



European Association for Promotion of Science and Technology (EuroScience)

International Union of Geodesy and Geophysics (IUGG)

NATO Advanced Research Workshop

“Risk Science, Society and Sustainable Development”

August 26-27, 2004
Stockholm, Sweden

The EuroScience Working Group “Science and Urgent Problems of Society” and the Committee on Geophysical Risk and Sustainability of the International Union of Geodesy and Geophysics are organizers of the Stockholm workshop on risk science, society and sustainable development.

The ARW is held in the framework of the EuroScience Open Forum (ESOF2004, <http://www.esof2004.org>), the first pan-European scientific meeting ever staged, to provide an interdisciplinary forum for open dialogue, debate and discussion on science and technology in society.

The workshop is a second meeting of distinguished experts in problems of risk science and sustainable development. The first ARW sponsored by NATO, EuroScience and IUGG was held in Budapest, Hungary, 15-16 June 2002, and proved to be quite successful.

Programme Committee

Jean-Patrick Connerade, President, EuroScience

Uri Shamir, President, International Union of Geodesy and Geophysics

Organising Committee

T. Beer (IUGG), Australia

A. Ismail-Zadeh (EuroScience & IUGG), co-Director, Russia/Germany

F. Praderie (EuroScience), co-Director, France

WORKSHOP
Risk Science, Society and Sustainable Development

P R O G R A M M E

1st day

Thursday August 26, 2004

Room 356 at Norra Latin

Convener: A. Ismail-Zadeh

- 14:45-15:00 A. Ismail-Zadeh (Karlsruhe University, Germany; Russ. Acad. Sc., Moscow, Russia)
Introduction to Problems of Risk and Sustainability
- 15:00-15:30 A. Makarenko (National Technical University, Kiev, Ukraine)
Methodologies for Risk Evaluation in Large Heterogeneous Systems
- 15:30-16:00 E. Kontar (Russian Academy of Sciences, Moscow, Russia)
Maritime Geophysical Risks and Sustainability
- 16:00-16:15 Break
- 16:15-17:00 General discussion on risk, society, and sustainability
(discussion leaders: T. Beer and A. Ismail-Zadeh)
- 17:00-17:45 Joint business meeting of the IUGG GeoRisk Commission,
the Natural Hazard Society, and EuroScience WG “Science
and Urgent Problems of Society”.

WORKSHOP
Risk Science, Society and Sustainable Development

P R O G R A M M E

2nd day

Friday August 27, 2004

Room 361 at Norra Latin

Convener: T. Beer

- 9:30-9:45 Addresses given by representatives of the EuroScience
(J.-P. Connerade, President) and IUGG (U. Shamir, President)
- 9:45-10:15 G. Papadopoulos (Natl Observatory of Athens, Greece)
Earthquake Hazards and Mitigation Efforts in the Mediterranean Area
(Rammal Award Lecture)
- 10:15-10:45 T. Beer (CSIRO Environmental Risk Network, Aspendale, Australia)
Environmental Risk Management
- 10:45-11:15 F. Wenzel (Karlsruhe University, Germany)
Megacities - Megarisks
- 11:15-11:30 Break
- 11:30-12:00 P. Wiedemann (MUT Research Centre Juelich, Germany)
*Risk and Sustainability: Mutual lessons from approaches
to the use of indicators.*
- 12:00-12:30 J. Paterson (University of Westminster, London, UK)
*Sustainable Development and the Precautionary Principle:
Lessons from Law?*

ABSTRACTS

Environmental Risk Management

Tom Beer

The problems of environmental risk management will be discussed within the Budapest Manifesto framework using an Australian case study of emissions from biofuels. A recent major study, available at www.industry.gov.au, examined the “Appropriateness of a 350ML Biofuels Target”. The concerns relate to the environmental, economic and social appropriateness of a political promise to produce 350ML of biofuels by 2010. The consequences examined were greenhouse gases, air pollution and health, and regional employment. Life-cycle calculations of emissions were combined with road transport projections and economic modelling. The certainties, uncertainties and probabilities involved in the calculations were evaluated and displayed as probability distributions of the health costs. The costs of greenhouse gas abatement, and job-subsidies were compared with criteria - in particular the requirement by the Australian Greenhouse Office that greenhouse gas abatement projects should achieve abatement at less than \$10 per tonne. Risk control, in this case, primarily involved the political risk to the organisations involved in generating a report that had findings unfavourable to the biofuels industry. Communication was through the traditional publication channels (via the web), but also through leaked drafts of the document, Parliamentary speeches and press releases.

Dr. T. Beer, *Ph.D., D.Sc.* is vice-president of the International Union of Geodesy and Geophysics (IUGG) and chair of the IUGG Commission on Geophysical Risk and Sustainability. Dr Beer coordinates the CSIRO Environmental Risk Network. He is an international expert on environmental risk, including greenhouse gas and air quality issues and particularly their application to transport. He was part of the team that won the CSIRO Chairman’s medal in 2000 with his component being the analysis of greenhouse gas emissions from hybrid electric vehicles. He has led teams to undertake life-cycle analyses of the atmospheric emissions from the use of alternative fuels in vehicles.

Maritime Geophysical Risks and Sustainability

Evgeny Kontar

The assessment of the potential of geo-hazards and their risks to populated areas is becoming an important domain of scientific research and mitigation management. Shelf zones are quickly becoming new major areas of industrial technological development owing to growing population in maritime regions and vast natural resources such as fish, oil, and gas available in these areas. Therefore, understanding risks of natural and human-made hazards in these areas contributes to strengthening the scientific and technological basis of a number of industries including oil/gas production and transport. Traditional ways to evaluate risks of earthquakes and tsunamis (e.g., through analyzing historic data) are often not comprehensive enough and may result in lower estimates of the actual risks of these hazards, while a combined approach developed recently at the We will concentrate in this talk on the new mehtods in risk evaluations of submarine contaminated groundwater discharge, saltwater intrusion, coastal zone earthquakes, landslides, and tsunamis in the Mediterranean, Black, and Caspian seas. This information can be introduced targetting potential risk groups, including local authorities and the general public, to enhance general risk awareness.

Professor E.A. Kontar *is a head of the Laboratory for Experimental Methods at the P. P. Shirshov Institute of Oceanology, Russian Academy of Sciences, Moscow, and a professor of Marine Geoecology and Engineering at the Moscow State Geological and Prospecting University. He received his PhD and DSc degrees in Moscow. He is a member of the Russian Academy of Natural Sciences and serves for a number of national and international committees and commissions in Earth Sciences.*

New methodologies for risk evaluation in large heterogeneous systems

Alexander Makarenko

New methodologies are necessary for considering the problems of risk evaluation in large-scale systems with many different parts: natural, technical, biological, and social. The variety of scenarios is essential property of such systems. Consequently, the risk evaluation can be done with event probability evaluation and system trajectories. I consider a promising approach accounting for a human factor in decision making, which is based on new neuronal networks models for large heterogeneous systems. As one of illustrative examples I consider the large energetic plant operating. It concerns the problem of imitation of personal functions and their decision-making. The approach can help to consider different scenarios of functioning in critical and normal situations. An important problem is the description of large systems as the whole complex object. The approach to probability evaluation of initial element failures of and its influence on continuing of the processes should be discussed.

Professor A. Makarenko, born 1951, PhD, DSc, graduated from the Moscow Physical and Technical Institute (MFTI), is now a vice-chair of the Department of Mathematical Modelling at Institute for Applied System Analysis, National Technical University, Kiev, Ukraine. His research interests cover mathematical modelling of global processes in large socio-economical systems; modelling and prognoses of geopolitical relations; problems of science, technology transfer and education; modelling of radionuclide spreading after Chernobyl, floods modelling, ecological problems; sustainable development problems.

Earthquake Hazards and Mitigation Efforts in the Mediterranean Area

Rammal Award Lecture

Gerassimos Papadopoulos

Earthquakes and associated phenomena in the Mediterranean area constitute the most important hazardous phenomena of geological nature. Large seismic events, earthquake induced landslides and other ground failures as well as tsunamis are the main components of the seismic hazard. Some of them are of only local impact. Others, however, like strong shallow and intermediate-depth earthquakes and strong tsunamis, may have a large area of impact, which exceeds national borders. Frequently the extent of destruction creates urgent needs for international mobilisation to support rescue operations and provide humanitarian help. In the long-term sense the international collaboration in education and research, know-how exchange and civil protection management increase drastically the capacity for the seismic hazards mitigation. Successful examples of collaboration between scientific and civil protection units in the Mediterranean area are described.

Professor G. Papadopoulos born in 1951 in Greece did his PhD in Geophysics (1982), Univ. of Thessaloniki, Greece. He was a postdoc at M.I.T., USA (1984), senior researcher at the Earthquake Planning and Protection Organisation, Athens (1985–1994), visiting researcher at the Natl. Research Center for Earth Science & Disaster Prevention, Tsukuba, Japan (1993). Now he is a Research Director (since 2002) of the Inst. of Geodynamics, Natl. Observatory of Athens and Adjunct Professor, Dept. of Civil Engineering, Hellenic Air Force Academy, Athens (since 1983). His research interests are on instrumental and historical seismicity, earthquake prediction and tsunamis. He is a Chairman of the International Natural Hazards Society and a Chairman of the ESC Subcommittee on Earthquake Prediction. He is 2002 EuroScience Rammal Awardee.

Sustainable Development and the Precautionary Principle: Lessons from Law?

John Paterson

One of the key foundations of sustainable development is the precautionary principle – a concept that has given rise to a considerable amount of controversy. For some, it is a barrier to technological progress, for others a means of preventing potentially harmful applications of science. What does this principle actually mean? What is its contribution to sustainable development? How should it be applied? This paper will consider whether an examination of the relationship between science and law can assist in answering questions such as these, and thus provide some greater clarity about this important principle.

Dr. J. Paterson is Reader in Law at the School of Law, University of Westminster, London, UK. He has worked on a number of research projects in the field of risk governance and acts as a consultant for the OECD Nuclear Energy Agency. Recent publications include 'Trans-science, trans-law and proceduralization', *Social and Legal Studies*, 12:4, 523-543.

Megacities - Megarisks

Friedemann Wenzel

Megacities as large urban agglomerations of people and infrastructure are at the same time sites of rapid development and new opportunities but also places of high risks for sustainable development. Conversely, there can be no sustainable development if urban exposure to natural hazards is not significantly reduced. Various factors contribute to the increase of megacities vulnerability including: High population exposure due to concentration of housing in below standard construction, complex and aging infrastructure; dependence of population welfare on proper functionality of lifeline systems such as transportation, power, water, and communication; lack of robustness of critical facilities such as public health, public safety and educational facilities; weaknesses of preparedness programs and response and relief capabilities. Because of the speed of change in large cities the key challenge for risk reduction is a dynamic approach that takes temporal changes of hazards, vulnerability and exposure appropriately into account. Megacities must be understood as entities where everything is highly variable in time and everything is interacting in a complex non-linear way. As urban growth will determine human development of the next decades understanding and managing risks in megacities will become a key challenge.

Professor F. Wenzel *born in 1951 in Germany did his PhD in Geophysics in 1985. After several years in the U.S. and Australia he became a Professor at University of Karlsruhe in 1994. Research interests include interdisciplinary approaches towards earthquake disaster mitigation. He is a vice-chair of the German National Disaster Reduction Committee (DKKV) and Executive Board Member of the 'Earthquakes and Megacities Initiative'.*

Risk and Sustainability: Mutual lessons from approaches to the use of indicators

Peter Wiedemann

Risk management and sustainable development are two strategic frameworks currently utilised for studying and managing the environmental consequences of human actions. This paper seeks to analyse and compare the two frameworks by focussing on their use of indicators. In each case two similar questions arise, in the context of environmental and health-related decision making: How safe is safe enough? And how sustainable is sustainable enough? Expressed in this way, it becomes clear that risk management and the promotion of sustainable development include a series of comparable tasks: to identify hazards, to quantify the potential losses, to develop criteria for what is meant by safe enough or sustainable and to communicate about this with the public or other users of information. In the communication process, one crucial task is to indicate risks or sustainability in order to help increase knowledge about the state of environmental and health related problems and what is proposed for their remediation or mitigation. Consequently the selection of appropriate indicators is of practical importance in both areas. Thus the approach here is to learn both by comparing the 'core' of each field, and by applying work on risk indicators and examining current developments in risk management. More detailed criticism of each field is certainly also necessary, but cannot easily be discussed in the space of this article, and we hope that our relatively 'wooden' portrayal of the two fields at the start of this article will be found acceptable for the above purposes.

Professor P. Wiedemann, Ph.D., is the Director of the Program Group MUT (Humans, Environment and Technology) at the Research Center Juelich, Germany. Dr. Wiedemann has served as a member of the WHO task force on risk communication (1992-1994), and as the speaker of the Scientific Expert Group of the National Action Program "Environment and Health" (1998-2000), was head of the working group "Risk Communication" of the German Association of Engineers (VDI) and contributed to the "OECD Issue Team on Risk Communication" in 2000. In 2002-2003 he has been president of the Society for Risk Analysis Europe. Dr. Wiedemann's research focuses on bridging the gap between risk perception research and risk communication on the one side and risk analysis and management on the other side. His current research interests include the application of comparative risk assessment, uncertainty analysis, and evidence assessment to provide a basis of sound science for the application of the precautionary principle.