University of Nevada Las Vegas); Clauberg, M. (Forschungszentrum Jülich GmbH); Purvis, K. (Claremont Colleges); Ezzati, M. (Resources for the Future / WHO); Goble, R. (Clark University)

Comparing regional, regulatory and disciplinary methods for defining and managing uncertainty David Hassenzahl, University of Nevada Las Vegas This mini-symposium draws on a range of disciplinary perspectives to identify salutary approaches to managing uncertainty, and the tension between the inevitability of uncertainty and ideological preference for risk-based decision rules. Uncertainty has been variously defined in the risk literature, and differentially treated by decision-making bodies. While some of definitions have been more effective than others, and significant literatures have been developed within agencies or government, little effort has been done to compare approaches across agencies and governments. Identifying the strengths and weaknesses of different definitional and institutional approaches will stimulate improved trans-boundary risk decision-making. Several examples will be used to explore this issue. Some recent work produced for the German Federal Risk Commission provides an example of the German approach to environmental standard-setting and its associated uncertainties. In this context, risk communication is both a challenge and a starting point for risk-related standard-setting. Several salient cases come from the United States, including uncertainties in cost-effectiveness estimation at the federal level, sorting methods explored in the New Jersey Comparative Risk Project and ongoing FEMA mandated regional vulnerability assessments. Finally the use of language and methods of risk analysis to explore evidence for and against the existence of new and emerging risks may prove salutary for cases of extreme uncertainty. These cases suggest a need to propagate, rather than minimize, uncertainty; and need for further understanding how to communicate uncertainty to diverse audiences; and a need to avoid undermining or discrediting risk analysis by ignoring uncertainty.

3:30 - 4:00 pm

Poster Session/Coffee Break

Ballroom Foyer

Monday Mini Symposia 4:00 - 5:30 pm

Room: Holbein

M-MS.11 Assessing the Human Health Risks Following the Collapse of the World Trade Center Towers (Part 2)

See M-MS.1 for abstract and speakers.

Room: Watteau 1

This Session Ends at 6:00 pm

M-MS.12 Social Amplification of Risk: Implications for Risk Policy and Governance (Part 2)

See M-MS.2 for abstract and speakers.

Room: Watteau 2

M-MS.13 Responding to the 2001 Anthrax Bioterrorism Attacks: Addressing the Risk Issues (Part 2)

See M-MS.3 for abstract and speakers.

Monday Mini-Symposia 4:00 - 5:30 pm (continued)

Room: Tintoretto 1

This Session Ends at 6:00 pm

M-MS.14 Radiological Risks in Varying Environmental Contexts

Organizer: Antone Brooks, Washington State University

Speakers: Cox, R. (National Radiation Protection Board - UK); Cucinotta, F.A. (NASA Johnson Space Center); Hall, E.J. (Columbia University); Paretzke, H.G. (GSF-Inst fuer Strahlenschutz)

This mini-symposium reviews the scientific basis for radiation risks and applies derived risks to different exposure environments. Dr. Brooks will discuss new scientific developments in the field of radiation biology and evaluate the impact of research on changes in radiation paradigms and low-dose radiation risk. Dr. Hall will discuss on the role of radiation protection and risks assessment in medicine. It is impossible to imagine the practice of medicine in the 21st century without the routine use of x-rays for diagnosis and therapy. However, any World forum on risk must consider that every year on the planet earth 2 billion people are exposed to radiation for diagnostic purposes and 5.5 million for radiotherapy! This represents a huge, and increasing, population exposure to a man-made carcinogenic agent. Some estimates of the risks associated with this widespread use of radiation are needed to balance against the undoubted medical benefits. Space travelers are exposed to a wide range of radiation types not present on earth, including cosmic rays. Because human epidemiological data is lacking for cosmic rays, risk projections must rely on theoretical understanding and on data from experimental models using simulated space radiation. Dr. Cucinotta will review biophysical and radiobiological models describing the effects of cosmic rays and apply these to predict radiation risks. These analyses are applied to space mission scenarios to estimate risks for a lunar colony, deep space outpost and a Mars mission. These data will be related to the maximum acceptable risks for radiation workers on earth. Finally, Dr. Paretzke will provide a summary for the mini-symposium. He will review the current and potential future directions for radiation standards and risk for a wide range of environmental situations. The mini-symposium provides a useful summary of radiation risks and helps place risk in prospective relative to other environmental risks.

Room: Tintoretto 2

M-MS.15 A Retrospective 20 Years After on the Red Book ("Risk Assessment in the Federal Government")

Organizer: Warner North, NorthWorks

Speakers: North, D.W. (NorthWorks, Inc.); Dourson, M. (TERA); Rodricks, J.V. (ENVIRON); Löfstedt, R.E. (Kings College London)

The 1983 National Academy of Sciences/National Research Council Report, "Risk Assessment in the Federal Government: Managing the Process" has had a large impact on the process of risk assessment for chemicals in the environment, not just in the state and federal agencies in the United States, but also in many organizations outside the United States. The US Federal Government and US Environmental Protection Agency guidelines for cancer risk assessment followed from the recommendations of this report. Many

international organizations have used the risk assessment concepts and procedures described in this report in setting up their own processes. The widely used nickname "Red Book" results from a long title, a red cover, and a large number of copies printed; the reference is to the book of sayings of a former leader of the People's Republic of China.

This symposium will bring together members of the committee that authored the Red Book with other leaders in the field, for a retrospective discussion of the messages from the Red Book, the experience of the past 20 years on risk assessment for chemicals, and implications for risk assessment in other areas. The journal "Health and Ecological Risk Assessment" has commissioned a special issue for the twentieth anniversary of the Red Book, to appear August 2003, and HERA has given permission for authors of papers in this special issue to give a preview of their insights for the World Congress. Formal presentations will be kept short, to encourage discussion of the messages from the Red Book, how these messages have been put into practice, and what lessons might be learned to improve risk assessment practice.

Room: Willumsen

M-MS.16 Selecting Chemicals for Regulation

Organizer: Mitchell Small, Carnegie Mellon University

Speaker: Rogers, M.D. (Forward Studies Policy Advisor, European Commission, Belgium); Warhurst, A.M. (European Policy Office, Belgium); Müller-Herold, U. (Swiss Federal Institute of Technology, Switzerland); Shatkin, J. (The Cadmus Group),

Thousands of new chemicals are produced each year throughout the world. Government agencies and multinational organizations are still in the early stages of deciding which of these chemicals to subject to regulation, reporting requirements, or other oversight activities. There is a great need for the sharing of information on effective technical and administrative procedures for implementing these programs - to ensure that the public health and environment are protected while encouraging economically sound, innovative and sustainable chemical products. This session brings together scientists and decision makers in the European Union and the US to identify and compare emerging approaches.

Room: Permeke

M-MS.17 Spatial Methods for Environmental Sampling, Risk Characterization, and Management

Organizer: Tom Purucker, University of Tennessee

Speakers: Bing-Canar, J. (US Environmental Protection Agency Region 5); Goovaerts, P. (Pgeostat and Biomedware); Purucker, S.T. (University of Tennessee); Stewart, R.N. (University of Tennessee); Della Sala, S. (Venice Port Authority)

The investigation and management of natural resources requires the ability to integrate ecosystem knowledge with spatial processes. In addition, sampling, interim cleanup, and regulatory decisions often must occur even while data available for assessment is incomplete. This mandate for action requires approaches to extrapolate from known data to cover information gaps, while exposing to decision-makers the nature of the uncertainty inherent in the process. This is a tall order, and the result is that environmental risk

Monday Mini-Symposia 4:00 - 5:30 pm (continued)

assessment, one of the most commonly used tools to manage natural resources, is a science where current needs are often exceeded by available tools and data. The calculation of risk is dependent on the exposure assessment distribution, which can be heavily dependent on the spatial distribution of contamination. Therefore, environmental risk assessments conducted for contaminated sites must ultimately consider the spatial distribution of contamination if an effort is to be made to confront uncertainty. However, due to difficulties inherent in efficiently spatially characterizing sites, regulatory guidance often recommends a summary statistic be used as the exposure concentration when conducting an environmental risk assessment. Therefore, when the risk assessment is conducted, the spatial distribution of data is often lost and not recaptured in a risk context through the rest of the environmental decision-making process. The use of geostatistical tools has great potential to improve the utility of risk assessments, particularly with respect to characterizing the exposure assessment distribution. This in turn can improve processes that depend on this estimation, such as the efficient design of secondary sampling schemes and the evaluation of remedial alternatives being considered. This talk discusses methods for using geostatistical methods to produce concentration, risk, probability, variance, and area of concern maps and discusses how these types of results can be incorporated into the environmental decision-making process.

Room: Mezzo

M-MS.18 Children's Environmental Health— Risk Assessment Issues (Part 2)

See M-MS.9 for abstract and speakers.

Room: Tempo

M-MS.19 Defining Specifications for Integrating Data in Environmental Health Investigations; Barriers, Stakeholders and Solutions

Organizer: Marsha Marsh, US Environmental Protection Agency
Speakers: Bakanidze, L. (Center for Disease Control/ATSDR); Orlova, A. (Johns Hopkins School of Public Health); Issa, N. (US Centers for Disease Control); Marsh, M. (Johns Hopkins School of Public Health); Bradley, P. (US Environmental Protection Agency); Valleron, A.-J. (University of Paris Medical School); Boreiko, C. (International Lead Management Center)

Mini Symposia objectives:

1. To define and prioritize the desired functions of monitoring and assessing the risks of human health to exposure of hazardous and environmental pollutants (integrating health data efforts to reduce the risk of human exposure to hazards) for stakeholders, users, and perspectives across public health domains (eg, bio terrorism, lead poisoning, asthma, air pollution, water pollution, water quality, infectious, communicable diseases and chronic disease, etc.

2. To define the range of data elements needed to be standardized and integrated (hazards, exposure, risk, health outcomes, health interventions) Case study of lead poisoning.

3. To discuss existing frameworks and systems in light of these functions and to evaluate the feasibility of linking data from these systems to support the timely monitoring and assessment of the risk and disease outcomes of human exposure to hazards and environmental pollutants.

4. A white paper summary with future research recommendations for these gaps

The Pew Environmental Health Commission (USA), 2000 identified "a gap in critical knowledge that hinders efforts to reduce or eliminate diseases" that "might be prevented by better managing environmental factors." Stakeholders and environmental burden of disease perspectives for USA and Europe are examined.

Room: Permeke
SRA Europe Business Meeting
6:00 - 7:00 pm

Tuesday, 24 June

Plenary Session – 8:30 - 10:00 am

Salles des Nations Ballroom

Global And Trans-Boundary Risks

Sub-theme Leader: Joyce Tait, Scottish Universities Policy Research and Advice Network (SUPRA), The University of Edinburgh

Climate Change and Climate Policy: Key Challenges for the Risk Community

M. Granger Morgan (Carnegie Mellon University)

Transboundary Risks: How Governmental and Non-Governmental Agencies Work Together

Ursula Gundert-Remy (Federal Institute for Risk Assessment)

Risk Governance: A New Approach

Charles Kleiber (State Secretary for Science and Research; Swiss Department of Home Affairs)

10:00 - 10:30 am

Poster Session/Coffee Break

Ballroom Foyer

Breakout Sessions – 10:30 am - Noon

Room: Watteau

A. GMOs and International Trade

Scott Ratzan (Johnson & Johnson)

Speakers: Dierdre Hutton (National Consumer Council, UK), Simon Barber (EuropaBio, Belgium), J.P.M. Schenkelaars (Schenkelaars Biotechnology Consultancy (SBC), Heike Baumuller (International Centre for Trade and Sustainable Development (ICTSD)

Trade in GM seeds and crops has become one of the most contentious international risk issues. Numerous NGOs and some national governments (in response to public pressure) are calling for very rigorous controls, moratoria on GM crop developments or an outright ban. On the other hand the companies involved in their development, supported by the US and some other governments, maintain that there is no evidence of risk which would justify such actions. Conflicts among EU countries, between the EU and the US, and increasingly involving the developing world, have demonstrated the inherent difficulties in harmonizing regulatory and administrative procedures in the face of manifestly different institutional commitments and political/administrative cultures. In risk regulation as in any other area it is also important to recognize the multiple perspectives and interests of different industry sectors and of different companies within sectors. This variation in response is what gives some firms a competitive advantage over others and increasingly the international operating environment of industry is being altered in favor of those companies that see risk regulation as an opportunity rather than a constraint.

This session will address issues relevant to the needs of: developing countries; consumers; the food industry and the agro-bio-technology industry.

Room: Tintoretto

B. Global Climate Change?—Extreme Events

Joanne Linnerooth-Bayer (IIASA)

Speakers: Neil Doherty (Wharton School, University of Pennsylvania), Howard Kunreuther (Wharton School, University of Pennsylvania), Mahendra Shah (IIASA), Anna Vari (Hungarian Academy of Science)

Extreme weather events, such as riverine or coastal flooding, windstorms and droughts, present challenging problems in reducing the human and economic damages and in spreading the residual losses from the direct victims to a wider base. The focus of this breakout session is the assessment and management of risks of weather-related catastrophes. Participants will discuss the importance of climate change in the frequency and intensity of weather-related disasters, as well as improved tools and “catastrophe models” for assessing the risks from extreme events, their applications for risk mitigation and financial management, and procedures for developing and using these tools in participatory procedures. While the focus is on extreme weather events, the conceptual development can be transferred to technological disasters and to proactive management of deliberate catastrophes, such as terrorist activities. The session will focus on advanced modeling such as catastrophe models, innovations in risk-transfer instruments, and governance of disaster risk management at the local, national, and global levels.

Tuesday Breakouts 10:30 am - Noon (continued)

Room: Rembrandt/Permeke

C. Risk Analysis and the Precautionary Principle

Peter Wiedemann (Forschungszentrum Juelich, Germany), and Martin Clauberg (University of Tennessee)

Speakers: *David Gee (European Environment Agency), Michael Rogers (European Commission), Marjolein Van Asselt (Maastricht University, Netherlands), Jonathan Wiener (Duke University)*

Within the last decade — specifically the last 5 years — the concept of the “Precautionary Principle” has come into (regulatory) focus and momentum for it has been growing. Indeed, the regulatory acceptability has been growing more rapidly in the European Union than in the United States, highlighted by the European Union’s official incorporation of the precautionary principle into the regulatory framework in 2000. Whether deservedly or not, the precautionary principle has been blamed for economic and regulatory tensions between the European Union and the United States. Although several attempts have been made to understand and alleviate the tensions attributed to the precautionary principle, a final consensus has not been achieved to date.

The goal of this moderated panel discussion is to explore anew the underlying concept, conflict & problem issues, and suggestions to move forward in finding ways to open up a constructive dialogue on “Risk Analysis and the Precautionary Principle.”

Room: Alto/Mezzo/Tempo

D. Systemic Risk and Interdependencies

Yacov Y. Haimes (University of Virginia)

Speakers: *Ulrike Kastrup (Swiss Federal Institute of Technology Zurich), Sadayoshi Kobayashi (Nuclear Safety Commission, Cabinet Office of the Government of Japan), Joost R. Santos and Yacov Y. Haimes (Center for Risk Management of Engineering Systems, University of Virginia)*

The dominance of information technology in our business and commerce has also created a critical-path dependency across our interconnected information systems and critical infrastructures that can be exploited by would-be terrorists. For example, banking and finance institutions depend on the information infrastructure to operate their systems, reliable telecommunications depend on electricity, and the electric utilities depend on a reliable source of energy. The session explores the advances in modeling, assessment, and management of risks of terrorism to interdependent infrastructures. It also addresses the need to better understand the interconnectedness and interdependencies between the complex system of critical infrastructure systems, such as transportation, telecommunications, and electric-power systems. Specific methodologies with case studies will be presented and discussed.

Brown Bag Lunch – Noon - 1:50 pm

(cash and carry)

Risk Analysis in a Global Community

This lunch will offer a forum for discussion of the needs of risk analysis around the world. How can improved training and use of risk analysis be achieved in diverse countries? What do professional risk analysts need to facilitate their work? Following brief comments by an international panel of experts, the chair will invite comments and questions from all attendees.

Chair:

Dr. Bernard Goldstein, President, SRA

Panelists:

Dr. Chris Schonwalder, USA

Dr. Igor Linkov, Russia

Dr. Jamal Hisham Hashim, Malaysia

Dr. Rosana Moraes, Brazil

Dr. Rajeev Gowda, India

Dr. Naum Borodyanskiy, Ukraine

Rapporteur:

Prof. Jonathan Wiener, SRA Chapters & Sections Chair, USA

Tuesday Mini Symposia 2:00 - 3:30 pm

Room: Holbein

T-MS.1 Anthropogenic Climate Change - Risks, Perceptions and Policy Responses

Organizer: Nick Pidgeon, University of East Anglia, United Kingdom
Speakers: Palutikof, J., Warren, R., Poortinga, W., Bickerstaff, K., Tompkins, E. (University of East Anglia)

The issue of global climate change presents us with a range of risk issues spanning the whole range of physical and social science approaches to risk and uncertainty. This interdisciplinary mini symposium brings together natural and social science perspectives in discussion of the state-of-the-art in the science of climate uncertainty and prediction alongside research on public perceptions and risk governance. It also represents one of the first collaborations of researchers drawn from the new Zuckerman Institute for Connective Environmental Research, a new £10m facility established at the University of East Anglia from June 2003, with the mission to make innovative connections to address the global and environmental issues of the day from a trans-disciplinary perspective. The first paper will be presented by Viner and Palutikof (Climatic Research Unit) on the science of anthropogenic climate change, drawing upon extensive research on the global climate record. The second paper by Warren et al (Tyndall Centre) discusses various approaches to risk assessment in climate change and the propagation of these uncertainties through an Integrated Assessment Model and attaching probabilities to climate scenarios. The third paper by Lorenzoni, Poortinga et al (Centre for Environmental Risk/Centre for Social and Economic Research on the Global Environment) turns to the characteristics of climate change risk in terms of public perceptions, comparing these with baseline data on perceptions of nuclear energy. Relationships between risk perceptions and trust in institutions will also be discussed. The final paper by Tompkins et al (Tyndall Centre) addresses the potential societal risks (i.e. range of future directions of policy negotiations) associated with the division of climate change response strategies into adaptation and mitigation at the international level, through the evolving structure of the international institutions (IPCC, UNFCCC and associated agreements, COPs).

Room: Watteau 1

T-MS.2 The Management of Uncertainty in Risk Science and Policy (Part 1)

Organizer: Silvio Funtowicz, European Commission Joint Research Centre, Institute for the Protection and the Security of the Citizen
Speakers: Craye, M. (European Commission Joint Research Centre, Knowledge Assessment Methodologies); Saltelli, A. (European Commission Joint Research Centre, Applied Statistics); van der Sluijs, J. (Universiteit Utrecht, Copernicus Institute for Sustainable Development and Innovation); Grin, J. (University of Amsterdam, Department of Political Science); Natenzon, C. (University of Buenos Aires, Institute of Geography)

The management of uncertainty calls for important changes to our knowledge infrastructure. These concern methodological developments as regards the practice of science and structural and

institutional changes in the science-policy interface. An enhanced conceptualisation of uncertainty in risk science as well as an integrated methodological framework are needed. Uncertainty management is to be seen as a necessary step to ensure the plurality of the knowledge input into policy processes dealing with risks. In this way the management of uncertainty is related to other aspects as the quality of the knowledge and the democratisation of expert processes. Working towards standards of uncertainty management would also serve to increase transparency towards policy and stakeholder communities. It is therefore an instrument to increase trust in policy decisions and safety regulation based on uncertain knowledge and will decrease the potential for controversy on the knowledge base. The different speakers share the conviction that this challenge will be best dealt with by an integration of technical-quantitative, participatory, institutional and deliberative approaches to the management of uncertainty. The proposed mini-symposium will both review work that has been done in the field and, through discussion and debate, contribute to the development of perspectives for integration and further research topics. Subjects of the presented papers, as well as for comments and interventions in the debate and discussion can cover : · analysis of uncertainty, categorisation of different sorts and sources and standardisation of these ; · role of uncertainty and ignorance in the decision making context ; · the embedment of the management of uncertainty within extended peer groups ; · integration, refinement and extension of existing tools and methods ; · applications and exercises in a variety of decision-making contexts ; · institutional aspects of the management of uncertainty.

Room: Watteau 2

T-MS.3 Integrated Environmental Strategies: Mitigating Global Risks while Obtaining Local Benefits (Part 1)

Organizer: Luis P. Cifuentes, Universidad Catolica de Chile, Chile
Speakers: Arvai, J. (Ohio State University); Braga, A. (University of Sao Paulo); Conte-Grand, M. (Universidad del CEMA, Argentina); Chen, B. (Shanghai Medical University); Kumar, S. (Institute of Health Studies, Hyderabad, India); Sibold, K. (US Environmental Protection Agency)

Two of the more pressing environmental risks faced today by most countries of the world are air pollution and global climate change. In most instances these problems are analyzed and managed separately, even though they both derive from the same cause, fossil energy consumption. While local air pollution is recognized as a serious environmental risk in many developing countries, climate change is viewed as a developed world problem. Recent research has shown that technologies and policies that reduce greenhouse gas (GHG) emissions can also improve local air quality and consequently have positive impacts on public health, while offering long-term benefits for climate change mitigation, in both developed and non-industrialized nations.

The objectives are to: a) facilitate the exchange of state-of-the-art risk assessment methods used to conduct public health impact assessments, b) improve collaboration and communication among researchers from different countries and disciplines, c) identify key issues, knowledge gaps, methodological shortcomings, and

Tuesday Mini-Symposia 2:00 - 3:30 pm (continued)

research needs, d) recommend activities and initiatives for research, collaboration, and communication.

This workshop will present integrated analyses conducted under the U.S. Environmental Protection Agency Integrated Environmental Strategies (IES) program in three countries: Argentina, Chile and Mexico. Results concerning local public health improvements will be presented, as well as methodological issues. A roundtable discussion will identify key issues, knowledge gaps, methodological shortcomings, and research needs including additional data or analyses needed.

Room: Tintoretto 1

T-MS.4 Risk Assessment in the Context of Trade Disputes; The Resolution of Science Based Trade Disputes (Part 1)

Organizer: Elizabeth Anderson, Sciences International, Inc.

Speakers: Anderson, E. (Sciences International, Inc.); Goldstein, B. (University of Pittsburgh); Harlow, S. (University of Michigan); Pauwelyn, J. (Secretariat, World Trade Organization, Geneva); Atik, J. (Professor Sayre MacNeil Fellow, Loyola Law School)

The World Trade Organization is committed to the use of risk assessment as agreed upon in the Sanitary and Phytosanitary measures (SPs) negotiated in the Uruguay Roundtable and enacted in 1994. The Uruguay Round requires that countries either adopt harmonized international standards or, if they choose to maintain stricter regulations, base these on a scientific justification based on risk assessment. Very similar statements have also been incorporated into the NAFTA agreements. Only a hand full of cases have thus far been tried by the dispute panels in Geneva, e.g., the salmon case, and beef hormones case. As adjudication of many environmental and health related trade disputes now falls under the authority of the World Trade Organization (WTO) and NAFTA, it becomes incumbent on the WTO And NAFTA to develop the capacity to understand and act within the context of scientific principles and systems of evidence. Likewise, the scientific community must develop the capacity to understand the emerging legal context of environmental and health-related trade disputes and provide scientific evidence that meets the legal requirements of international trade law. The harmonization of scientific and legal systems of evidence has progressed in specific legal areas, such as the arena of U.S. tort law, however, the harmonization of these systems of evidence within the context of international trade law is in a nascent stage. Various legal scholars have presented concerns about the current process of incorporating scientific evidence within the dispute settlement process. The aim of this symposium is to promote dialogue among parties responsible for evaluating scientific evidence in such disputes, legal scholars and leading scientists in the field of risk assessment. The goal of the symposium will be to identify critical issues of misunderstanding between the two fields as well as areas where further scholarly research, regulatory risk management and training may be required.

Room: Tintoretto 2

T-MS.5 Adaptation as an Approach for Managing Climate Risk (Part 1)

Organizer: Anand Patwardhan, Indian Institute of Technology, India
Speakers: Huq, S. (IIED, United Kingdom); Tongia, R. (CMU); Leary, N. (AIACC / START); O'D. Trotz, Ulric (CPACC, Barbados); Chen, B. (CIESIN), Arvai, J. (Ohio State University), Wiesner Steiner, A. (University of Bremen)

Adaptation to climate change is emerging as one of the central issues in negotiations concerning climate change and in climate policy formulation. In many cases, adaptation includes the management of climate variability and extreme weather events such as heat and cold waves, floods and tropical cyclones. This issue lies at the intersection of several distinct policy communities, including, for example, the natural hazards and regional development communities and the insurance sector, as well as a number of scientific disciplines, including meteorology, hydrology, risk analysis and decision theory. This minisymposium will explore: the role of climate change in altering exposure to weather-related hazards; the applicability of risk management approaches, instruments and institutions for managing climate risk; and the synergies with sustainable development strategies. The minisymposium will have a developing country focus, and will seek to highlight the particular institutional, social and technological barriers that might limit the application of risk management approaches and strategies in developing countries.

Room: Willumsen

T-MS.6 Guiding Risk Communication: The EMF Case

Organizer: Peter Wiedemann, Research Center Juelich, Germany
Speakers: Wiedemann, P.M., Thalmann, A.T. (Research Center Germany); Niewoehner, J., Gerrard, S. (University of East Anglia - School of Environmental Sciences); Duerrenberger, G. (Swiss Federal Institute of Technology - ETH)

Understanding and effective implementation of risk communication (RC) must be guided by the realization that more than just risk numbers are communicated.

The analysis of the extensively discussed issue of possible health risks of high frequency electromagnetic fields (HF EMF) of mobile telecommunications, shows the RC discussion not only centers around the legitimate scientific debate, but also draws upon the conflicting or diverging information frames, the underlying mental models, and the way that information is presented.

A number of international and national expert risk reports on HF EMF agree that there is no scientific proof for health risks below the well-known exposure limit values for thermal effects, but there is disagreement whether sufficient evidence for other effects exists to justify precautionary measures.

Such expert disagreements foster public debates and are a serious problem for RC, suggesting that scientific knowledge about HF EMF is poor and risk assessments may not be valid. Thus, it is important to understand how these expert disagreements come

Tuesday Mini-Symposia 2:00 - 3:30 pm (continued)

about. Research using a scientific dialogue among experts aimed to make transparent what consensus and what dissent exists and why.

RC directed at laypersons also faces a diverging underlying mental model as that of experts, and issues of trust, fairness and consideration particularly in planning matters, institutional handling and risk/benefit trade-offs are highly relevant to the public.

How to effectively communicate different strengths of evidence and to assess the efficiency of communicative effectiveness of various communication strategies is also important. In experimental studies, the impact of information frames on laypersons' risk appraisals were examined.

Communication designs need to consider public understanding holistically and fulfill specific requirements when presenting the information, whether it be in written or multimedia form. Only when RC accounts for "perception factors" can responses be understood and RC designed more effectively.

Room: Rembrandt

T-MS.7 Work-Induced Risks and Their Effects on Health, Environment and Economic Viability

Organizer: Ortwin Renn, Center of Technology Assessment, Germany

Speakers: Bischof, H.J. (German Occupational Health Insurance); Raddant, U. (Karlsruhe University); Renn, O. (Center of TA); Rantanen, E. (Occupation Health Finland)

The session is organized by the section: Machine and Systems Safety within ISSA (International Social Security Association). It will address the new challenges of occupational risk management on an international scale and describe new management systems for coping with future challenges. The session will particularly address new occupational risks that interact with economic, social, political and psychological factors, both at the domestic and the international level. These new interrelated risk fields require new approaches for assessment and management. They necessitate integrative tools that go beyond the usual agent-consequence analysis but focus on interdependencies and spill-overs between risk clusters. These new risks also face specific problems with respect to public perception, workers' satisfaction and risk governance structures. They are often driven by crisis and immediate—often non-reflected—management actions determined by public pressure. The emphasis of the session will be on the following questions: How can risk analysts investigate, locate and verify new occupational risks that may have a negative impact on the health of workers? What type of information is needed to cope with these new risks? What are the internal and external sources to enhance workers' capacity and performance as a means to facilitate adaptation processes? How can we avoid stress and strain effects? How can we apply the precautionary principle in occupational risk management?

Room: Permeke

T-MS.8 Environmental Risk Transition Profiles in Asia Reconsideration from Global Environmental Risk Aspect

Organizer: Michinori Kabuto, National Institute for Environmental Studies, Japan

Speakers: Jin, Y. (China CDC); Kabuto, M. (Japan NIES); Peralta, G. (University of Philippines); Honda, Y. (University of Tsukuba)

There are various combinations of local environmental risks and controls among areas or countries at different developmental stages, in different climates as well as with different health risks in general in Asia. Those differences may in turn cause a difficulty of risk communications necessary for risk managements especially regarding cross-boundary risk issues including global warming, transports of environmental pollutions and wastes, chemical contamination of imported food etc. For promoting risk communications, a more comprehensive measure of environmental risks for covering both local and global environmental risks such as those for "global environmental risk" proposed by Kaspersen and Kaspersen seems necessary as a tool to explain the mutual relationships between each of those various risks at the global level.

In the mini-symposium, after an introduction by Dr. Michinori Kabuto, Dr. Jin Yinlong will describe major environmental issues and their EHIA and managements in China. Then, Dr. Jeff Spickett will make a summary report of findings by his EHIA works in Philippines, China, PNG, Mongolia, Malaysia and Fiji, which may provide a cross-table to show types of risk issues by area or country. Dr. Michinori Kabuto will introduce the results of questionnaire study on environmental risk perception among the people in 5 cities in China and 3 cities in Indonesia, indicating the possible modifying effects of education level on the perception. Finally, Dr. Yasushi Honda will show environmental risk situations in Japan in association with mortality trends and mortality risk of heat waves among age people during summer as one of the health risk associated with global warming.

In the discussion, a strategic approach to raise risk perception and promote managements in relation to major environmental risks will be summarized with considering the local situations.

Room: Mezzo

T-MS.9 Fiber Risk - A Unified Approach (Part 1)

Organizer: Jay Turim, Sciences International, Inc.

Speakers: Turim, J. (Sciences International, Inc.); Moore, M. (The Morgan Crucible Company plc); Brown, R. (Toxicology Services); Meyer, A. (Pillsbury Winthrop LLP); Moolgavkar, S. (University of Washington); Burley, C. (Chairman to ECFIA)

Asbestos, once hailed as the Magic Mineral, has been since recognized to be a highly dangerous substance. Since what is called asbestos consists of different minerals from two classes of silicate with substantially different properties, it is now believed that it is the fibrous nature of the substance, not its chemical properties, that principally accounts for its dangers. For this reason alone, regulators in the U. S. and overseas as well as the general public have demanded that man-made fibers meet the highest standards of

Tuesday Mini-Symposia 2:00 - 3:30 pm (continued)

safety before being introduced into commerce This symposium deals with the role risk assessment has played in informing stakeholders about the potential hazards arising from the manufacture and use of synthetic fibers. After briefly reviewing the asbestos situation, we will first describe how the material properties of synthetic fibers are different from those of asbestos. We will then review the epidemiological and toxicological data that has been collected. A novel method that has wide application to many different fibers, using biologically-based extrapolation models to estimate human risk will be described. The symposium will continue with an exploration of how fiber risk is viewed by American and European regulators, with emphasis on their perspectives of the Precautionary Principle. Industry attempts to deal with potential risk, such as the introduction of product stewardship programs that foster research and limit exposures, will be discussed. The liability issues posed in the U.S. and Europe will be described as well as attempts to harmonize the different regulatory systems. In conclusion, we will sum up of the successes and failures associated with the well-founded attempt by regulators to understand and control risk. This symposium should be of interest to anyone with an interest in learning more about how the art of risk assessment intersects with the real world of decision-making.

Room: Tempo

T-MS.10 Spatially Explicit Risk Assessment: Blending Landscape Ecology with the Ecological Risk Process

Organizer: Igor Linkov, ICF Consulting

Speakers: Kapustka, L. (ecological planning and toxicology); Moraes, R. (Chalmers University, Brazil); Kiker, G (U.S. Army Engineer Research & Development Center); Grebenkov, A. (Institute of Power Engineering, Belarus)

This Symposium developed by the SRA Ecological RA Specialty Group and SETAC Ecological RA Advisory Group builds upon a growing recognition that risk assessments must contain greater relevance to ecological interactions. Spatial relationships are among the most dynamic features of ecological systems. Spatial relationships are among the most dynamic features of ecological systems. This symposium will explore approaches to incorporate meaningful ecological relationships into the basic risk assessments conducted at sites and across regional landscapes. In particular, the areas of exploration would emphasize concurrent consideration of biological, chemical, and physical agents vis-à-vis exposure and effects on target species, guilds, communities, and systems. Emphasis would be on techniques (both qualitative and quantitative; "absolute" and "relative" risk assessment), which concurrently consider biological, chemical, and physical agents. The key focus of the presentations will be on methods to incorporate ecological information critical to defining the quality of wildlife habitat into the basic structure of ecological risk assessment. The session will bring together scientists working in ecological sciences, environmental protection, and conservation who are working to develop, apply and test methods that quantify and predict risks to a variety of wildlife species subject to differing, co-occurring stressors.

3:30 - 4:00 pm

Poster Session/Coffee Break

Ballroom Foyer

Tuesday Mini Symposia 4:00 - 5:30 pm

Room: Holbein

T-MS.11 Problems of Precautionary Governance

Organizer: Adam Burgess, University of Bath, United Kingdom

Speakers: Burgess, A. (University of Bath, United Kingdom); Furedi, F. (University of Kent); Brown, T. (Sense About Science); Durodie, B. (Kings College, London); Gillott, J. (Genetic Interest Group)

The precautionary principle now informs policy and decision making in a number of different fields. A precautionary approach is becoming routinised independently of the particularities of individual risks. The institutionalisation of precaution is advancing particularly rapidly in the UK. A significant recent example was the creation of the Independent Expert Group on Mobile Phones by the UK government in 2000. Unsurprisingly given the precautionary ethos informing the groups creation, its conclusions were similarly precautionary, particularly with regard to childrens usage. This was despite the acknowledgement that there was no evidence to suggest that human harm could be caused by the electromagnetic radiation emitted by cellular phones and their transmitters. Precautionary decision

making is frequently prompted by media-driven demands for absolute safety, but appears to now also have acquired an independent dynamic. Elements of a new form of precautionary governance have emerged in many fields, but particularly those related to science, consumption and the environment. Little critical energy has focused upon examining this development. The literature on precaution in general is both very limited and lacks critical distance from its subject matter. Potentially problematic longer-term consequences of expedient, short-term decision making guided by precaution have rarely been considered. Professor Frank Furedi will outline a theoretical approach to understanding the institutionalisation of precaution focusing on what he terms a crisis of elite authority. The remainder of the symposia will examine the particular case studies of cell phones (Adam Burgess); European chemical regulation (Bill Durodie); British scientific institutions (Tracey Brown); genetic science(John Gillott); and the Venetian flood barrier (Dominic Standish).

Tuesday Mini-Symposia 4:00 - 5:30 pm (continued)

Room: Watteau 1

T-MS.12 The Management of Uncertainty in Risk Science and Policy (Part 2)

See T-MS.2 for abstract and speakers.

Room: Watteau 2

T-MS.13 Integrated Environmental Strategies: Mitigating Global Risks while Obtaining Local Benefits (Part 2)

See T-MS.3 for abstract and speakers.

Room: Tintoretto 1

T-MS.14 Risk Assessment in the Context of Trade Disputes; The Resolution of Science Based Trade Disputes (Part 2)

See T-MS.4 for abstract and speakers.

Room: Tintoretto 2

T-MS.15 Adaptation as an Approach for Managing Climate Risk (Part 2)

See T-MS.5 for abstract and speakers.

Room: Rembrandt

T-MS.17 Early Risk Detection I. Weak Signal Detection + Early Risk Detection II. Implementation Challenges

Organizer: Martin Clauberg, Research Center Juelich, Germany
Speakers: Clauberg, M. (Research Center, Germany); Gee, D. (European Environment Agency); van Notten, P. (International Centre for Integrative Studies); Grutsch, M. (Research Center, Germany); Cleemann, L. (Allianz Zentrum für Technik GmbH)

Early risk detection is a conceptual approach to detect, or recognize, upcoming or emerging risks. It provides timely recognition, characterization, and, if feasible, quantification of emerging risks. Thus, risk management can react swiftly and appropriately and address the most important risk topics in a persistent and prospective manner.

Early risk detection integrates ideas from retro- and prospective risk management evaluations, precautionary principle, systems performance, and organizational culture concepts.

Analyses and knowledge of the successes and failures of early recognition or early warnings was undertaken in a major study by the European Environment Agency. In Germany, the action programme "Environment and Health", focussed on methods requirements and identified three different risk contexts or types. Different approaches for different risk types are identified in a methods catalog useful for creating tailored method trains. Results point to a feasible framework for differentiating risk types, methods, tools, and organizational processes.

The need for scientifically proven data and knowledge must be balanced with the need to detect signals early and as something more than just background noise. Concepts of evidence weigh(t)ing and structurally balanced implementation of the precautionary principle play a major role.

Historically, detection of changing societal developments, exploration of seeds of change and signals of their development are relatively uncharted territory. Systems performance for signal detection is not only intrinsically and objectively linked to the system architecture, but also to intersubjective socio-cultural and psychological factors. Thus, scrutinization of the public perception is of major significance, especially regarding technological innovations. Implementation requires the proper organizational setting, i.e. organizational culture. The organization itself can act as a subjective entity and the organizational culture must account for socio-cultural and psychological factors, thus enabling motivation for improvement from the inside. Challenges remain for surprises, discontinuities, wild cards, and weak signals.

Room: Permeke

T-MS.18 Managing Natural Hazards. The Role of Insurance and Liability

Organizer: Ortwin Renn, Center of Technology Assessment, Germany

Speakers: Schäfer, R. (SV-Insurance Company); Linnerooth-Bayer, J. (IIASA); Renn, O. (Center of Technology Assessment, Germany)

At the end of the nineties the field of hazard assessment and management needs some new impulses for handling the risks of human existence within the natural or semi-natural environment. What are the circumstances under which humans will live in the future? Based on the recent trends of increased losses due to natural hazards and inadequate human responses to cope with them, the potential of natural disaster as well as the vulnerability of social systems appear to get worse. Insurance and liability can play a major role in three regimes of risk management: risk-based; uncertainty-based and vulnerability-based management regimes. The classic risk management regime uses insurance as a pool for an equal distribution of opportunities and risks for a large group of insured objects or subjects. In the case of uncertainty management insurance can play a role in providing incentives for gaining more knowledge and spreading relevant knowledge to all actors involved. In the case of the vulnerability management, insurances can play a facilitator for risk management integration and combinations of economic development and loss prevention. One of the crucial issues is the question of how much can be left to the market and what needs to be regulated by governments. More and more analysts acknowledge the need for a private-public partnership in dealing with natural hazards. These partnerships rely on the incentives of the market system by providing insurance and by regulatory frameworks that make free rider positions (moral hazards) and equity problems less likely to occur. The mini-symposium will address these challenge and discuss the repercussion of natural hazards management for insurance and liability.

Tuesday Mini-Symposia 4:00 - 5:30 pm (continued)

Room: Mezzo

T-MS.19 Fiber Risk - A Unified Approach (Part 2)

See T-MS.9 for abstract and speakers.

Room: Tempo

T-MS.20 Case Studies in Risk and Governance

Chair: Lori Geckle, U.S. Center for Health Promotion and Preventive Medicine

Speakers: Geckle, L., (U.S. Center for Health Promotion and Preventive Medicine); Invarson, J. (Sweden), Walls, J. (University of East Anglia, United Kingdom), Zivic, P. (Scienton)

Risk communication concepts and practices continue to evolve in the face of world changes. While risk communication has generally been defined as a method for identifying and addressing stakeholder concerns, efforts within the United States have typically amounted to "educating and informing" stakeholders.

Today, one-way communication methods employed at the conclusion of a project are being replaced with an earlier, more inclusive approach. The U.S. military in particular is learning that risk communication is a strategic planning process to identify and establish partnerships to jointly address risk concepts more effectively.

Over the past several years, the U.S. military has begun to adopt and apply basic risk communication principles. Training is now included in military leadership schools and other military courses, and alliances with universities known for risk communication research have been developed.

At the same time, the U.S. military continues to face unique risk communication challenges requiring a delicate balance between the need for citizens to be informed and involved, and the need to protect national security. In the war on terrorism, effective risk communication processes are crucial to alleviating anxieties of service members being placed in stressful environments in the service of their country. On the Homeland Security front, battling bioterrorism must be a collaborative effort through improved risk communication processes, public information dissemination, and disease surveillance. In essence, an effective risk communication process helps avoid mass public hysteria, while focusing on the immediate response actions to those most directly affected.

In light of U.S. events since September 2001, it is even more crucial for the military to build and maintain the strategic partnerships necessary to collaboratively face these challenges as a cohesive, world-wide force. This session will explore some of the steps the U.S. military is taking to meet these risk communication challenges.

• Methods for Risk and Vulnerability Analysis

Johan Invarson (Sweden)

In this report, methods for risk and vulnerability analysis of process industri and transport of dangerous goods are examined. Fault Tree Analysis, Event Tree Analysis, and QRA can, along with Anticipatory Failure Determination, Hierarchical Holographic Modelling, and System Action Management, be used as methods for risk

and vulnerability analysis of technical infrastructure. For risk and vulnerability analysis of transports, new methods have to be invented. It is a serious problem that there are no satisfactory methods for risk analysis of transport of hazardous materials. The methods that must be invented could for example be based on quantitative approaches such as the concept of Hot spots.

• A Critical Examination of the New Governance of Risk: Environmental Regulation in the United Kingdom

John Walls (University of East Anglia, United Kingdom), T. Horlick-Jones, T O'Riordan

The shift from government to governance in the regulation of environmental risk is often portrayed as an attempt to reach a consensus on controversies over risks and to ward off future risk management failures. Stakeholder involvement in decision making is seen as increasingly necessary in order to correct the steering deficit of the state, to rebuild trust in state institutions, and to obviate problems caused by uncertainty in risk assessments over new technological developments. In this paper we scrutinise this model in the light of recent developments in the United Kingdom, focussing in particular on the regulation of genetically modified crops, and mobile telephones. We conclude that the shift to governance is best understood in terms of the response of the state to the changing role of markets, and to government more generally. In particular, we caution against romantic interpretations of governance as indicating a uniform popular trend towards the democratisation of state decision-making, despite the very real opportunities for reform that it affords. We suggest a more plausible account is provided by seeing governance as a form of governing necessitated by a series of interlocking economic and social changes, and responses to successive risk management crises. In the same manner as within the private sector, where a pre-occupation with the management of risk has become a central concern of corporate governance, governments, like corporations, are only too aware of the potency of 'reputation risk' associated with high profile environmental crises. Similarly, corporations and governments alike recognise the value of positive lay perceptions as strategic assets; as a means of 'rebuilding trust', in what is seen as a capricious age of unstable consumer behaviour. We conclude by sketching a new model in which the state achieves 'meta governance' of environmental risks by the establishment of new institutional forms and an expanded policy community. This development may be seen as a contingent outcome of the interaction of a number of contemporary features of British political economy and society.

• Information Risk Modelling Using Information Security Model

Predrag Zivic (Scienton)

After the security issues were mostly solved on the mainframe platform, distributed computing added enormous amount of new security challenges and standards such as BS7799/ISO17799/ISO21827 (SSE-CMM). The information technology professionals could not come up with a single approach to define information security space.

Tuesday Mini-Symposia 4:00 - 5:30 pm (continued)

This session will present the risk modeling using the Information Security Model™ that will enable information security professionals to create objective, standardized, quantifiable, efficient and repeatable risk assessment; Therefore enabling the development of the defensive and responsive management system and business tailored security strategy. A key goal is to augment complex risk and security condundrum with real life infrastructure security models and measures using simple, understandable, and straightforward Information Security Model™. This new information security and risk model combines, streamlines and visualizes an integration of BS7799/ISO17799, CobiT(R) and SSE-CMM standards with real life information infrastructure to provide security professionals with ability to properly protect the complete info-space.

The presented risk assessment approach using the Information Security Model(TM) maps business and information technology creating proper approach to information governance in support of corporate governance.

Wednesday, 25 June

Plenary Session – 8:30 - 10:00 am

Salles des Nations Ballroom

Sustainable Development with Acceptable Risks

Sub-theme Leader: Gail Charnley, HealthRisk Strategies

Governance and Capacity Development for Risk Management in Developing Countries

Omar Bakhet (United Nations Development Program)

Risk as a Model for Sustainability

Peter Wiedemann (Forschungszentrum Julich)

The Sociopolitics of Risk: Challenges to Sustainable Development

Paul Slovic (Decision Research),

10:00 - 10:30 am

Poster Session/Coffee Break

Ballroom Foyer

Breakout Sessions – 10:30 am - Noon

Room: Watteau

A. Public Health Priorities

Scott Ratzan (Johnson & Johnson)

Speakers: *Jamal Hashim (Universiti Kabangsan, Malaysia), Zailina Hashim (Universiti Putra Malaysia), Junko Matsubara (Nuclear Safety Commission, Japan), Carlos Santos-Burgoa (Director General de Salud Ambiental, SSA)*

Health and development are intimately interconnected. Both insufficient and inappropriate development can create threats to public health through poverty, over-consumption, and misplaced risk reduction priorities. The effective linkage of health, socio-economic improvement, and decision-making is one key to sustainability that we hope risk analysis can help support. Experience has shown, however, that introducing risk analysis as a decision-making tool in the context of public health and development generates risk communication challenges. The goal of this session will be to develop recommendations with regard to how the tools of risk analysis can help characterize threats to public health that accompany globalization and development and help set public health priorities so that our efforts to achieve sustainability will be most effective.

Room: Tintoretto

B. Globalization and Cultural Integrity

Steve Rayner (University of Oxford & ESRC Science in Society Programme)

Speakers: *Roger Kasperson (Stockholm Environmental Institute), Joanne Linnerooth-Bayer (International Institute for Applied Systems Analysis), Tommy Tranvik (Rokkan Institute, University of Bergen)*

Globalization creates environmental, cultural, and social costs and benefits. It has been imbued by some with the power to improve livelihoods; while others express concern that it poses serious threats to cultural identities and institutions. This session will examine the nature of globalization and its, sometimes counter-intuitive, effects on the integrity of local, place-based cultures. Speakers will frame issues for discussion in the contexts of international commercializa-

tion of GM crops, regional climate change impacts, the self-determination of indigenous peoples, and trans-boundary trade in hazardous waste.

Room: Rembrandt/Permeke

C. Sustainable Resources

Charles Berger (Cleary, Gottlieb, Steen and Hamilton)

Speaker: *Charles Berger (Cleary, Gottlieb, Steen and Hamilton), Boshra Salem (University of Alexandria)*

One of the most significant impacts of human development is on natural resource production, distribution, and use. Economic growth and social development depend on resource use. As an important example, to meet the needs of a growing world population, global energy consumption continues to increase substantially. Access to safe drinking water is another ubiquitous concern, with sustainable freshwater a growing need. This session will address core sustainability challenges such as meeting the growing demand for natural resource supplies and uses while mitigating concomitant risks to health and the environment. The goal of the session will be to explore the role that risk analysis can play in assessing and managing risks from expanding natural resource demands in both the developing and developed worlds.

Room: Alto/Mezzo/Tempo

D. Protecting Biodiversity

Hamdallah Zedan (Convention on Biological Diversity)

Speaker: *Steven Clemants (Brooklyn Botanical Garden)*

The variety and variability of genes, species, populations, and ecosystems provide the foundation for the earth's essential goods and services. The current decline in biodiversity is largely the result of human activity and represents a serious threat to human development. Potential risks to the sustainability of ecological integrity include (but are not limited to) dense urbanization and infrastructure, intensive agriculture and fisheries, invasive alien species, chemical use and manufacture, and climate change. This session will evaluate the role that risk analysis can play in characterizing and mitigating threats to biodiversity.

Luncheon 12:15 - 2:10 pm

Risk and Sustainable Development

Salles des Nations Ballroom

1:15 pm - Welcome Speaker

Michael D. Rogers, European Commission, International Vice-Chair of the SRA Risk Science & Law Specialty Group (RS&L SG)

1:20 pm - Introduction

Jonathan Wiener, Duke University, SRA Councilor and RS&L SG Executive Committee

1:25 pm - Keynote Address

Commissioner Rolf Annerberg, Head of Cabinet, Commissioner Wallström,

2:10 pm - Adjourn

Wednesday Mini Symposia 2:15 - 3:45 pm

Room: Holbein

W-MS.1 Risk communication and public policy

Organizer: Ragnar Löfstedt, King's College London

Speakers: R.E. Löfstedt (King's College London); W. Verbeke (Ghent University, Belgium); J.R. Eiser, M.P. White (University of Sheffield, United Kingdom); S. Ratzan (Johnson & Johnson); M. Knowles (Coca-Cola European Public Affairs)

Over the past ten years Europe has been affected by a series of scandals and controversies ranging from the MMR vaccine in the UK, to dioxin in Belgian chicken feed, to Mad Cow disease. These controversies and others like it have led a majority of Europeans to be mistrustful of regulators (be they on the national or on the EU level), industry as well as policy makers. Because of this increase in public distrust of authorities, amplified in many cases by the mass media, the public in Europe is becoming more risk adverse. This public risk adverseness, in turn, increases the likelihood of an alarm or scare developing. These alarms cause difficulties for the authorities in question to address from a risk and or science communication perspective as they are not trusted. In this session, we examine and evaluate from a communication perspective several such scares that have taken place in Europe over recent years. Among the cases we look at (and evaluate) include the Belgian Coca-Cola scare as well as the Swedish acrylamide alarm. In conclusion, each of the presenters offer some insights with regard how future scares can be better communicated in an era of acute public distrust.

Room: Watteau 1

W-MS.2 New Insights of Risk Perception Research: The Role of Trust and Credibility

Organizer: Michael Zwick, University of Stuttgart, Germany

Speakers: Zwick, M. (University of Stuttgart); Pidgeon, N. (University of East Anglia); Sjöberg, L. (Stockholm School of Economics); Slovic, P. (Decision Research), Poortinga, W. (University of East Anglia), Renn, O. (Center of Technology Assessment, Germany)

Advances in science and technology have accelerated the speed of technological change and extended the scope and magnitude of human interventions into nature and everyday life. These processes require major societal efforts to assess, control, mitigate or avoid adverse consequences to contemporary and future human life.

However, it does not seem to be sufficient for responsible risk policy, to rely on the magnitude of expected losses. First, because dissensions of experts determining risks occur. Second, because innovative deployments may lead to unexpected side effects that point to the limits of traditional knowledge. Essentially, the understanding of what are desired or undesired outcomes, is linked to one's standpoint: the notion of risk, their assessment and acceptability are based on social preferences. Therefore, to ask the question to the social conditions of risk perception, valuation and acceptance is anything else than trivial.

Decades of research have created insights in basic concepts explaining risk perception. However, consensus on what risk valuation and acceptance depends on, is still missing. Potential determinants are ›psychometric‹ risk characteristics like catastrophe potential, dread, controllability or voluntariness of risk taking. Under certain circumstances, risks may appear exceedingly hazardous; this can evoke a stigmatization and the subsequent avoidance of places, products or technologies. The degree of trust in institutions, occupied with risk regulation and control may influence risk acceptance as well. Human preferences refer to value orientations: in

Wednesday Mini-Symposia 2:15 - 3:45 pm (continued)

which the ones expect benefits, the others fear detriments. Finally, socio-demographic characteristics like age, sex, the affiliation to occupational or confessional groups may influence risk perception, valuation and the willingness to tolerate risks.

On the basis of recent empirical studies the explanation power of different theoretical concepts explaining the public's risk acceptance, is analyzed and discussed. Our mini symposia offers the chance to discuss the meaning of the insights for future risk communication and risk policy.

Room: Watteau 2

W-MS.3 A New Perspective of Flood Disaster Management: Asia Monsoon World and Resilient Society (Part 1)

Organizer: Saburo Ikeda, Nat. Res. Inst. for Earth Science and Disaster Prevention (NIED), Japan

Speakers: Fukuzono, T. (National Research Institute for Earth Science and Disaster Prevention - NIED); Sato, T. (National Research Institute for Earth Science and Disaster Prevention - NIED); Shi, P. (Institute of Resource Sciences, Beijing Normal University); Watanabe, M. (Visiting Researcher, Kyoto University); Guha-Sapir, D. (University of Louvain School of Public Health); Sukhapunphan, T. (Director Hydrology and Water Management Center for Upper Northern Region, Thailand); Seo, K. (Aoyama Gakuin, Japan)

In the latter half of the 20th century, we have had global urbanization. Especially, in Japan we had rapid urbanization from 1950's to 1970s and flood plains near metropolises were developed into residential areas. And now the population explosion in Asian countries has forced people into flood prone areas. These have raised damage potential of a flood, that is likely to be aggravated by changes in the social structure, including the aging of society, intensive and complex utilization of urban resources (land, below-ground structures, public services, water and sewerage networks, and so on). Furthermore, it is expected that the climate change would cause the increase of the number of the events and the frequency of heavy rainfall, which are triggers of floods.

Due to steadily increasing public investment to hard measures such as dikes, dams, drainage facilities, etc., in major rivers, a number of catastrophic flooding have been drastically diminished in Japan. However, if a dyke-break once happened huge damage would be brought about. On the other hand, lasting flood free situation and the increase of urban population weakened communities with flood-preventive wisdom and abilities. The challenge now is how to confront the rapidly growing risk of catastrophic losses by introducing the soft policy measures, including participation of local populations in disaster management. In this session community-based and resident-based disaster risk management strategies: specifically, participatory decision-making by local populations in the design and planning of flood risk management strategies, particularly with respect to soft policy measures will be discussed.

Room: Tintoretto 1

W-MS.4 Can Genetically Modified Crops Promote Sustainable Agriculture in the Developing World? (Part 1)

Organizer: Felicia Wu, RAND

Speakers: Löfstedt, R.E. (King's College London); Schimmelpennig, D. (US Department of Agriculture); Wu, F. (RAND); Goldstein, B.D. (University of Pittsburgh); Rogers, M.D. (European Commission)

Many scientists view genetically modified (GM) crops as a means to achieve sustainable agriculture worldwide. Theoretically, biotechnology can create crops that will solve virtually any natural agricultural problem, from tomatoes that can grow in salty soil to virus-resistant sweet potatoes to rice that produces beta-carotene. However, the technology faces an uncertain future because of concerns about potential risks. The recent food crisis in Zambia provides food for thought on this issue: though 14 million Zambians were at risk of starvation, their government officials rejected tonnes of corn donated by the United States (US) because it was not guaranteed to be GM-free. What risks did they fear in this case? The answers could be complex, ranging from cultural issues to environmental and health concerns to fears of losing their export markets, particularly to the European Union (EU). These concerns may explain the precautionary attitude a number of other African and Asian nations are now adopting toward agricultural biotechnology. This symposium attempts to step beyond the science of GM crops, to examine the political, social, and cultural issues involved in acceptance of GM crops worldwide. A full suite of benefits and risks are discussed, touching on food production and nutrition, economic and market risks, and cultural concerns. Regulatory issues, including the Precautionary Principle in national decision-making and the reversal of burden of proof, are explored. Finally it is important to consider the differences between US and EU regulations on GM crops, and their impact on the developing world. This symposium will attempt to shed light on whether genetically modified crops can truly contribute to sustainable agriculture in the developing world.

Room: Tintoretto 2

W-MS.5 Partnership for Strengthening Science-Based Decision-Making in Developing Countries

Organizer: Jim Solyst, American Chemistry Council

Speakers: Solyst, J. (American Chemistry Council); Johnson, T. (National Academies of Science); Hecht, A. (US Council on Environmental Quality)

The World Summit on Sustainability Development (WSSD) resulted in governments agreeing to and reaffirming a wide range of concrete commitments and targets for action to achieve more effective implementation of sustainable development objectives. One of the key objectives was "Improve policy and decision-making at all levels through...improved collaboration...between scientists and policymakers..." The WSSD Report urged governments to "Make greater use of integrated scientific assessments, risk assessments and interdisciplinary and intersectoral approaches." Governments were urged to "Establish partnerships between scientific, public and private institutions, including by integrating the advice of scientists into decision-making bodies to ensure a greater role for science, technology development and engineering sectors..."

Wednesday Mini-Symposia 2:15 - 3:45 pm (continued)

The concept of partnerships was strongly promoted by the Summit and the Plan of Implementation report. Over 220 partnerships were identified in advance of the Summit and approximately 60 partnerships were announced during the Summit by a variety of countries. One of the new partnerships announced in Johannesburg was an effort to promote better utilization of scientific knowledge in policy and program decisions and better incorporation of the needs of decision-makers into research priorities. This partnership will involve the U.S. National Academies, the Third World Academy of Sciences, the InterAcademy Panel, the U.S. Environmental Protection Agency, the American Chemistry Council, the National Council for Science and the Environment, and the H. John Heinz Center for Science, Economics, and the Environment, and other interested parties. To ensure that the partnership products are science-based, solutions oriented, and international, the partners, through the U.S. National Academies, will collaborate with other national and regional scientific academies.

The partnership will support a series of “science in decision-making workshops” in developing countries. Specific topics and locations are being determined, and the intent is to address key issues featured at WSSD.

Room: Willumsen

W-MS.6 A New Initiative: IRGC (International Risk Governance Council)

Organizer and Speaker: Wolfgang Kröger, LSA-ETHZ, Switzerland

Reasons: Development of new technologies and the associated risks, efficiency and burden sharing of such risks, the society acceptability of risks, and stakeholders involvement in the current decision making processes, at large, require fresh new approaches. There is a need for a new kind of approach in order to adopt, accept, and manage new risks and introduce relevant / advanced governance procedures. IRGC, as a body of excellence in risk governance is taking the daunting task to connect, from an international experience, various problem fields and cross-cutting issues in the newly promoted concept of risk governance.

This mini-symposium is aiming at introducing and promoting new ways and solutions to deal with emerging systemic risks in a world of dynamic technological changes, evolutionary implications of stakeholders in problems of worldwide relevance and importance, namely more safety and sense of security to mankind.

1. Risk Governance. A Topic for International Counseling, by W. Kröger, ETHZ, Switzerland
 - a. IRGC: problem statement, other organisations, mission
 - b. Organisation and management, legitimacy
 - c. Products
 - d. Potential impacts on national and international decision making processes
2. Priorities Fields in Risk Governance; Illustration of Potential Deliverables, by a representative of the South German Institute of Empirical Social Research, Munich, Germany
 - a. Taxonomy of risk
 - b. Critical Infrastructures

c. Genetic Engineering

d. On Governance Issues.

3. Panel Discussion: Expectations from different sectors and chances to fulfill IRGC mission; Representatives from Governments, International Organisations (OECD, WBCSD), private sector (EdF), etc.
 - a. Integrated solutions for risk governance - IRGC
 - b. Disseminated experience on risk governance

Room: Rembrandt

W-MS.7 Harmonization of Environmental Risk Assessment Methods

Organizer: Michael Dourson, TERA

Speakers: Bolger, M. (Food & Drug Administration); Faustman, E. (University of Washington); Meek, B. (Health Canada); Slob, W. (RIVM)

The purpose of this symposium is to discuss ongoing work in the harmonization of environmental risk assessment methods. The first two talks are devoted to technical issues associated with specific aspects of risk methods, such as the determination of the point of departure based on the critical effect, and the choice of appropriate uncertainty factors to use with this point of departure based on toxicokinetic or toxicodynamic data. The third talk summarizes evolving efforts to harmonize the assessment of risk from cancer and noncancer endpoints based on an understanding of mode of chemical action. This effort started in part with a workshop sponsored by the Society of Toxicology. The fourth talk describes the process of harmonization of methods with one of the world's oldest international risk bodies, the Joint FAO/WHO work group. Case studies will be used by speakers to illustrate the various risk assessment challenges.

Room: Permeke

W-MS.8 Support for Businesses Seeking Sustainable Practices (Part 1)

Organizer: Mitchell Small, Carnegie Mellon University

Speakers: Heller, M. (U.S. National Science Foundation); Griffiths, J. (Sustainable Forest Products Industry & Biodiversity, Switzerland); Hertwich, E.G. (Norwegian University of Science, Norway); Small, M.J. (Carnegie Mellon University); O'Connor, R. (U.S. National Science Foundation)

With growing pressure from governments, consumers, and shareholders, firms are now increasingly concerned about their environmental performance, especially in learning how to make their business practices more sustainable. This mini-symposium brings together business groups, researchers, and research sponsors that are developing new approaches to foster sustainable development and sustainable environmental practices for business. Their shared experiences lie in both creating models of sustainability and environmental performance tracking, as well as one-on-one case studies with firms. A more comprehensive and strategic approach to risk assessment and management, based on a new generation of analytical tools and management structures, is identified as a requirement for global businesses.

Wednesday Mini-Symposia 2:15 - 3:45 pm (continued)

Room: Mezzo

W-MS.9 Risk Perception and Communication, Key Concepts for Environmental Sustainability

Organizer: Javier Urbina-Soria, Universidad Nacional Autonoma de Mexico (UNAM), Mexico

Speakers: Urbina-Soria, J., Mercado-Domenech, S., Arjonilla-Cuenca, E. (National University of Mexico); Acuna-Rivera, M. (University of Surrey)

Environmental sustainability has as a core goal the modification of current life styles by means of education and social participation, at all levels. To achieve this, it is necessary to comprehend psychosocial factors that can account for human behaviour and decision making. Risk perception and communication are processes that are highly related with sustainability, since they promote environmental awareness and self-responsibility. Two studies carried out in Mexico City will be presented as part of this symposium, in order to demonstrate how psychosocial factors are crucial to understand peoples behaviour when they face or are about to face an environmental risk. Differences and similarities in risk perception between lay people and experts will be discussed. On the other hand, it will be argued that risk communication as a permanent process could enable people to behave in a more sustainable way before, during and after a risk occurs. But it also has to take into account not only government and experts point of view, but also peoples perception and ideas, to really make a difference. Thus, risk communication can help to make people more aware of the extent and nature of environmental hazards and risks, empowering them to act in co-operation with social, public, and private sectors. Risk perception and communication will be analysed under sustainability framework, emphasising their role in promoting sustainable life styles and more livable planet, considering actual and future needs. Three main topics will be discussed in this symposium: environmental risk perception, risk communication and psychosocial dimensions of environmental sustainability.

Room: Tempo

W-MS.10 Risk Management in Hospital: Lessons from Industry

Organizer: Nathalie de Marcellis-Warin, CIRANO, Canada

Speakers: de Marcellis-Warin, N., Dufour, G. (CIRANO); Gauthier-Gaillard, S. (Sorbonne University); Baumont, G. (IPSN & Environnt Minis)

In 1999, a highly publicized report from the Institute of Medicine (IOM) awakened public and professional interest in safety in health care in the United States. The IOM report suggested that out of the total number of admissions to US hospitals (approximately 33.6 million in 1997), the number of Americans who died because of preventable adverse events was between 44 000 and 98 000. The one comparable study from Australia produced even higher rates of death. We can imagine that the situation is very near in Canada and in most European countries. Adverse events in hospitals become a problem of public health all around the world. Its not acceptable for patients to be harmed by the same health care system that is supposed to offer healing and comfort. All governments try to develop strategies to ensure safe environment for patients. The sustainability of the health system depends also on the capacity to respond safely to the health needs. We are going to show in this symposium that health care systems could learn much about safety and risk-management from other industries. First, we will want to think on techniques useful in nuclear and aviation industries to identify and analyze risks and to show how these techniques can help to improve patient safety. Secondly, we will make an international comparison of iatrogenic risks reporting systems in North America and Europe (from a local register of accidents to a national database). Third, we will present the Recuperare model, a model developed in France by the Institute for Nuclear Safety and Protection (IPSN) to identify system deficiencies and to underline human, technical and organizational factors and we will present its adaptation to the Quebec health care system. A pilot study is in progress in Quebec hospitals which plan to implement this tool.

3:45 - 4:00 pm

Poster Session/Coffee Break

Ballroom Foyer

Wednesday Mini Symposia 4:00 - 5:30 pm

Room: Holbein

W-MS.11 Decision Analytic Approaches for Structuring Stakeholder Involvement

Organizer: Timothy McDaniels, School of Planning, University of British Columbia, Canada

Speakers: McDaniels, T.L. (University of British Columbia); Gregory, R.S. (Decision Research and UBC); Renn, O. (Center for Technology Assessment)

This mini-symposium draws on the collective experience, research findings and applied practice of three researchers who work extensively on involving stakeholders in risk management decisions through the concepts and applied practice of decision analysis.

This mini-symposium will address current practice and useful decision analytic tools for involving stakeholders in societal risk

management decisions. Several themes will be explored in the mini-symposium. One theme will be the evolution in the writing on decision analysis as a practical process, with greater emphasis on a good problem structure, and using the simplest possible kinds of comparison judgments to clarify tradeoffs and preferences among alternatives. A second, related theme is the need, when working with stakeholder advisory groups, to make the required judgments manageable for the participants, with reliance on simpler elicitation modes and multiple measures. A third theme is the potential many different modes of stakeholder interaction, ranging from citizen juries, to shorter, referendum-like questionnaires, to long term advisory groups, or others, all of which could be informed by decision analytic concepts. A fourth theme would be the role of learning over time, or adaptive management as a boon to fostering workable and informative stakeholder processes. To illustrate these themes, examples

Wednesday Mini-Symposia 4:00 - 5:30 pm (continued)

and experience from Europe, the United States and Canada will be discussed.

The three participants all approach stakeholder involvement and decision analysis from different but related disciplines and perspectives. Gregory is trained as an economist and psychologist, Renn as a sociologist and geographer, and McDaniels as a decision scientist and policy analyst. Note that each of the three participants is an author in the forthcoming SRA book on Risk Analysis and Society.

Room: Watteau 1

W-MS.12 Risk Assessment and Environmental Decision Making in Mediterranean Region (Poster Platform Session)

Organizer: Igor Linkov, ICF Consulting

Speakers: Levner, E. (Holon University, Israel); Emara, M. (Al-Azhar University, Egypt); Ganoulis, J. (Aristotle University, Greece); Hayek, B. (Royal Society, Jordan)

Middle East countries suffer from severe environmental problems. Remedial and abatement policies for areas contaminated by chemicals or physically disturbed by industrial development require management decisions which weigh the benefits of resource use and/or remediation against the risks and disruptions associated with their implementation. In particular, a framework is needed that: integrates risk assessment and engineering options; generates performance standards; compares options for risk reduction; communicates uncertainty; and effectively allows reiteration of the decision-making process. The goal of this session is to illustrate environmental conditions in the region and to stimulate discussion on applicability of risk assessment concepts and mechanics in helping decision-makers in Mediterranean countries to choose among various environmental policies.

The NATO Workshop on Comparative Risk Assessment (Italy, October 2002) has resulted in the formation of the Mediterranean Chapter of the Society for Risk Analysis. The founding members of the Chapter will be presenting their work as well as other risk-related project and problems in their home countries.

Tentative list of posters:

1. Jacques Ganoulis (Aristotle University, Greece): Risk-based floodplain management in the Mediterranean. A Case-study.
2. Jacques Ganoulis (Aristotle University, Greece): Risk assessment and management of coastal pollution. Case studies.
3. Mostafa M. Emara (AL-Azhar University, Egypt) Global and Local Problems And Environmental Security
4. Mostafa M. Emara (AL-Azhar University, Egypt) Environmental degradation: effects on soil and environmental health
5. Eugene Levner (Holon Academic Institute of Technology , Israel) A fast method for the detection of the pollution sources minimizing the risk to the population health
6. Eugene Levner (Holon Academic Institute of Technology , Israel). An extension of the Leighton-Shoemaker model for locating regional waste-water treatment systems minimizing the risk to the population health".

7. Abou Ramadan (Atomic Energy Authority, Egypt). Environmental Monitoring Systems and Risk Assessment in Egypt

8. Bassam Hayek (Royal Society, Jordan). Risk Assessment in Jordan

9. Alon Tal (Israel). Comparative Risk Assessment in Mediterranean Region

Room: Watteau 2

W-MS.13 A New Perspective of Flood Disaster Management: Asia Monsoon World and Resilient Society (Part 2)

See W-MS.3 for abstract and speakers.

Room: Tintoretto 1

W-MS.14 Can Genetically Modified Crops Promote Sustainable Agriculture in the Developing World? (Part 2)

See W-MS.4 for abstract and speakers.

Room: Tintoretto 2

W-MS.15 Legislation and Risk Management as Tools in Sustainability

Organizer: Joseph Huggard, The Weinberg Group Inc.

Speakers: Golob, L. (Health and Safety Executive, United Kingdom); Ballantine, B. (European Policy Centre); Huggard, J. (The Weinberg Group Inc.); Löfstedt, R.E. (King's College London)

Regulatory Impact Analysis Optimization of Risk Management in Sustainable Economies This symposium explores the development of legislation and regulation as risk management tools globally and describes approaches to the evaluation of the impact of each proposed legislative and regulatory risk management program on local economies. Governments develop legislation and regulation as risk management tools intended to assure the protection of the individual and the whole of society and to support the sustainability of cultures and of social institutions. These risk management tools are developed and applied differently in various cultures. In democratic societies seeking transparency, there is a demand for early exposure of the proposed legislation and regulation in order to assure appropriate and open review. Bruce Ballantine and his colleagues will describe the development of legislation and regulation as regulatory tools and the need for transparency to engender adequate debate to ensure adoption of the most appropriate approaches to risk management. Dr. Laurence Golob and his colleagues will discuss methods for the identification of those individuals and portions of society which could be affected by proposed regulation and legislation and characterize approaches to delineation of the concerns of those potentially affected to assure consideration and adoption of the most utile regulation or legislation. Joseph Huggard and his colleagues will describe applications of decision theory, outcomes and effectiveness research and motivational research to the development of methods for identification of the critical individuals or portions of society potentially affected, for the identification of the issues which are critical to these portions of society and to the potential development of unique models for each proposed regulation or legislation. The goal of the effort is to foster adoption of risk management programs tailored to sustainable societies.

Wednesday Mini-Symposia 4:00 - 5:30 pm (continued)

Room: Willumsen

W-MS.16 Harmonization of Risk Standards: Results of the German Risk Panel

Organizer: Ortwin Renn, Center of Technology Assessment, Germany

Speakers: Kappos, A. (Hamburg Ministry for Health); Kalberlah, F. (FOBIG Corporation); Wuthe, D. (State Public Health Center); Renn, O. (Center of TA)

One of the pressing problems in risk assessment and management is the lack of harmonization of assessment and management procedures as well as standards. In particular, risk management institutions and agencies have developed their own protocols and procedures for setting standards and regulating exposure. Often enough these attempts to manage risks lead to inconsistencies among similar or even identical threats in different environments (for example occupational versus public exposure) or to counter-intuitive results (such as regulating mineral water less rigorously than normal tap water). As a response to the challenges outlined above the German Government established an "Interministerial Expert Panel on Harmonization of Risk Standards" that started its work in 2000. The final report has been published in June of 2003. The session will introduce the mandate of the Panel and provide a first international presentation of the final results. The presentation is divided in four parts: Overview of the recommendation; Lessons for risk assessment, lessons for risk management and lessons for risk communication. What have been the major lessons learned from the German Risk Panel? The panel recommends a functional separation between risk assessment and risk management. It is convinced that public participation and involvement should be included from the beginning of the assessment process. With respect to risk management and communication, the panel believes that risk agencies need to integrate a broader perspective on risk. Such a perspective should include the natural, technical and social sciences. The expertise of these disciplines is particularly important for the screening of risks before regulatory action is taken. The panel recommends the establishment of a National Risk Council. The Council should have the responsibility to issue guidelines for risk assessment and appraisal of risk management options as well as to initiate risk communication and public participation programs.

Room: Rembrandt

W-MS.17 Comparative Human Health Risk Assessment

Organizer: Michael Dourson, (TERA)

Speakers: Patterson, J. (TERA); Klauenberg, B.J. (U.S. Air Force Research Laboratory); Wiedemann, P. (Forschungszentrum Juelich, Germany); Linkov, I. (ICF Consulting)

The purpose of this symposium is to discuss assessment and management issues in comparative environmental risk. The first two talks are devoted to assessment issues in the balancing of risks and benefits of eating fish that have both contaminants and beneficial ingredients, and use of non-lethal weapons that have both intended and unintended outcomes. Both talks are extremely timely given the huge ongoing consumption of fish (and recom-

mendations to eat more), and the increased emphasis on use of Non Lethal Weapons to expand warfighter and peacekeeper options in military operations other than war. The remaining two talks will focus on the issues found in the incorporation of assessment into management decisions. The first of these talks describes the process of stakeholder involvement. The second highlights different countries' perspectives. Both of these talks are also timely given the desire of many groups to harmonize methods at the outset. Case studies will be used by speakers as needed to illustrate the various risk assessment and management challenges.

Room: Permeke

W-MS.18 Support for Businesses Seeking Sustainable Practices (Part 2)

See W-MS.8 for abstract and speakers.

Room: Mezzo

W-MS.19 Risks, Vulnerability, Sustainability, and Governance - A New World Reality Landscape

Organizer: Adrian Gheorghe, KOVERS KT - ETHZ, Switzerland

Speakers: Gheorghe, A. (KOVERS KT - ETHZ, Switzerland); Rusanen, M. (University of Kuopio, Finland)

The realities of today (economic downturn, declining support for aid to developing countries, poverty in the developing world, unbalanced consumption and consequent energy and material intensity, unethical corporate behavior and mismanagement, assessment errors and consequent counterproductive financial politics, the revival of the ideologies feeding from mass frustrations) are pressing the needs for better understanding of risks, vulnerability and associated threats and constraints to sustainable development.

While the World became aware of the need for a sustainable development, new risks have piled on top of the old ones; vulnerability to catastrophic threats have materialized out of the mist of unlikely dystopias; new rules, values, and behaviors tend to trim new looks for the political correctness and public acceptability in the democratic and newly freed societies alike. New Governance techniques, codes and stereotypes are contemplated. The UN Agenda 21 highlighted some categories of risks while others - recently are named as 'systemic risks', are vigorously emerging (e.g. BSE, terrorism). Taking risks is never end talking.

The original wisdom about the sustainable development has long rested on the implicit assumption that un-sustainability would only arise from internal, merely logical, inconsistencies in strategies, politics, and management - period. Recent events have revealed the terrible power of the hidden factor: the human response - to strategies, politics, and management. If the sustainability process is to be kept alive, several elder concepts including safety culture, risk awareness, emergency preparedness need a fresh polability smartness, and perhaps the adaptive reaction to cultural diversity, both in law/order/peace-keeping and in implementing a sustainable - that is accepted, as opposed to only 'acceptable' development. Better governance of systemic risks has been pointed out as being necessary and urgent.

Wednesday Mini-Symposia 4:00 - 5:30 pm (continued)

Room: Tempo

W-MS.20 Reviewing Acceptable Risks and Approval of Redevelopment Plans for Sites Under Long-term Remediation

Organizer: Evelina Vaughan, Massachusetts Department of Environmental Protection

Speakers: Bley, D. (Buttonwood Consulting Inc.); Lowe, J. (Parkman Environment, United Kingdom); Hristov, H. (Toxicologist, US Environmental Protection Agency, Region 9); Vlassevaa, E. (St. Ivan Rilski University, Bulgaria)

The Massachusetts Department of Environmental Protection (MA DEP) provides information to developers regarding the scope of contamination problems, review and approves redevelopment plans. MA DEP selects and proposes a site to be approved for a Brownfield Cleanup Revolving Loan Fund program; works with a municipality, provides technical expertise for Engineering Evaluation and Cost Analysis of proposed action; and provides a qualified government site manager to oversee the site work. The agency also manages the project; develops and distributes a final report to the municipality, interested parties and other governmental agencies; keeps administrative records; and assists with public involvement. There is even higher responsibility for the agency to review redevelopment plans in disadvantaged communities because of the limits of public awareness in such communities. The environmental restrictions for the use of land in MA were audited after the Brownfield Act was signed into law in 1998. Lifting the restrictions quite often requires significant efforts. One of the difficulties is the difference in risk assessment performed under federal regulations prior to restrictions placement and risk assessment done under state regulations. If the restrictions have been placed in a Consent Decree, which is often done at the early stages of a project, the process of changing the restrictions later, as part of a Remedial Action, is complicated. It can also give the responsible parties a feeling of lesser liability protection. In some cases it results in an over-restriction on land use, and unreasonably limits redevelopment. The mechanism of inspection, enforcement, and on-line availability of land restrictions is discussed. The process of reviewing and approval of a redevelopment plan submitted during Long-Term Remedial Action, such as the process of natural attenuation or phytoremediation of groundwater contamination, are illustrated on real cases at state, federal and BF sites. The proper determination of acceptable risk, predicted contaminant concentration values, and limited time of exposure during such remedial action will give new results of risk calculation. Those results will allow a broader range of land use, as well as a possible partial and differential property use. The mini-symposia session is designed to stimulate the development of international approaches to the common issues in dealing with redevelopment of formerly contaminated sites including BF sites. The hope is that, in the future, participants may offer communities in different countries solutions to sustainable urban redevelopment.

Poster Abstracts

Poster presentations: Monday and Tuesday: 10:00 - 10:30 am and 3:30 - 4:00 pm

Wednesday 10:00 - 10:30 am and 3:45 - 4:00 pm

Posters are on display 8:00 am - 6:00 pm each day in the Ballroom Foyer

Monday, 23 June

P1.1 Development of Risk Analysis System for Integrated Environmental Management in Korea

Shin, D.C., Kim, Y.S. (Yonsei University, Korea); Park, S.E. (Envioneer Co.); Yang, J.Y. (Yonsei University, Korea); Lim, Y.W. (Seonam University)

The goal of our project is to develop available system software in health and ecological risk assessment and to offer it as Decision Support System (DSS) to aid the effective management of environmental risk in municipal and industrial areas in Korea. Three types of models were constructed in the system. One is an environmental fate model for simulating contaminant concentrations in environmental multi-media, the second is a model for estimating health risk and the third is a program for predicting ecological risk. This system will help rank environmental problems on a risk-based priority basis and advise on reasonable resource allocations in specific areas. We plan to develop a prototype of the system software in the first and second years (2001~2003) and a generic type of the system software including Geographical Information System (GIS), in the final year (2003~2004).

P1.2 Intuitive Toxicology in Public Assessment of the Potential Health Risks from Electromagnetic Fields

White, M.P., Eiser, J.R., Harris, P. (University of Sheffield, United Kingdom)

Two public surveys (Ns =199 & 1320) investigated perceptions of the potential health risks from mobile phone related electromagnetic fields (EMFs). Both asked for estimates of absolute and relative use of mobile phones, and whether people lived near a mobile phone base station. Perceived risks to the self and others were assessed using a direct comparison method in Study 1 and an indirect comparison method in Study 2. Both studies revealed greater comparative optimism for the mobile phone than for the mast, related risks. Moreover, optimism for the mobile phone risks was associated with the comparative measure of self-reported use over and above the absolute measure in both studies. Thus in conditions of uncertainty many people appear to assess their personal vulnerability in terms of their relative exposure compared to peers rather than their absolute exposure, indicating the importance of interpersonal rather than just inter-hazard risk comparisons.

P1.3 A Tiered Risk-Based Process for Child-Focused Safety Assessment for Commodity Chemicals

Becker, R. (American Chemistry Council); Bond, G. (The Dow Chemical Company); Kaplan, M. (DuPont Life Sciences Enterprise); Laffont, M. Cefic (European Chemical Industry Council); Salamone, L. (American Chemistry Council)

Child focused health initiatives are increasing across the world, and risk assessment methods to evaluate potential threats to chil-

dren from chemical exposures are needed. We propose a tiered risk-based process for developing hazard and exposure information for child focused safety assessments for commodity chemicals. The process begins with a screening level risk assessment, drawing hazard information from the internationally harmonized core set of toxicity tests (OECD-SIDS and HPV Challenge) and exposure information from readily available sources. The base set of hazard studies identifies sites of toxicity, effect and no effect levels for all major organs from acute, repeat dose (subchronic) and in utero exposures and includes evaluations of reproductive effects and the potential of a substance to damage DNA. A defined set of biologically based toxicity criteria are used as part of the decision matrix. Comparisons are made between NOAELs and estimated exposures to derive margins of exposure and this information, considered in conjunction with the toxicity criteria (triggers), provides the basis for determining subsequent actions. Options include: low priority for further studies; refining the exposure assessment and/or conducting additional toxicity tests. The biologically-based toxicity triggers guide decisions as to whether additional toxicity tests are warranted and indicate which specific types of studies are important to gain greater certainty concerning a substances potential hazard to children.

P1.4 Risk Assessment Information System (RAIS): An International Environmental Risk Information Center

Galloway, L., Thomas, D.J., Dolislager, F.G. (University of Tennessee); McGinn, W. (Oak Ridge National Laboratory)

Risk Assessment Information System (RAIS) is a web-based package of online tools developed to meet the information needs of the expert as well as the public. The RAIS originated as a tool to help DOE catalog risk assessment practices and procedures for the Oak Ridge Field Office. Over the years the RAIS has gained registered users from 54 countries. These international users have joined registered users from 45 of the 50 states in America. The tools and the guidance presented on the RAIS have assisted the risk community of the world to be more familiar with the risk assessment process. The RAIS takes advantage of searchable and executable databases, menu-driven queries, and data downloads to provide tutorials, tools, guidance, risk results, and other risk information. The RAIS is based on US EPA guidance for performing risk assessments; however, the ability to modify exposure parameters has made the RAIS fit many international needs. The integrated RAIS tools include: Preliminary Remediation Goals, Federal and State Water Guidelines, Toxicity Values, Toxicity Profiles, Chemical-Specific Factors, Human Health Risk Values, Ecological Benchmarks, Background Comparison, and Soil Screening Guidance Levels. The RAIS presents all equations, assumptions, and definitions of the tools and risk assessment process in user-friendly and publicly available webpages. A configura-

Monday Posters (continued)

tion control process ensures that all changes/additions are consistently controlled, documented, tracked, and distributed to users. These efforts have greatly enhanced the transparency of the basic risk assessment tasks for all stakeholders. Submitted for poster presentation.

P1.5 Cryptosporidiosis Susceptibility and Risk: Assessment Results and Validation

Makri, A., Modarres, R., Parkin, R. (George Washington University)

Regional estimates of cryptosporidiosis risk from drinking water exposure were developed and validated, accounting for susceptibility due to AIDS status and age. We constructed a model with probability distributions and point estimates representing: Cryptosporidium in tap water, tap water consumed per day (exposure characterization); dose-response, illness probability given infection, prolonged illness probability given illness, and three conditional probabilities describing the likelihood of case detection by active surveillance (health effects characterization). The model predictions were combined with population data to derive expected case numbers and incidence rates per 100,000 population, by age and AIDS status, and for two geographical scales of the same region (risk characterization). They were compared with same-year surveillance data (2000) to evaluate predictive ability. The predicted mean risks, similar to previously published estimates for this region, were associated with large variability and uncertainty and over-predicted observed incidence - most extensively when accounting for AIDS status. The observed-predicted comparison suggests that over-prediction may be due to conservative parameters applied to both non-AIDS and AIDS populations, and that biological differences for children need to be incorporated. The model appears sensitive to geographical differences in AIDS prevalence. We describe the study and discuss the use of epidemiological surveillance data for validation, model parameters pertinent to susceptibility, and next steps.

P1.6 Information, Communication and Stakeholder Involvement for Long-Term Decisions: Hanford Case Studies (3 Poster Presentations)

Drew, CH., Faustman, E.M., Griffith, W.C. (University of Washington)

This poster session will focus on information, communication and stakeholder involvement for long-term decision making at the Hanford Site, a former nuclear weapons production facility in Washington State, USA. The first poster describes a pilot website developed in partnership with stakeholders to promote the "transparency" of decisions made at Hanford. Meaningful long-term dialogue about cleanup will not be possible if the decisions made today (and in the past) are not transparent to all those who are part of the discussion (including decision makers, technical specialists, and other interested and affected parties). However, the current public record that provides such information is far from transparent. The pilot Decision Mapping System (DMS, <http://nalu.geog.washington.edu/dms>) proposed and evaluated visual, geographic and text-based tools to organize and present decision information about Hanford cleanup on the Internet. An evaluation of the DMS suggested that its organization and

linkages do promote transparency. The second poster describes several strategies for identifying stakeholder risk information needs for transporting nuclear waste. It discusses three public processes about increasing participation in and transparency of nuclear waste transportation and disposal decisions. Activities included focus groups to identify concerns about nuclear waste transportation, exit surveys at regional public workshops about inter-site waste transfer issues, and visual "tools" to synthesize technical information and allow stakeholders and Tribes to participate in meaningful discussion. The third poster contrasts the roles of public and regulatory stakeholders in the evolution of cleanup criteria for soils contaminated with nuclear waste from Hanford's nuclear reactors along the Columbia River. A variety of regulatory agencies, tribal nations, local governments, environmental groups, citizens groups, Hanford employees and other public stakeholders have played a role in shaping the interpretation of regulations and the extent of the remediation at Hanford. This poster will describe their roles and examine the contrasting methods the regulatory agencies use in adopting international recommendations for radiation protection. Acknowledgement: These posters were prepared with the support from the U.S. Department of Energy, under Award No. DE-FG26-00NT40938, from the U.S. Environmental Protection Agency through R 826886-01-0 and from the National Institute of Environmental Health Sciences through 1P01-ES09601-01. However, any opinions, findings, conclusions, or recommendations expressed herein are those of the authors and do not necessarily reflect the views of these agencies.

P1.7 Scaling Risk Governance: Major Accident Hazard Regulation in the European Union

Walker, G.P. (Staffordshire University, United Kingdom)

The distribution of decision-making powers, operational obligations and institutional responsibilities across political space are important and contested dimensions of risk governance. In the European Union there are repeated debates over the level at which the regulation of risk should be organised, the balances to be struck between inter and intranational consistency and local flexibility, between harmonisation and subsidiarity and process and outcome determination. This poster considers how scale has figured in the regulation of major accident hazards, through the evolution of the Seveso and COMAH Directives at a European level and the development of UK legislation implementing and supplementing EU obligations. The tensions between international and national and national and local levels are explored, focusing in particular on spatial planning and associated risk assessment practice. The analysis draws on recent geographical perspectives to consider scale both as the organisation of political space and as a socially constructed and contested strategic resource.

P1.8 Risk Assessment for Chemicals in Drinking Water the California Experience

Howd, R.A., Fan, A.M. (Office of Environmental Health Hazard Assessment)

California's Office of Environmental Health Hazard Assessment (OEHHA) conducts independent risk assessments for a variety of California programs and purposes, serving a state population of

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over 34 million. OEHA evaluates risks from chemicals in air as well as in drinking water, with special consideration of children's health issues, safe pesticide use, fish consumption, and multi-route exposures. Our Public Health Goals (PHGs) for chemicals in drinking water are based solely upon health considerations, separate from cost and technical feasibility. The risk assessment process provides an opportunity to consider local conditions, population factors, and new methods, and respond to citizen concerns. Consumer warnings provided through this process may focus attention on the high cancer risk levels allowed at the Maximum Contaminant Levels (MCLs) for chemicals such as arsenic and disinfection byproducts. Examples of how the process is working to support public health protection and citizen involvement are provided.

P1.9 Copper Speciation in the Sediments of the Heavily Polluted Abu-Kir Bay, Egypt

Saad, M.A.H., Badr, N.B. (Alexandria University, Egypt)

Abu-Kir Bay, a shallow semicircular basin east of Alexandria, receives fresh Nile water, brackish lake water and highly polluted water. This study deals with distribution of total copper and its species in the sediments of this bay. Sampling was conducted along two sectors; Maadia Sector (MS) reflecting the effect of agricultural discharges from Lake Edku and Tabia Sector (TS) representing the effects of industrial wastes. Total copper (TCu) in MS showed a decrease seaward, reflecting the use of CuSO₄ as an algicide for controlling massive blooms of algae in Lake Edku. A five step sequential extraction technique was used to describe the chemical association of copper with major sedimentary phases; exchangeable (F1), carbonates (F2), Fe/Mn oxides (F3), organic / sulfides (F4), and residual associations (F5). The Cu fractions decreased in the following order: F5 F4 F2 F3 F1 in MS and F5 F4 F3 F2 F1 in TS. In MS, the highest F1 value was detected away from the mixing zone, giving a chance for increasing the rate of adsorption. In TS, the highest F1 concentration was recorded in the vicinity of the outfalls. MS recorded a higher average value of F2, offering a favorable condition for copper association with carbonate. The local anthropogenic contamination in TS with industrial wastes might decrease F2 in this area. F3 showed along MS an increase seaward, contrary to TS. Despite the inshore stations were influenced by accumulation of organic materials from land-based sources, the F4 values at these two locations were lower than those at the offshore stations. F5 reflects in TS the degree of chemical weathering, due to human activities by introduction of highly corrosive materials into the environment. A significantly positive correlation exists between F5 in suspended matter and sediments, indicating the interaction between both phases.

P1.10 Risk Assessment of Chemicals: What About Children?

Wolterink, G., De Zwart, L.L., Sips, A.J.A.M., Van Engelen, J.G.M. (National Institute of Public Health and the Environment – RIVM, The Netherlands)

With respect to sensitivity to chemicals, children and adults differ in exposure, kinetics and dynamics. The question is whether

the present procedures for risk assessment adequately protect children against adverse effects of chemicals.

For instance, the presently used toxicity tests in pups won't detect subtle neurodevelopmental disturbances or carcinogenic or immunologic effects of early exposure to substances. Moreover, the pattern and level of exposure in humans and laboratory animals differs.

For adults and children more insight into the exposure scenarios is needed. A decision tree may indicate whether the available data are adequate for risk assessment for children. The suitability of young animal toxicity tests should be investigated. Dose-response data and NOAELs of tests in adults and juveniles, and data on pediatric drugs may provide insight in age-dependent intraspecies variation. PBPK modeling may indicate which group of children is most at risk for a certain chemical.

P1.11 Health Risks of Radiographers Employed in a Hospital of Vizag Steel

Venkata Sai Prabhakara murty, P.V.S. (Occupational Health Services and Research Center, India); Venkata Lakshman rao, K.V.S. (India)

Survey on health risks among radiographers working in a hospital of Vizag Steel, India was conducted in the year 2002. All 9(male)radiographers aged 35-45 years(median 38 years) and control subjects(24) who were matched for sex and age(within 3-5 years) interviewed using a questionnaire about work practices and symptoms experienced during and off the work. The total number of symptoms experienced by the radiographers were greater than controls. Personal exposure to ionizing radiation (0.05-2.60 milliSievert for 9 months) was well within the limit compared to annual effective dose limit 30 mSv. Estimated risk level was moderate and the risk control action plan developed was: (i) Periodical monitoring of health and personal exposure to ionizing radiation. (ii) Inspection of existing ventilation systems in dark rooms and other work environments. (iii)Work place monitoring for chemical contaminants. (iv) Assessments of subjective symptoms experienced to know about their consistency, once in year.

P1.12 Modeling of Dispersion and Deposition of Contaminated Aerosols for Decision-Making Process

Andrijevskij, A., Lukashovich, A., Trifonov, A. (Joint Institute of Power and Nuclear Research of National Academy of Sciences of Belarus, Belarus)

This work investigated problems of modeling of dispersion and deposition of contaminated aerosols as applied to decision-making process to optimize a location of nuclear power plants in urbanized areas. Techniques of spatial simulation of aero- and hydrosphere's on the base of multidimensional conservation equations have been worked up by considering a comparative analysis of scales of micro- and macro processes. Multifunctional code complex for forecasting of dynamics of ecological situation and ecological risk assessment have been developed taking into account an interaction of contiguous areas dissimilar on a functional significance. Recent progress in model developments and numerical experiments is summarized.

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P1.13 Chemical Incidents and Their Health Impacts: A Surveillance Programme in England.

Leonardi, G.S., Herriott, N. (Chemical Incident Response Service, United Kingdom)

Lung cancer is a leading cause of cancer death in developed countries and is rising in many developing countries. Radon has long been known to be among the main causes of lung cancer. It has been reported that radon health risk is proportional to its concentration, down to EPA's action level of 200 Bq m⁻³. Despite the fact that residential radon is believed to be the second leading cause of lung cancer in some developed countries, there are no data on the incidence of radon related lung cancers in Iran. Inhabitants of Ramsar, a city in northern Iran, are exposed to levels of natural radiation as high as 55-200 times higher than the average global dose rate. Furthermore, radon levels in some regions of Ramsar are up to 3700 Bq m⁻³. To assess the association between the radon concentration and frequency of lung cancer, lung cancer patients recorded over the past two years in eight districts of Ramsar with different levels of radon were studied. Data from the Ramsar Health Network show that both crude lung cancer rate and adjusted lung cancer rate in one district with the highest recorded levels of external radiation and radon concentration are lower than those of the other 7 districts. It can be concluded that lung cancer rate may show a negative correlation with natural radon concentration.

P1.14 Health Risk of Exposure to High Levels of Natural Radon in the Inhabitants of Ramsar, Iran

Mortazavi, S.M.J., Rezaeian, M. (Rafsanjan University of Medical Sciences – RUMS, Iran); Ghiassi-nejad, M. (National Radiation Protection Department, NRPD, Iranian Nuclear Regulatory Authority, INRA)

Lung cancer is a leading cause of cancer death in developed countries and is rising in many developing countries. Radon has long been known to be among the main causes of lung cancer. It has been reported that radon health risk is proportional to its concentration, down to EPA's action level of 200 Bq m⁻³. Despite the fact that residential radon is believed to be the second leading cause of lung cancer in some developed countries, there are no data on the incidence of radon related lung cancers in Iran. Inhabitants of Ramsar, a city in northern Iran, are exposed to levels of natural radiation as high as 55-200 times higher than the average global dose rate. Furthermore, radon levels in some regions of Ramsar are up to 3700 Bq m⁻³. To assess the association between the radon concentration and frequency of lung cancer, lung cancer patients recorded over the past two years in eight districts of Ramsar with different levels of radon were studied. Data from the Ramsar Health Network show that both crude lung cancer rate and adjusted lung cancer rate in one district with the highest recorded levels of external radiation and radon concentration are lower than those of the other 7 districts. It can be concluded that lung cancer rate may show a negative correlation with natural radon concentration.

P1.15 Risk Characterization of Endocrine Disruptor Chemicals

Lee, B.M., Choi, S.M. (Sungkyunkwan University, South Korea)

Endocrine disruptor chemicals (EDCs) produce a variety of adverse health effects including infertility, reduction in sperm count, teratogenicity, carcinogenicity and mutagenicity. A comprehensive literature survey on the 48 EDCs classified by Centers for Disease Control and Prevention (CDC) was conducted using a number of databases. The survey results revealed that toxicological characteristics of EDCs were shown to produce developmental toxicity (81%), carcinogenicity (79%, when positive in at least one animal species; 48%, when classified based on IARC evaluation), mutagenicity (79%), immunotoxicity (52%), and neurotoxicity (50%). Regarding the hormone-modulating effects of EDCs, EDCs showing estrogen modulating effects were closely related to carcinogenicity or mutagenicity. The toxicological characteristics of the EDCs will be useful for future research directions on EDCs, toxic mechanism and risk assessment. Acknowledgement. This work was supported by a grant from NITR/Korea FDA for Endocrine Disruptor Research.

P1.16 SADA: Freeware for Integrating Ecological and Human Health Risk Assessment with Geostatistics

Purucker, S.T., Stewart, R.N., Welsh, C.J.E. (University of Tennessee)

Spatial Analysis and Decision Assistance (SADA) is freeware for performing environmental assessments in support of risk-based decision-making. The capabilities of SADA can be used independently or collectively to address site specific concerns when characterizing a contaminated site, assessing risk, determining the location of future samples, and when designating areas of concern. SADA provides a full human health risk assessment module and associated databases. The risk models follow the EPA guidance and can be customized to fit site specific exposure conditions. The ecological risk module allows users to perform benchmark screening against a large array of benchmarks and also has the ability to calculate spatial exposures to a number of common terrestrial receptors. SADA has a strong emphasis on the spatial distribution of contaminant data and will plot risk results within a spatial context. Several tools are provided in SADA for performing a geospatial analysis. Among these are geospatial interpolants such as ordinary kriging, indicator kriging, inverse distance, natural neighbor, and nearest neighbor. The freeware include methods for measuring spatial correlation among data, modeling spatial correlation, and the interpolants can be used to produce concentration, risk, probability, variance, and cleanup maps.

P1.17 RAIS: Environmental Risk Assessment Harmonization with Transparent Model and Database Integration

Thomas, D.J., Dolislager, F.G., Galloway, L.D. (The University of Tennessee); McGinn, C.W. (Oak Ridge National Laboratory)

The University of Tennessee (UT) & Oak Ridge National Laboratory (ORNL) Risk Assessment Information System (RAIS) is a web-based package of online tools developed to meet the information needs of the expert as well as the international public. Many updates

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are currently in progress on the RAIS with the goals to provide complete model reference information and documentation of database structures. Meeting these goals will provide a harmonious balance of risk understanding between risk assessors, government agencies, and the public. Currently updated databases include: chemical-specific parameters, federal and state guidelines, and radionuclide slope factors. The chemical-specific parameters database is updating values and references for log Kow, Koc, S, BF, Kd, H, MW, Fm, Kp, GIABS, Bwvet, Bvdry, Fb, ABS, Di, and Dw. The federal and state guidelines have been updated for: federal, Illinois, Kentucky, Ohio, South Carolina, Tennessee, and Washington. The radionuclide slope factors have been updated with the new Federal Guidance Report No. 13. These efforts have greatly enhanced the transparency of the RAIS to provide basic risk assessment tools. The implementation of an online and transparent process promotes harmonious risk communication.

P1.18 Smallpox Disease and Vaccine: Mental Models and Subjective Risk Estimates

Bostrom, A. (Georgia Institute of Technology); Atkinson, E.

The bioweapon potential of smallpox and other vaccine-preventable diseases increases the importance of understanding how people think about vaccines and vaccination policies. New smallpox vaccine policies and a lack of adherence to them suggest that subjective risk estimation is key. This paper applies two frameworks - a mental models framework and a metrics and mappings framework for subjective quantitative estimation - to study how people understand smallpox vaccine risks and the relative likelihood of adverse events from smallpox disease and vaccine. A pilot study of 24 university students finds wide variability in beliefs about and estimates of risks from both the vaccine and the disease, although all knew that smallpox is deadly. Many compared smallpox to chickenpox. Estimates of how many would die in the US this year from smallpox varied by five orders of magnitude, while on average the risks of dying from the vaccine were underestimated.

P1.19 Dioxin Levels in Blood of Residents and Incinerator Workers in Urban Area of Korea

Yang, J.Y. (Yonsei University, Korea); Lim, Y.W. (Sounam University); Jang, W.S. (Pohang University); Shin, D.C. (Yonsei University, Korea)

We describe the results of study in which serum levels of dioxin in a group of workers at the MWI were compared to those in a comparison group of community residents who had never worked at the MWI. The blood samples were obtained between 2001 and 2002 from volunteer workers (n=29) and residents (n=49) living near to the MWIs. For background exposure, the general group was 11 adults living in the urban area not including the MWIs. The average levels of dioxin were 14.93 pg/g lipid, 15.19 pg/g lipid, and 12.37 pg/g lipid for workers, residents and general, respectively. The levels of dioxin in blood were not significantly different between the groups, whereas a significant correlation between the age of the subjects

and the levels of dioxin in blood could be observed. Finally, no significant differences of dioxin-levels in blood were found in relation to the specific residential area.

P1.20 Distribution of Inorganic Metals in Blood of Adults at Urban Area in Korea

Kim, H.H., LIM, Y.W., Yang, J.Y., Ho, M.G., Shin, D.C (Yonsei University, Korea)

The objective of this study was to describe the distribution of metals concentrations in blood of adults who were not occupationally exposed in Korea. The blood samples were obtained between February and August 2001 from volunteer adults in urban area of Korea. 66 male participants were 46 (20-75) years of age and 74 female were 40 (20-69) years of age. The levels of metals in blood were observed the log-normal distribution, and we calculated geometric mean (GM) and geometric standard deviation (GSD). The GM levels of metals in blood of the men were 65.88?/l, 1.01?/l, 0.23?/l and 0.15?/l, for Pb, Cr, Ni and Cd, respectively. The GM levels of the women were 58.49?/l, 1.66?/l, 0.30?/l and 0.10?/l, for Pb, Cr, Ni and Cd, respectively. The levels of Pb-B and Cd-B were significantly higher non-smoker than smoker, whereas those of Cr-B and Ni-B were not different by smoking habit.

P1.21 Total Human Exposure Assessment for Pollutants using Multimedia and Multiroute Scenarios in Korea

Yang, J.Y. (Yonsei University, Korea), Lim, Y.W. (Sounam University); Kim, Y.S., Ho, M.K., Kim, Y.S. (Yonsei University, Korea)

The objective of this study was to estimate human exposure to environmental pollutants using a multimedia/multiroute scenario in an urban area of Korea. The assessment of the human exposure for pollutants involved five scenarios (VOCs, Metals, PAHs, Dioxin and Radon). The multimedia-multiroute human exposure models predicted LADD of pollutants using human intake factors and concentrations in the exposure contact media. For VOCs, the major route was not only direct inhalation by air pollution but also indirect exposure route by the water consumption. For metals, the ingestion LADD accounted for more than 50% of the total LADD. For PAHs, exposure via inhalation was highest compared with exposure via other pathways. For dioxins, the major route was indirect ingestion by the transfer process from pollutants in the air, soil, or water to the foods. The major route was indirect inhalation of radon by diffusion process from its source to its accumulation indoor.

P1.22 Communicating Environmental Health Risks: an Information Intervention for Ultraviolet Radiation

Neill, H.R., Hassenzahl, D.M. (University of Nevada Las Vegas)

Environmental education programs such as Sunwise, sponsored by the U. S. Environmental Protection Agency, are designed to educate school children, teachers and parents about risks of ultraviolet radiation. This paper examines the extent to which alternative informational interventions change risk reduction behaviors both for individuals and their children. Using two versions of a survey questionnaire, one with and one without graphic pictures of adverse impacts

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of excessive exposure to the sun, we obtained over 350 responses from members of nonprofit groups with diverse demographic backgrounds in Las Vegas, Nevada. Our survey asks respondents to report anticipated changes in behavior, economic values and other socioeconomic information. Respondents had the opportunity to complete a follow up survey two weeks later. Using univariate and multivariate statistical analyses, we find that pictures appear to make a significant difference in responses at the time of intervention, and that these differences remain several weeks later.

P1.23 Informational Regulation of Major Industrial Accidents: The Case of the U.S. LEPCs

de Marcellis-Warin, N., Peignier, I., Sinclair-Desgagne, B. (CIRANO & HEC)

In the United States, the Emergency Preparedness and Community Right to know Act mandated the creation of organizations at local level to develop emergency plans for catastrophic releases of toxic chemicals and give information from covered facilities. Local Emergency Planning Committees (LEPC) were established to be broad-based membership groups with the responsibility to receive information from local facilities about chemicals, 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 LEPCs established. The purpose of the poster is to examine the informational regulation of major chemical accidents through the example of LEPCs. We investigate the role they can play in information disclosure. To have a comprehensive analysis of their activities, we sent a questionnaire to each LEPC. Data were collected about staffing, activities, resources, training and information. Results will be presented.

P1.24 Health Risk Assessment for Radon of Groundwater in Korea

Kim, Y.S., Kim, J.Y., Park, H.S., Park, S.E., Shin, D.C. (Yonsei University, Korea)

An initial study has been conducted to evaluate the distribution of radon levels and their risk levels of groundwater in Korea. Probability distribution of 616 samples was log-normal one with 1,867pCi/L as arithmetic value, 920pCi/L as median and 40,010pCi/L as maximum during four years(1999-2002). In addition, 10% of total samples are in excess of 4,000pCi/L, 20% in excess of 2,700pCi/L, and 30% in excess of 1,700pCi/L, and 15 samples exceeds 10,000pCi/L. We select 565 samples for risk analysis, and applied unit risk which is 6.62×10^{-7} per pCi/L to be recommended by NAS committee. It results in 10^{-4} level of their excess cancer risk and in 10^{-2} level in some areas with high concentration of radon. It must be monitor periodically and take adequate actions in these risky sites. We recommend that it needs to take more survey and finally set guideline for radon regulation in groundwater.

P1.25 Comparative Risk Analysis for Priority Ranking of Environmental Problems in Seoul

Kim, Y.S., Lee, Y.J., Park, H.S., Lim, Y.W., Shin, D.C. (Yonsei University, Korea)

In Korea, no CRA (comparative risk analysis) studies have been undertaken, nor have their methodologies of such studies been established. Therefore, the objectives of this study were to establish the framework of CRA consisting of health risk, economic risk and perceived risk, and to estimate and compare these risks among the three environmental problems of air pollution, indoor air pollution and drinking water contamination, which are themselves subject to the eight sub-problems of hazardous air pollutants (HAPs), regulated pollutants (representative as PM10) and dioxins (PCDDs/PCDFs) in air pollution, indoor air pollutants (IAPs) and radon in indoor air pollution, and drinking water pollutants (DWPs), disinfection by-products(DBPs) and radionuclides in drinking water contamination in Seoul, Korea.

P2.1 Assessment of Gas Pipeline Failure Probability on the Basis of Expert Judgments

Krymsky, V.G., Akhmedjanov, F.M. (Ufa State Aviation Tech. University, Russia); Kozine, I.O., Markert, F. (Risø National Laboratory, Denmark)

Many countries in Europe are concerned about the hazards caused by transmission gas pipelines (GP). This is the reason to launch projects developing perspective aids for closing GP on explosions or leakages. In turn, decisions that provide a choice of policy for placing special closing valves require drawing a pipe risk profile over GP entire length. Naturally, risk assessments should include values of pipeline failure probability. Meanwhile, forecasting GP failure frequency faces a lot of difficulties because many influencing factors cannot be formally described. In this situation expert judgments become an effective tool for decision support. The approach proposed is oriented towards a classification of the factors that influence failure probability in six groups: third - party actions, GP corrosion, pipes producing quality, construction and installation quality, natural disturbances and other factors (particularly, project decision quality). A further analysis shows that the factors in all groups are correlated with the pipe diameter, wall thickness, burying GP depth, percentage of pipeline under water table, properties of soil, intensity of land movements, etc. The intervals for each factor influence levels are divided into sub-intervals, so an opportunity appears to consider random events like pipe failures as conditional ones with respect to belonging levels of influence for different factors to definite compositions of chosen sub-intervals. These conditional probabilities can be estimated by experts and then combined via additive convolution. The total probability of pipeline section failure is computed as a function of conditional probabilities mentioned. Acknowledgements: V. Krymsky participated in this research thanks to NATO grant 26-02-0001. Work of F. Akhmedjanov was supported by grant E02-3.0-4 of Russian Ministry for Education.

P2.2 Risk-Based Decision Making for Novel Technologies

Cornford, S.L., Feather, M.S., Moran, K. (California Institute of Technology)

A risk-based decision-making process conceived and developed at JPL and NASA has been used to help plan and guide novel technology applications for spacecraft. Because this process addresses broad-ranging challenges that arise in planning development, deployment and operation of almost all kinds of novel technologies, it has wide applicability. It rests on quantitative assessments, gathered from cross-disciplinary teams of experts, of critical relationships between "objectives" (intended uses of the novel technology), "risks" (impediments to attaining objectives) and "mitigations" (measures to prevent, detect or alleviate risks). Custom software is used to assist in gathering and organizing the information, performing risk-based calculations over it, and visualizing the results in ways that facilitate decision-making. Applications have demonstrated: improved insights into a variety of risks, ability to trade and calibrate risk across discipline boundaries, optimized planning of

how to address risk, and risk-informed comparison among design alternatives. See <http://ddptool.jpl.nasa.gov> for details.

P2.3 Emerging of Country Risk in the Middle-East Europe.

Sitek, E. (Professor)

Poster will present changes in country risk measures developing and their impact on direct investments in the Mid-East Europe. My intention is to present effectiveness of mentioned measures used in the decision making process.

P2.4 Era of Globalization and Terrorism Threats: The Strategy of Risk Management

Atoyev, K.L. (Institute of Cybernetics, Ukraine)

The analysis of main difficulties of the struggle with terrorism allows emphasize the problems caused by main tendencies of the 21st century: economical globalization, social disruptions, corruption, mental disadaptation, and cultural clash of civilizations. Pooling of advanced biotechnology, enormous finances and authoritarian personalities gives dangerous explosive mixture that threatens to humankind functioning. It is necessary to find optimal trajectory of society development when increasing of democracy doesn't strengthens the destructive and terrorist movements. The mathematical approach for study the interrelations between indices of globalization and terrorism threats and determination of optimal controls minimizing terrorism threat is elaborated. The main advantage of this approach is the determination of terrorism threat dynamics as the function of dynamic variables characterizing the indices of globalization. It permits to identify the weakest link on global, federal and local levels and to elaborate the effective measures that increase the safety of civilian population.

P2.5 Gone with the Wind is Coming Back: Ukraine and Risks of Its North-Atlantic Integration

Atoyev, K.L. (Glushkov Institute of Cybernetics); Borodyansky, N. (International Solomon University, Germany)

The system analysis of various risks, connected with integration of the Ukraine into North-Atlantic associations was carried out to rank the main priorities of their mutual penetration. The optimal trajectories of integration as well as controls associated with various economic, technical, political and cultural programs of interrelation were determined on the basis of elaborated computer technology. Their efficiency was also investigated in terms of risks changes. One of the main benefits for Europe is strengthening of its defense. It is especially necessary if we take into account the escalation of terrorism threat in the world and existence of zones of instability in the Europe's neighbourhood. Without such integration the risks of involving the Ukraine in above zones will increase. The main benefit for the Ukraine is strengthening of its stability and acceleration of its economic development. The optimal trajectory of integration may be associated with such interrelation between the Ukraine and Western partners that minimizes mental disruption of its parts and accelerates the reforms.

Tuesday Posters (continued)

P2.6 Perception of Risks and Coping Strategies to Cope with a Volcanic Risk

López-Vázquez, E., Flores-Espino, F., Peyrefitte-Ferreiro, A., Martínez-Vázquez, K. (*Universidad de las Américas-Puebla, Mexico*)

This study presents qualitative results of a research about different risks perceived near a volcanic risk zone in Mexico, and the strategies people practice to cope with risk. Risks perceived were measured in four different zones. First zone is the nearest and the more dangerous, and zone four the more distant and less dangerous. A questionnaire with open questions was utilized. Results show that in the first zone, volcanic risk was perceived as the most important, in zone 2 and 3 the alcoholism was perceived as the most important, and in zone 4, water pollution was perceived as the most important. In contrast when residents were asked for the risk perceived as affecting them directly, volcanic risk was perceived as the most important in the three nearest zones. Different coping strategies are taken to cope with volcanic risk, but 48% of people do not feel prepared to face it.

P2.7 Reduced form Model to Estimate Air Pollution Health Impacts

Cifuentes, L.A.P., Jorquera, H.P. (*Universidad Católica de Chile*); Gaioli, F. (*Secretaría de Medio Ambiente – Argentina*); Gouveia, N. (*University of Sao Paulo*); Davis, D. (*Carnegie Mellon University*)

Although many Latin American countries are already suffering the direct and indirect consequences of global climate change, climate mitigation policies are usually not ranked high in their political agenda. Such policies when exist are mostly driven by local air pollution abatement and this is likely to remain so in the near future. The main objective of this work is to devise clear, quantifiable, replicable indicators that can be used by policy makers, to estimate the local and regional health damages induced by local human activities and the benefits from reducing air pollution associated with GHG and air pollution mitigation measures and changes in social habits, based on the results of co-benefit analysis from 3 SA cities (Santiago, Chile; Buenos Aires, Argentina; and São Paulo, Brazil). Based on analysis and comparison of case studies already being developed in Argentina, Brazil and Chile, we have developed an approximate way of computing health benefits for different policy options, along with their associated carbon reductions. As part of the work, we have also determined the common issues that dominate the estimation of effects as well as the differences, to determine the factors that settle the health benefits: atmospheric conditions, population characteristics, economic conditions. The final objective of this work is to propose a reduced-form model that can be used to estimate the health benefits, the GHG abatement, and their relative importance in different SA cities. The information produced by this work will be very useful for decision-makers in most south American cities, at the moment of considering different policy options. We thus hope to effectively effect policy making regarding global change and air pollution abatement in the Americas.

P2.8 Integration of Scientific and Lay Accounts of Air Pollution

Kelay, T., Uzzell, D., Gatersleben, B., Hughes, S., Hellowell, E. (*University of Surrey, United Kingdom*)

This paper provides an integrated account of lay and scientific assessments of air pollution, demonstrating the significance of Geographic Information Systems (GIS) as a valuable tool. With a focus upon traffic-generated air pollution we developed a novel approach in order to abstract scientific and lay accounts (involving causes, consequences and severity) of air pollution and represented them digitally using GIS, in order to detect disparities. The results demonstrated that public estimates of air pollution were not unlike scientific accounts. This has major theoretical implications for risk research and bridging what we researchers perceive to be the gulf of understanding between experts and the public. The multidisciplinary nature of this research provides the missing links in existing research by accounting for disparities between perceptions of air pollution and scientific evidence. It is intended that the research will heighten policy makers particularly local authorities awareness of risk communication, since the research provides valuable insight into how scientific information should be communicated to the public in the future.

P2.10 Environmental Risk Factors in the Black Sea Region-A Challenge for an International Risk Management

Göktepe, B.G. (*Turkish Atomic Energy Authority - TAEK and voluntary Turkish Environmental & Woodland Protection Society -TURCEK*); Gönençgil, B. (*University of Istanbul and voluntary Turkish Environmental & Woodlands Protection Society - TURCEK*)

The Black Sea has been facing a catastrophic degradation over the last four decades. The serious environmental damage of this unique marine eco system has been the major concern of the international organizations and communities since the Bucharest Convention in 1992. The Black Sea Region became a challenging international arena for political, scientific and socio-economic risk management activities during the past decade.

In this poster; trans-boundary environmental risk factors affecting the Black Sea marine environment are reviewed and main risk management issues are discussed.

The Black Sea is shared by six countries; Turkey, Bulgaria, Romania, Ukraine, Russian Federation and Georgia. But if all the rivers flowing into the Black Sea are considered; in this area of the Black Sea Basin; population of 170 millions people live in 17 countries. Major rivers of Europe, the Danube, the Dnieper and the Don discharge heavy load of pollutants. The only connection of the Black Sea to the oceans is through the Turkish Straits Region (TSR) which presents a special case for the trans-boundary environmental risk management problem. The TSR has the busiest international marine traffic in the world and therefore has the highest probability of vessel casualty risk. Major marine vessel accidents of the past are shown in tables.

Tuesday Posters (continued)

P2.11 Risk Analysis in Phytosanitary and Regulatory Agriculture Applications

Sequeira, R.A. (USDA)

Risk analysis in phytosanitary applications is unique. However, risk analysis is central to biological trade and commerce (animal products, fruits and vegetables). Unlike environmental and toxicological risk assessments, the analysis of exposure and the concept of 'dose-response' are not key factors. The main elements of regulatory risk analysis in agriculture are presented. Emerging areas in phytosanitary risk assessment are also outlined. Specifically, the poster discusses spatial analysis in phytosanitary applications and illustrates the topic with some case examples.

P2.12 Risk and Governance in the Third World Countries: Bangladesh Context

Karim, N., Shaheen, N. (University of Dhaka, Bangladesh)

The terrorist attack of September 11, 2001 in USA has pursued a world-wide trend toward making better use of risk oriented concepts, tools, thought and mobilizing public opinion. Besides this, efforts have been giving to develop a methodology on the basis of experiences and expertise in the perspective of recent advancements in assessment, management to reduce risk. In this regard, it can be said that, it is particularly a critical at a time when globalization has redefined not only our understanding of the national and the nation-state but also the international and the global basis. However, the main theme of my paper will be to seek avenues to reduce risk with sufficient governance in the context of Bangladesh.

P2.13 Risk Perception and Decision Making at the United States Department of Agriculture

Venette, S.J., Sellnow, T.L. (North Dakota State University); Venette, R.C. (University of Minnesota)

This study, first, identified how the United States Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) Plant Protection and Quarantine (PPQ) communicates and interprets risk when making resource allocation decisions. This study drew upon literature that explains how people perceive risk and how risk communication helps construct an interpretation of reality.

The data revealed that risk aversion is a determinant of risk perception. Generally, the less risk tolerant a person was, the greater their assessment of risk. The project also explored experience and risk aversion (among other variables) as determinants of risk perception. Correlation analysis failed to identify a significant relationship between experience and the perception of risk. However, multinomial logit modeling revealed that experience factors did significantly affect high risk perceptions. As action-oriented research, this project was designed to meet the needs of the USDA and to expand understanding of risk communication.

This study uses concepts from Communication, Economics, Microbiology, Risk Analysis, and Food Safety.

P2.14 An Introduction and Enunciation of Key Concepts and Methodological Techniques

Jarvis, D.S.L. (University of Sydney, Australia)

This presentation analyses the concept of political risk and explores its utility as a means of understanding political events and processes that can threaten order, stability and continuity in international relations and disrupt the normal practices of interstate investment, trade, and commerce. More particularly, the presentation is an attempt to systematize and codify the disparate literature that surrounds the concept of political risk such that it might be more rigorously applied as a social science method for understanding political events and their effects upon commercial and strategic activities.

P2.15 U.S. EPA Internet Tools for Assessing Hazardous Waste Sites

Dolislager, F.G., Galloway, L.D. (University of Tennessee)

The Oak Ridge National Laboratory and The University of Tennessee have developed on-line tools for the U.S. EPA that assist in assessing hazardous waste sites. These tools are: Soil Screening Level Guidance for Chemicals (SSL), Soil Screening Level Guidance for Radionuclides, and Preliminary Remediation Goals (PRG) for Radionuclides. These tools are available to the general public. Tools potentially to be made available to the public are: Preliminary Remediation Goals for Chemicals, HEAST Toxicity Values, PRTV Toxicity Values, and Radionuclide Dose Cleanup Concentrations. Every one of these tools are designed to disseminate useful information in a clear and concise fashion. A scroll-and-select menu system is employed for selection of chemicals/radionuclides and the following screening pathways: Residential Soil (PRG), Outdoor Worker Soil (PRG), Indoor Worker Soil (PRG), Tap Water (PRG), Fish Ingestion (PRG), Soil to Ground Water (PRG and SSL), Agricultural Soil (PRG), Ingestion (SSL), Inhalation of Fugative Dust (SSL), and External Exposure (SSL) and Inhalation of Volatiles (SSL). These tools provide great detail of operational guidance. The equations presented are filled with U.S. EPA standard default exposure parameters; however, it is possible to change these parameters with site-specific data. When used in the context of a decision-making process, the parameter selections and decisions are clearer and more relevant. Thus, consensus-building is facilitated because the decision authority is shifted towards all stakeholders. The implementation of an online and transparent process, with public and stakeholder involvement, helps to reinforce public trust and credibility currently plaguing the risk assessment field and community.

Tuesday Posters (continued)

P2.16 Genetically Modified Trees: Estimating Isolation Distances for Plantation Forestry

Linacre, N.A., Ades, P.K. (The University of Melbourne, Australia)

Globally there is growing concern about the problem of genetic pollution. This issue has gained public prominence with the creation of novel genotypes using genetic engineering, and their subsequent release into the environment. Of particular public concern are the risks associated with genetic pollution from the release of genetically modified plants into centres of diversity. This problem is of significance in Australia, which is a centre of diversity for eucalypts. Gene flow is managed using isolation distances, which are set using qualitative risk assessments by experts. However, we believe that quantitative risk assessments using mathematical models can augment expert opinion by better informing decision makers about the risks of gene flow. We have developed a spatially explicit gene flow and invasion model using cellular automata, which I use to investigate gene introgression between stands of plantation genetically modified eucalypts and stands of wild eucalypts. My results suggest that an isolation distance in excess of 100 meters is likely to be the minimum distance needed to limit gene introgression.

P2.17 The View from the Top; Turning Risk Management on Its Head

Vincent, M. (Monash University, Australia)

Risk is now a term that has emerged from a largely negative connotation, more of a compliance culture, to be a major policy initiative for public and private sectors to provide the means to optimise outcomes. Risks do not respect borders, they emerge across the spectrum of activities undertaken across the world and do not confine themselves to particular markets, modes of communication or particular structures or transactions. Risk management creates a context for the assessment of a particular situation, proposal or undertaking.

Much has been achieved in the management of risk at international and national levels. Indeed the intention of this paper is to build on these initiatives and to provide the first general multilateral policy framework for the management of risk. It is believed that this initiative is both consistent with other risk management instruments and complementary to a range of other international instruments.

This paper complements the definitional work done by ISO/IEC and the development of risk management practices, standards, measures, and specifications that have occurred at both international and national levels. It is also intended to accommodate the metamorphosis that risks inevitably undergo.

P2.18 The Berlin Roundtables on Transnationality

Richter, I.K., Müller, R., Berking, S. (Irmgard Coninx Foundation); and jointly organized by the Social Science Research Center Berlin (WZB), Humboldt University and the Irmgard Coninx Foundation.

Unlike the buzzword "globalization" which refers mainly to an economic trend, the concept of "transnationality" is political: How can a global civil society respond to challenges that don't stop at national borders?

The first colloquium, organized by *the Berlin Roundtables*, will take place from January 2-10, 2004. The event will consist of a ten-day workshop and a subsequent conference on:

Transnational Risks – the Responsibility of the Media and the Social Sciences.

Topics of the workshops are:

- NGOs between globalization and localization
- NGOs as agents of transnational civil society
- transnational risks: focus of the media & focus on the media
- global financial risks and transnational regime building.
- public health as a transnational challenge
- transnational risks from a historical perspective (Germany)

P2.19 GLORIA (Global Risk Assessment): Risk assessment with Bayesian Belief Networks for Power Industry.

Deleuze, G., Bertin, H., Pourret, O. (EDF/R&D)

We present in this poster the use of Bayesian networks for risk assessment and risk mapping. After a short description of the context of power production, we present a risk assessment process adapted to an industrial context, aiming for a global, consistent and rational Risk Management activity. Then, we present how Bayesian Networks can be used for risk assessment and decision analysis for managers, including a specific definition of risk criteria. We present then an application, the assessment of an initiating event for safety and availability of a production plant, including hydrological factors, stakeholders attitudes, regulatory changes. A risk map is elaborated, based on the risk analysis and the Bayesian network. We conclude the poster with the advantages and weaknesses of this approach and discuss how the use sophisticated risk analysis tools can help operational processes to directly manage their risks.

P2.20 Stakeholder Engagement in Health and Safety Risk Regulation

Bandle, A.M., Bristow, S., Golob, L. (Risk Policy Unit, Health and Safety Executive, United Kingdom)

The Health and Safety Commission (HSC) and Executive (HSE) are the regulatory authorities in Great Britain for risks arising from work activities. This is a wide remit, ranging from nuclear safety, through safety on the railways to work-related stress and work-related musculoskeletal disorders. There is, therefore, a wide range of stakeholders. HSC and HSE recognise the need to engage these stakeholders in framing and taking decisions about how the risks are regulated. This poster describes, with case studies from occupational health and from railway transport safety, how we undertake this task.

Tuesday Posters (continued)

P2.21 Adaptability to Global Climate Change by Adjusting Car Environment against Heat Stress

Sasaki, A., Fukushima, T., (Fukushima Medical University School of Medicine, Japan); Manomaipiboon, K. (Mahidol University); Uchiyama, I. (Kyoto University); Kabuto, M. (National Institute for Environmental Studies)

Countermeasures to the risk of global warming are required in running cars as common human environment. Temperature variations are inevitable due to dynamic heat exposure even in air-conditioned (AC) car. Unstable hot/cold air produces stress and fatigue resulting increased accidents during summer and extreme weather. Two cars either with or without heat insulating window film (F-car or non-F car) were compared during highway drive using temperature recorder, EEG and ECG, under constant AC. F car showed lower temperature in the ceiling, rear seat, and right arm than in non-F car. Sympathetic tone increased in non-F car drivers but not in F car drivers, though power spectrum of EEG (PS) showed only decrease during drive than rest reflecting subjective tension. Decreased solar radiation may contribute to homogeneous temperature resulting less AC load and stress to F car driver. It explains comfortable experience of heat insulating film beyond actual heat reduction.

P2.22 Comparing the Type, Quantity, and Availability of Risk Values Across Organizations

Wullenweber, A., Dourson, M., Maier, A. (Toxicology Excellence for Risk Assessment - TERA), (Presented by Jacqueline Patterson)

Risk assessors throughout the world use risk values to make important public health decisions. These risk values are developed by a variety of organizations and may differ due to scientific judgments, the mission of the organization, or the use of more recently published data. Additionally, different organizations develop different chemical priority lists and therefore, may derive risk values for different chemicals than other organizations. This analysis used risk values derived by Health Canada, the National Institute of Public Health and the Environment (The Netherlands), the U.S. Agency for Toxic Substances and Disease Registry, the U.S. Environmental Protection Agency, and independent parties to compare trends in the type, quantity, and availability of currently published risk values among organizations. For example, we find that there are risk values available from 3 or more organizations for 10 of the 20 Priority Hazardous Substances, often with different guidance values provided. We also find that for the majority of the roughly 600 chemicals in the International Toxicity Estimates for Risk (ITER) database, only a single organization has a risk value available. This analysis suggests the importance of being able to conduct side-by-side comparisons to both identify the availability of and to select risk values for application in public health decision-making.

P2.23 How EPA-HHRAP Protocol Could be Useful for Europe? A Belgian Prospective Point of View

Alexis Dutrieux (Atmpro)

The EC SEVESO Directives concern major accidental releases of chemical compounds. « Top tier » chemical companies have to build up together with authorities an efficient emergency plan. ATM-PRO provides its SEVEX Tools in order to identify realistic danger zones and build appropriate emergency response plan.

ATM-PRO performed a review of existing tools for assessing the human health impact of chronic industrial pollution. The Environmental Protection Agency (USA) developed a protocol called « Human Health Risk Assessment Protocol or HHRAP ». It provides guidance on how to conduct risk assessments for hazardous waste combustion units. It presents a user-friendly set of procedures for performing risk assessments including (1) a complete explanation of the basis of those procedures, and (2) a comprehensive source of data needed to complete those procedures.

The poster explains how « HHRAP » could be useful for Europe as being complementary to accidental release « packages ».

P3.1 Impact of Global Warming on Infectious Diseases in Japan Predicted by Non-linear Modeling

Urashima, M. (Jikei University School of Public Health, Japan); Okabe, N., Shindo, N. (National Institute of Infectious Diseases)

Over the course of this century, the Earth has warmed by about 0.5°, and mid-range estimates of future temperature change suggest an increase of 2.0° by the year 2100. Particularly in Tokyo, it has been noted that the ambient temperature during the summer months has been increasing dramatically. In this study, we attempted to establish nonlinear mathematical models in order to simulate increment effects of global warming on herpangina, hand-foot-mouth disease, influenza and Hemorrhagic Escherichia coli Enteritis, in Japan. These models quantified impacts of warmer climate conditions on number of herpangina, hand-foot-mouth disease, influenza and Hemorrhagic Escherichia coli Enteritis.

P3.2 Environmental Risk and The Precautionary Principle: A Bayesian View Applied to GMO

Aslaksen, I. (Statistics Norway)

In this paper we focus on the environmental risks associated with widespread adoption of genetically modified crops. Field releases of genetically modified crops may have irreversible consequences for the ecosystem, such as biodiversity loss, and the risk management needs to take these potential irreversibilities into account. The substantial uncertainty and lack of precise knowledge about the effects of genetic engineering imply that new approaches to assessing the uncertainties are needed. Recently, the precautionary principle has received widespread attention in decision making under uncertainty and threats of irreversible damage. We discuss policy responses to risk, in particular, how the precautionary principle may be applied in the risk management of GMO. In particular, we discuss Bayesian analysis as a means for improving the informational basis for decision making under large uncertainty about potentially irreversible effects on the ecosystem.

P3.3 Strategic Risks of Russia: Methodological Approach, Identification and Preliminary Assessment

Akimov, V., Lesnykh, V., Faleev, M. (The Center of Strategic Research, EMERCOM, Russia)

Different accidents, crises, catastrophes and disasters in principal can lead to national and international consequences. National scale risks, connected with sustainable development and national safety, are defined as strategic. The application of risk methodology on the crisis phenomena and catastrophes in modern Russia allows to develop base principles, methods and systems of identification, assessment and management of strategic risks. The study is focused on identification, assessment and forecasting strategic risks in Russia in the main areas of national activity: economical, political, social, ecological, industrial, R&D. The expert method mixed with fuzzy set approach has been used for strategic risks evaluation. Parameters of strategic risks can be used in the programs of socio-economic development of the country and its regions. Using estima-

tions and forecasting of strategic risks, the government can form a complex system of measures for strategic risk management on the given territory in a period of time.

P3.4 Pricing Default Swaps Including Reference Entity - Counterparty Default Correlation

Meissner, G.A. (Hawaii Pacific University)

In a default swap three parties are involved:

- a) The default swap buyer
- b) The default swap seller (counterparty)
- c) The insured entity (reference entity)

Jarrow Turnbull (1995), Jarrow Lando Turnbull (1997), Duffie (1999) and Hull-White (2001) laid the groundwork to value default swaps in the arbitrage free reduced form model environment. With a student of mine (Dima Ksendzovsky) I have developed a discrete model to value default swaps including reference entity - counterparty default correlation. The model is based on swap valuation techniques. One quadruple discrete tree represents the default swap payoff, one quadruple discrete tree represents the default swap payments. Solving the two equations resulting from the discrete trees for the default swap premium s , we derive a closed form solution for the fair (zero value) default swap premium. The model reduces to a standard default swap model when the counterparty default risk is zero. The model shows a minor impact on the default swap price if the default correlation between the reference entity and counterparty is zero. The model shows the strong impact on the default swap price for a positive default correlation between reference entity and counterparty.

P3.5 Comparison of Different Bus Types and Mortality Due to Fine Particulate Matter in Helsinki, Finland

Tainio, M., Tuomisto, J.T., Aarnio, P., Jantunen, M., Pekkanen, J. (KTL, Department of Environmental Health, Finland)

The Ministry of Social Affairs and Health presented us a question: "Would it be beneficial for public health, if buses in Helsinki metropolitan area would be converted to run with natural gas". This question was answered by estimating the long-term health effects to bus-derived fine particulate matter (PM2.5) emissions. Four bus types were compared in analysis. Average annual exposure to bus related PM2.5 was estimated by using data from an international exposure study. Dose-response functions were calculated by combining results from two large cohort studies. Emissions from busses were estimated to cause 23.4 (median) statistical deaths per year in year 2020 with the current fleet emission factor. Modern diesel buses showed 11.6 deaths per year, while diesel with filter and natural gas showed 5.9 and 3.4 deaths per year, respectively. A major uncertainty in the model derives from the uncertainty of potency differences of PM2.5 mass from different sources.

Wednesday Posters (continued)

P3.6 Communicating the Results of Risk Analyses

Visschers, V.H.M., Meertens, R.M., Passchier, W.F. (Universiteit Maastricht, Health Council of the Netherlands)

On the basis of risk communication practice and research, several scholars have developed insights in how information about a certain risk should be communicated to the public (see Covello, von Winterfeldt, & Slovic, 1987; Fischhoff, 1995; Keeney & von Winterfeldt, 1986; NRC, 1989; Sandman, 1994; Slovic, 2000; Weinstein & Sandman, 1993). Until now, overviews of the literature in this field have focused on situations that are problematic from a risk communication view: situations in which outrage is prevalent or can easily develop. However, risk communication often takes place when outrage is neither existent nor expected, and the problem consists of conveying the risks involved in an understandable way. To our knowledge, there is no overview that systematically reviews the findings and recommendations for such situations. In this poster presentation, the literature about risk communication for such situations is summarised and recommendations for risk communications are reviewed. These recommendations are supported and complemented by findings from a qualitative study on peoples reactions to press releases of a diversity of risks.

P3.7 Mexico City Co-Benefits: Air Pollution Health Risk Reduction from Greenhouse Gas Emission Controls

McKinley, G.A., Hojer, M., Zuk, M., Martinez, H., Fernandez, A. (Instituto Nacional de Ecologia, Mexico)

Mexico City is currently implementing its third air quality management plan. However, no risk assessments or cost benefit analyses have been used in the plan's development or implementation. Additionally, few opportunities for greenhouse gas (GHG) emission reductions have been analyzed. The Integrated Environmental Strategies' (IES) co-benefits study in Mexico City analyzes urban air pollution control strategies which will result in both significant local health benefits and substantial GHG emission reductions. We evaluate cost-benefit trade-offs and develop a reduced-form analysis tool for use by policy makers. We estimate that the accelerated retirement of taxis in the period 2003-2010 will save 35 to 52 lives per year, have a total health benefit to GHG relationship of 341 to 442 US dollars / ton C equivalent, and a cost to benefit ratio of 0.1 to 0.2, depending on the discount rate (3-7%) used. We present similar results for a range of control measures.

P3.8 Human Physiologically Based in vitro Digestion Models Simulating Fasting and Fed Conditions

Sips, A., Oomen, A., Versantvoort, C. (RIVM, The Netherlands)

We present in vitro digestion models reflecting the conditions of the gastrointestinal tract for the fasted and fed state of man in order to study the bioaccessibility of compounds from their matrix (dissolution in chyme). The method involves a three-step procedure simulating human digestion for the fasted or fed state in subsequently mouth, stomach and small intestines. Infant formula feedings were used as food and physiological based conditions i.e. composition of

media, pH and residence time periods typical for each compartment were applied. The effects of fasted vs fed conditions were studied on the bioaccessibility of different types of compounds from soil. The bioaccessibility of lead, cadmium, arsenic and benzo[a]pyrene from soil was on average 22%, 30%, 44% and 6%, respectively, for fasting conditions. The fed state had no or little effect on the bioaccessibility of the metals; bioaccessibility of benzo[a]pyrene was 3 to 8 fold increased.

P3.9 Risk Assessment in Children: Role of Pediatric PBPK Models

de Zwart, L.L., van Engelen, J.G.M., Wolterink, G., Sips, A.J.A.M. (National Institute of Public Health & the Environment, The Netherlands)

Risk assessment for drugs is based on another approach than that for other xenobiotics. For drugs an NOAEL is obtained in animals. Subsequently a safety margin can be calculated. A pediatric PBPK-model should help finding the dosage that results in a similar internal exposure in children as in adults. Subsequently, young animal models might be necessary to study effects on developing systems. In risk assessment of other xenobiotics the NOAEL is estimated from toxicological studies in animals. A TDI (tolerable daily intake) is derived using assessment factors for intra- and interspecies differences. This factor for intraspecies differences should also cover the differences between children and adults. Since for pharmaceuticals human data are available it is worthwhile to extrapolate the results in this area to other xenobiotics. Full adjustment of dosing of pharmaceuticals based on pharmacokinetic differences can be seen as a first step in quantifying risk for the pediatric population.

P3.10 Environmental Enforcement in Russia

Kharchenko, S.G., Alakhverdov, G.G. (Russian Academy of State Service at the President of Russian Federation)

The main problem of environmental safety in Russia is to increase effects of public participation in environmental decision-making through analysis of the work of Russian law-enforcement structures in the sphere of environmental safety, and to develop cooperation of local and federal governments and their law-enforcing structures (environmental police, state marshals, federal courts, environmental inspections) with community and non-governmental organizations. Since 1996, when Moscow Ecological Police was established, in the Russian Government and Parliament discussions about a role and place of law enforcement forces in the field of maintenance of ecological safety do not cease. For the last years the ecological police have appeared in several regions of Russia, but till now its activity meets great difficulties and resistance from Federal and local government representatives. To considerable degree difficulties which ecological police face are connected with its attempts to stop breaking of the law in the field of natural resources using.

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P3.11 Environmental Risk on the Working Military Grounds

Ignatavičius, G. (Vilnius University, Lithuania)

Military trainings on the military grounds as type of the human activity and herewith as type of anthropogenic activity to the Environment have many-sided impact for the total ecological complex. It is necessary to note that this impact is not only negative, but also, due to imitated attainability and specific activity, it has and very important positive account for the protection of valuable habitats and biodiversity.

In this report we would like to stop on the negative impact and especially on the potential risk rising for the nature and human health. Firstly, it is necessary to determinate, what in the military grounds exist the two main sources of the environmental risk:

1. Risk rising from the military activity;
2. Risk rising from the military infrastructure;
3. Other kinds of risk.

All of them have specific dimensions of potential risk. Therefore, the first and the most important task for military is the clear and correct determination of potential risk, not only for soldiers, but also, and this are no less important - for environment. After determination of potential risk, the next step is selection and realization measures for risk maximal reduction. But ipso facto those measures must be realistically evaluated and sustainable as for environment so for maximal effective military training too.

This poster presentation is predicted to make review about existing kinds of risk and possibilities to solve those problems in Lithuanian military grounds.

P3.12 GreenFacts Foundation - Communicating Scientific Facts on Health and the Environment

Zaruk, D. (GreenFacts Foundation)

GreenFacts Foundation publishes scientific information on health and environment issues in a language accessible for non-specialists. Its objective is to ensure that opinion leaders (policy-makers, journalists, teachers) and stakeholders can understand the information made available by authoritative scientific organizations. With better communication of the scientific facts, the perception of risks will be clearer and environmental debates will be more rational, leading more sustainable policy decisions. GreenFacts presents its documents on the Internet (www.greenfacts.org) as summaries in FAQ form. Non-specialists don't have time to read long, complicated documents, so the summaries are presented in three levels of increasing detail, starting with a brief summary of a few lines on Level One, more details in Level Two, and the source document on Level Three. GreenFacts has also developed a toolbox application so supplementary information (graphics, glossaries, references) can always be accessible on screen.

P3.13 A Tool to Facilitate an Understanding of How Dynamic Risk Perception Determines Acceptable Risk

Chesney, P., Cannibal, G., Baines, R. (University of Derby, England)

The conceptual basis for the modelling-tool is a transition from the traditional paradigm of rationalist and objective risk assess-

ment to a more interdisciplinary and holistic definition of risk that entails the incorporation of the relevant social values of risk perception from the very initiation of the decision-making process. The aim of this is to allow decision-makers, from the early stages of the decision-making process, a better understanding of how society may emotively respond to potentially hazardous event scenarios over time. It is hoped that the early recognition given to these social values will allow sufficient time for such concerns to be incorporated into, and reflected within, policy-relevant decisions. The risk-modelling tool has been developed using the STELLA software package and has been calibrated to past risk case studies to facilitate the process of model evaluation, modification and validation.

P3.14 Step by Step Guide to Iatrogenic Risk Analysis in Hospital

de Marcellis-Warin, N., Dufour, G. (CIRANO)

Iatrogenic risks are defined as injuries caused by medical management rather than by the underlying disease or patients condition. Empirical studies estimated at least 44 000 iatrogenic deaths from hospitalization each year in the US. Seventy percent of the iatrogenic injuries were due to error, not negligence. The most common types of human errors in medicine are procedural errors, errors of planning, decision errors, technical errors, communication errors and failures to prevent injury. High error rates are most likely in intensive care units, operating rooms and emergency departments. The salient causal factors in iatrogenic injury are systemic features. The numerous interactions with each other and with the equipment, the fact that each independent speciality operates without coordinating more with the others show us the complexity of such a system. We will present a step-by-step guidance about how to conduct a risk analysis in hospital.

P3.15 Environmental Risk Perception and Perceived Benefit among Residents and Workers in Industrial Area

Lim, Y.W. (Seonam University); Shin, D.C., Kim, M.H., Hwang, M.S. (Yonsei University, Korea)

Environmental risk perception and perceived benefit among residents and workers in industrial area Abstract Recent research indicates that social trust of those who manage a hazard is strongly correlated to judgements about the hazard's risk and benefits. This paper investigates differences, relationships and related factors of environmental risk perception and perceived benefit about 10 products manufactured among residents and workers in industrial area. A self-administered questionnaire survey using a structured instrument was carried out to residents and workers in industrial area during April, 2002. Total number of participants were 657 including 329 residents and 328 workers.

There was difference in environmental risk perception, knowledge and trust in authorities and perceived benefit among residents and workers. Especially, trust in authorities and perceived benefit were statistically significant difference among residents and workers. Inverse relationships between environmental risk perception and perceived benefit have been observed for different products. In

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other words, the greater the perceived benefit, the lower the perceived risk, and vice versa. According to the results, people having high trust in the authorities perceived less risks than people having low in the authorities.

To improve the communication of risk information, further study focus on assessment of experts, government and stakeholders in industrial area. Methodologies of this study can be used as the basis for investigating the structure of public perception of environmental products risks and benefit, designing a public information and risk communication program, and developing policy actions to improve acceptance.

P3.16 Inhalation Exposure Assessment Supporting Local Management of Risks Due to Atmospheric Pollution

Soggiu, M.E., Bastone, A., Rago, G., Masciocchi, M., Vollono, C. (Istituto Superiore di Sanità, Italy)

A quantitative assessment of inhalation exposure was performed in an Italian municipality characterised by industrial and urban atmospheric pollution causing high levels of pollutants concentration, worsened by adverse local meteorological conditions. A probabilistic approach was used identifying variables relevant in inhalation exposure and collecting the related data in order to describe individual exposure patterns and quantify inter-individual variability. This was performed through a survey, based on questionnaires and activity-diaries administered to a representative population sample, collecting data on behaviours, lifestyles, indoor/outdoor daily activities and housing characteristics. These data associated with monitored pollutants concentrations allowed evidencing differences in exposure among population subgroups (children, adolescents, adults, elderly) and identifying variables relevant in determining risk. Results lead to map local risks due to atmospheric pollution, to identify at-risk groups and to support local authorities in defining environmental policies and quality standards, aimed at promoting environmental sustainability (Life-Environment, Agenda21).

P3.17 “Safe Motherhood Initiative”- Anthropological Analysis of Risk Concepts in Health Reforms in Africa

Arborio, S.C (Nuffield Institute for Health- International Development, United Kingdom)

In the transitive context of Health System Reforms (HSR), risk concept represents a shared concern between the diverse levels of health management. The “Safe Motherhood Initiative” (SMI) involves various perceptions, priorities and actions according to political, managerial, professional and consumer levels. An anthropological approach, based on local context surveys in Mali allows understanding of the concepts of risks, uncertainties and trusts involved in SMI. The scientific objective highlights the process of negotiation which characterizes risk management between the diverse levels of HSR. This process involves not only statistical and objective risk analysis but also individual experiences and socio-cultural values that all interact in a concrete situation of maternal care. Methods are

based on literature review and qualitative investigation (50 semi-structured interviews and in situ observation) according to policy-maker, manager, practitioner and consumer levels. The expected outcomes target the development of appropriate community based interventions for Safer Motherhood and improvement of human resources management.

P3.18 Planning the Industrial Maintenance for Sustainable Development: Accounting and Decision Support

Obolenskaya, J. (All-Russian Extra-Mural Institute of Finance and Economics, Russia)

The planning of sustainable development for any local industrial system requires particularly provide desirable maintenance policy that allows minimising the probabilities of accidents with significant consequences and simultaneously limiting the financial losses due to maintenance costs. In other words, it becomes necessary to find a compromise between desire to reduce the number of dangerous events and the amounts of investments funding the repairs for not only critical equipment failures but also the degraded ones. Final decision in such conditions can be made only involving accounting results as well as the statistical models characterising risks for the system service process. As to the process mentioned it can be frequently represented by the time periods for on-line regimes, diagnostic tests (to check the system state), preventive maintenance (if some degraded failures have been recognised by the tests) and corrective maintenance (as the results of critical failures). Of course, costs of various kinds of operations (tests, preventive or corrective maintenance) are different and they also give different contributions to total risk reduction. Statistical model for this problem should describe the dependency between the maintenance operation costs and conditional probabilities of the accidents. The paper deals with the transformation of probabilistic technique based on this model to the methodology for decision support. The author considers how to organise accounting for definite system service and also how to accomplish the treatment of its results for giving decision maker any possibility to combine financial data with statistical values reflecting the equipment failures and finally to see the ways for decreasing average expenses. The main ideas of the paper have been implemented into the algorithmic procedures that can be used in industrial system creation projects.

P3.19 Risks in the Built Environment: Who Decides?

Corotis, R. (University of Colorado)

Constructing the built environment involves choices that alter nature, bringing utility, but affecting risk and sustainability of both environments. Views of structural code engineers must be recast in terms of implied considerations within those tradeoffs. Particularly important are concepts of sustainability and the role of mathematical versus perceived risk. The degree of acceptable risk, role of immediate benefit versus future risk reduction, and alternatives of safety and services are issues for all of society, not just engineering professionals. Risk itself must be recast in measures used by society

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to evaluate alternatives, including risk versus uncertainty. The last decade has seen mathematical theories to determine lifetime management for civil infrastructure systems. But the issues of risk perception and the political processes that lead to decisions have not been adequately addressed. There, the perception of the real value of the infrastructure and immediate return-on-investment have substantially more impact than future cost savings.

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Baltimore, Maryland
23rd Annual Meeting

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