

Process studies for rockfall, glaciers and permafrost, snow, avalanches, slope movements, hydrology of unstable terrain, debris flow, floods, wind, hail, geological hazard, drought

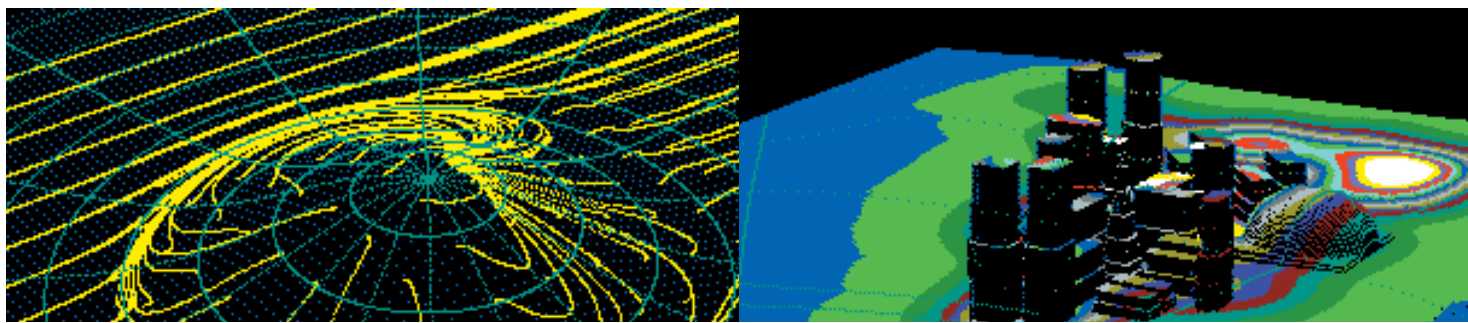
- Institute of Geotechnical Engineering, ETH Zurich
- Laboratory of Hydraulics and Glaciology, ETH Zurich
- Institute of Rocks, Foundation and Soil Mechanics, ETH Lausanne
- Laboratory of Geology, ETH Lausanne

Climate change, modeling of variability and predictability of climate, satellite monitoring

- Laboratory for Atmospheric Physics, ETH Zurich
- Institute of Geography, University of Berne
- Institute of Geography, University of Fribourg

Technical risks

Modeling and software development for assessment, evaluation, management and representation of technical risks for process industries and stor-



- Swiss Federal Institute for Forest, Snow and Landscape Research, WSL Birmensdorf
- Swiss Federal Institute for Snow and Avalanche Research, SLF, Davos
- Land and Water Use Laboratory, ETH Lausanne
- Institute of Geography, ETH Zurich
- Institute of Hydraulics and Energy, Hydraulic Constructions, ETH Lausanne
- Institute of Geology, University of Fribourg
- Centre d'Etude des Risques Géologiques (CERG-UNIGE), University of Geneva
- University of Applied Sciences, Rapperswil

Bush and forest fires, ecological impact studies, sustainability, soil erosion, risk analysis and management, forest hydrology, climate and vegetation, forest as rockfall and avalanche protection

- Swiss Federal Institute for Forest, Snow and Landscape Research, WSL Birmensdorf
- Department of Forest and Wood Science, ETH Zurich

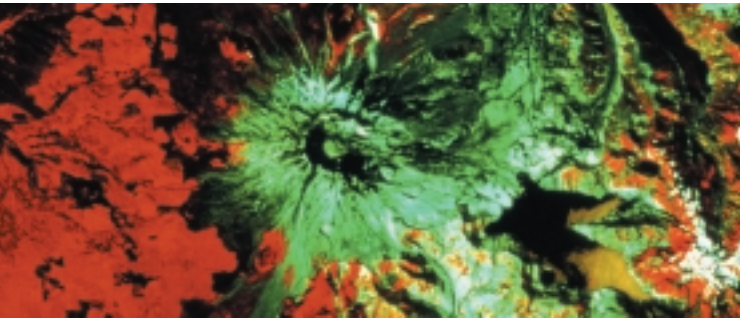
Socio-economic studies, public perception, political strategies, risk management

- Institute of Economic Research, University of Lugano
- Institute for Economic Research, ETH Zurich

age, power generation technologies (including nuclear safety), transportation of hazardous materials, waste management, complex infrastructure systems; integration of the GIS (Geographical Information Systems) and GPS (Geographical Positioning Systems) technologies into Integrated Decision Support Systems (IDSS); life cycle analysis (LCA), sustainability, cost optimization, legal/regulations-related issues; research, training, university education, consulting engineering and design, security, financial and socio-economic risk management-related issues.

- KOVERS (Competence Center for Technical Risks ETH) including Paul Scherrer Institute, ETH Zurich and EAWAG Dübendorf
- Center for Security Studies, ETH Zurich
- Institute for Economic Research, ETH Zurich
- Risk Lab, ETH Zurich
- Swiss Federal Institute for Snow and Avalanche Research, SLF, Davos
- University of Applied Sciences, Rapperswil

Virginia Tech is the leading science and technology institution of the Commonwealth of Virginia. The university links basic research in the natural and social sciences and engineering to applications in the service of public safety and social protection.



Virginia Tech has broad, multidisciplinary capability and experience in natural and technological disaster management. In the geological sciences the University supports the Virginia Tech Seismological Observatory and the Center for Water Resources Research. In engineering the university supports the Center for Environmental and Hazardous Materials Studies, and Virginia Tech is the lead institution for the Wind Hazard Mitigation Consortium, an organization of 10 U.S. research universities active in wind engineering research. Issues of critical infrastructure protection are addressed in the work of the Virginia Tech Center for Transportation Research, the Center for Power Engineering and the Center for Wireless Telecommunications. Associated with the University is the Waste Policy Institute which assists the Department of Energy in the management of hazardous waste materials. Scientific and technical research findings are translated into meaningful policy consideration through the work of the Center for Public Administration and Policy and the Center for Housing Research. Research applications, training and outreach related to international development are supported and coordinated at the University by the Office of International Research and Development. The Virginia Cooperative Extension Service has also played an active role in disaster damage assessment and public information for disaster mitigation, preparedness and response in Virginia.

Virginia Tech Seismological Observatory

The Virginia Tech Seismological Observatory maintains a seismic instrumentation array in Virginia and is a primary center for the study of the seismicity of the southeastern United States. The Observatory has prepared seismic risk maps for the Commonwealth and the region as well as detailed studies of historical seismicity.

The Center for Water Resources

The Center for Water Resources has evaluated the flood hazard throughout the Commonwealth and has been instrumental in the evaluation of mitigation techniques and risk reduction measures associated with flood insurance.

The Center for Environmental and Hazardous Materials Studies

The Center for Environmental and Hazardous Materials Studies has taken a leading role in environmental hazard assessment and environmental remediation. The Center has also contributed to environmental hazard awareness and risk communication.

Center for Energy and the Global Environment (CEAGE)

CEAGE combines the resources of faculty members and students from six departments at Virginia Tech to address global problems of energy and sustainable development. Research activities are currently focused on global warming resulting from the use of fossil fuels for power generation and transportation. Consequences of climate change and changing patterns of risk are also considered by the center.

As a land grant university Virginia Tech has extensive experience in technology transfer related to local and regional economic and social development.

The Virginia Tech Center for Transportation Research

The Virginia Tech Center for Transportation Research is leading cutting edge research in highway transportation safety related to the "Smart Road" research facility. The Center has pioneered the development of post-disaster traffic management and control techniques.

International Institute for Critical National Infrastructures

The International Institute for Critical National Infrastructures is a multi-national, multi-university consortium to bring about integrated development of the three critical infrastructures: electric power networks, communications networks and computer networks which are essential for the functioning of modern societies. The institute has initiated research on assessment, control and restoration of the electric power grid following catastrophic disturbances and on innovative technologies for defense against catastrophic failures of complex interactive power networks. The founding members of the Institute are Virginia Tech, Institut National Polytechnique de Grenoble, Hong Kong University, Hong Kong Polytechnic and EnerSearch, Sweden.

The Center for Wireless Telecommunications

The Center for Wireless Telecommunications combines the development of new telecommunications technology with the analysis of regulatory and business consequences. The Center is currently managing the development of LMDS based systems in Southwestern Virginia and the development of Disaster Management Information Systems for disaster response and mitigation.

The Center for Public Administration and Policy

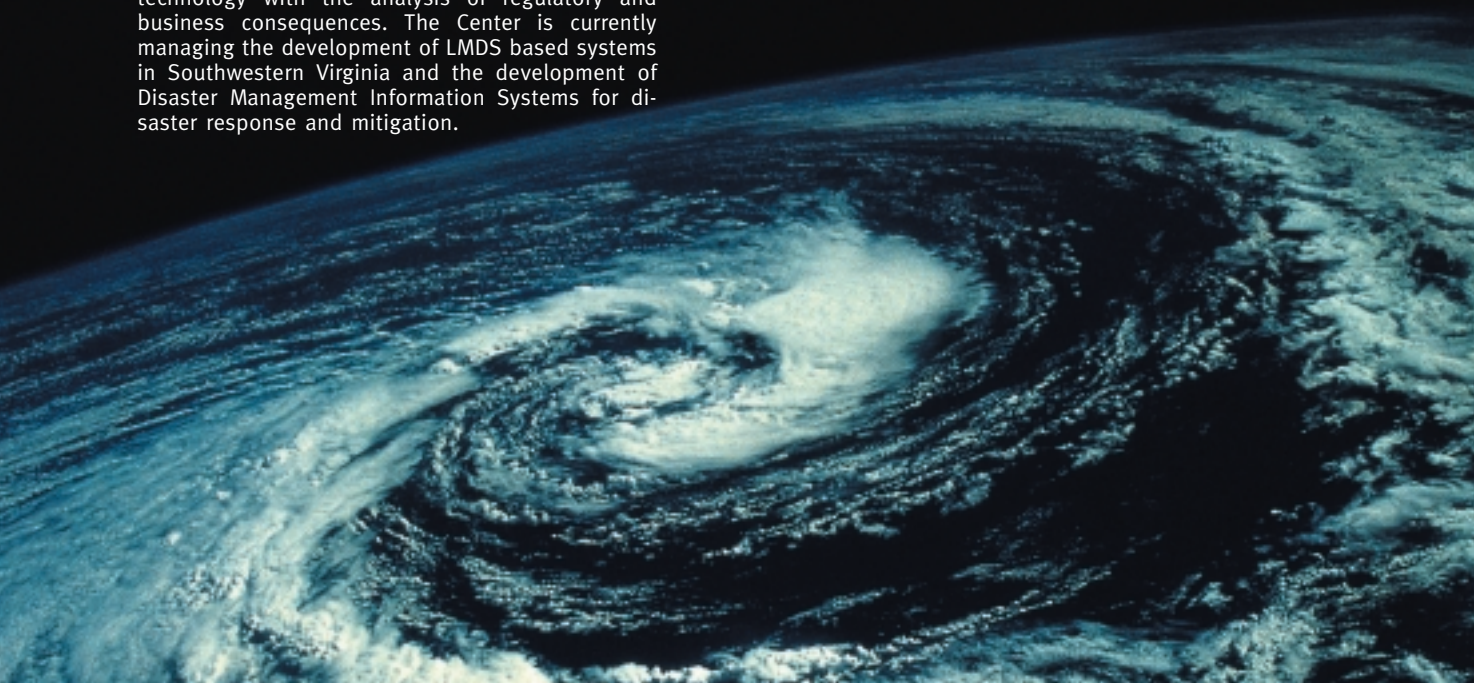
Faculty members of the Center for Public Administration and Policy have led key policy review for the Federal Emergency Management Agency and carried out research on the structure of organizations tasked with emergency response responsibilities.

The Waste Policy Institute

The Waste Policy Institute is associated with the University in the Virginia Tech Corporate Research Center. The Institute plays a major role in environmental remediation and public safety related to the nuclear energy and weapons industries.

Financial Risk Management Center (FRMC)

FRMC is a center of the Department of Finance of the Pamplin College of Business at Virginia Tech. The center provides a source of timely scholarly research and education on major issues related to the global market for derivatives, including futures, forwards, swaps and options. In both research and education the center's activities bring together leaders from academe, government and business to address key issues and problems associated with financial risk. Securitization of risk is a topic of critical importance to disaster risk management.





*The affiliated institutions of the **DRM** network are committed to knowledge development, transmission, and application in the field of disaster risk reduction and sustainable development.*

University of Texas at Austin (USA)

The *Department of Civil Engineering* has strong graduate programs in both Civil and Environmental Engineering. A number of centers and laboratories provide the facilities and staff to support research activities in disaster risk management related disciplines, like the Center for Research in Water Resources (CRWR), Center for Transportation Research (CTR), Construction Industry Institute (CII), Ferguson Structural Engineering Laboratory (FSEL), Geotechnical Engineering Center (GEC), Center for Energy and Environmental Resources (CEER), Construction Materials Research Group (CMRG), Environmental Solutions Program (ESP), International Center for Aggregates Research (ICAR).

London School of Economics (UK)

Centre for the Analysis of Risk and Regulation. The LSE has established the Centre for the Analysis of Risk and Regulation in recognition of the need for basic, interdisciplinary research in the area of risk management and risk regulation. This need is reflected in a growing academic interest from a number of disciplines regarding the analysis of processes underlying risk production, perception, management and regulation. It is also both a response to shifting corporate and governmental responsibilities and to the evolution of professional practice in risk management and regulation.

A significant part of the Centre's activities will be aimed at facilitating knowledge exchange between different organizations, fostering cross-fertilization regarding professional risk management and regulatory practices and creating an independent community of knowledge in this field that intersects economic sectors, professional backgrounds and disciplinary boundaries.

Max Planck Institute (Germany)

The *Global Fire Monitoring Center (GFMC)* located at Freiburg University monitors, forecasts and archives information on vegetation fires (forest fires, land-use fires, smoke pollution) at global level. The information thus generated supports decision-makers at national and international levels in evaluating fire situations or precursors of fire which potentially endanger humans or may negatively affect the environment.

George Washington University (USA)

Institute for Crisis, Disaster and Risk Management
The Institute organizes interdisciplinary research in engineering, social and behavioral science, public health and emergency medicine. The Institute also provides graduate level instruction at the masters and doctoral levels. George Washington University collaborates with Virginia Tech in the Joint Center for Disaster and Risk Management.

Bogazici University (Turkey)

Kandilli Observatory and Earthquake Research Institute. The Earthquake Research Institute and the School of Engineering are actively involved in a range of hazard and vulnerability assessment activities throughout Turkey. Urban loss estimation methodologies have been developed and applied. Current work is focused on the reconstruction following the August 1999 Kocaeli earthquake and risk reduction measures for the Istanbul region.

University of Buenos Aires (Argentina)

Center for Research and Transfer of Appropriate Technology (CITTA). The Center has taken a leading role in the development of architectural and urban planning techniques for the reduction of disaster risk. Recent work in conjunction with the World Bank has focused on the reduction of consequences of urban flooding in Argentina.

University of Hong Kong (China)

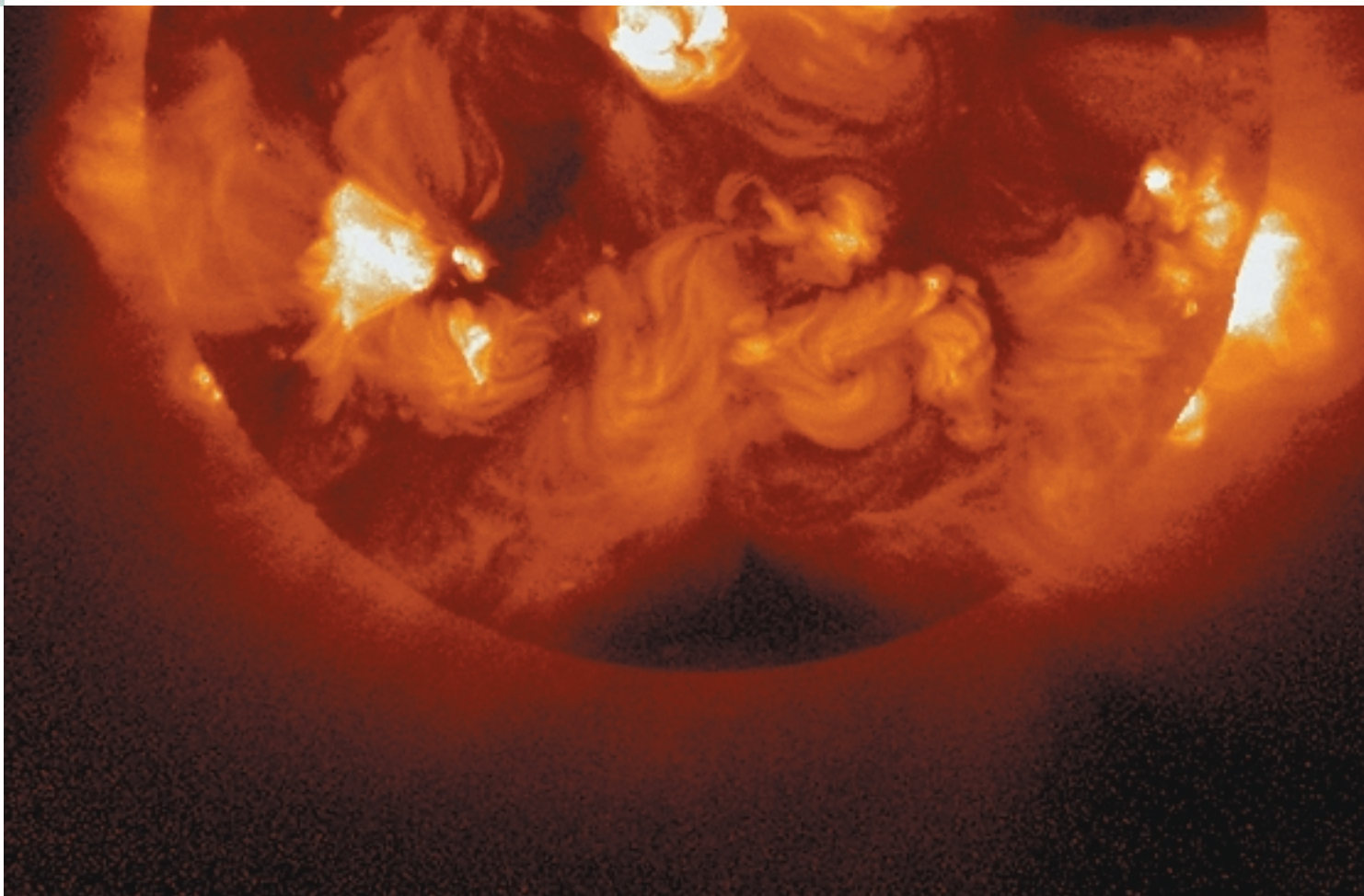
The *Department of Electrical Engineering* is actively involved in the analysis of system reliability for electric power systems and in research for the protection of critical infrastructure systems from natural and technological hazards. The university is also the location of internationally recognized expertise on landslide hazard reduction.

Yokohama National University (Japan)

Center for GIS Applications for Disaster Reduction. The Department of Urban Engineering and Architecture has taken a leading role in the development of Geographic Information Systems for the analysis of natural hazards exposure and vulnerability. Analytical tools are also under development for damage evaluation and reconstruction planning.

National Center for Disaster Prevention CENAPRED (Mexico)

CENAPRED is the coordinating agency for disaster management in Mexico. The national center works closely with the National University of Mexico (UNAM) on disaster risk and vulnerability analysis and on the study of the impacts of disasters in Mexico and Latin America.



DRM will move beyond traditional post-disaster response to develop integral risk management and to elaborate a culture of sustainable risk reduction harnessing both governments and the private sector.

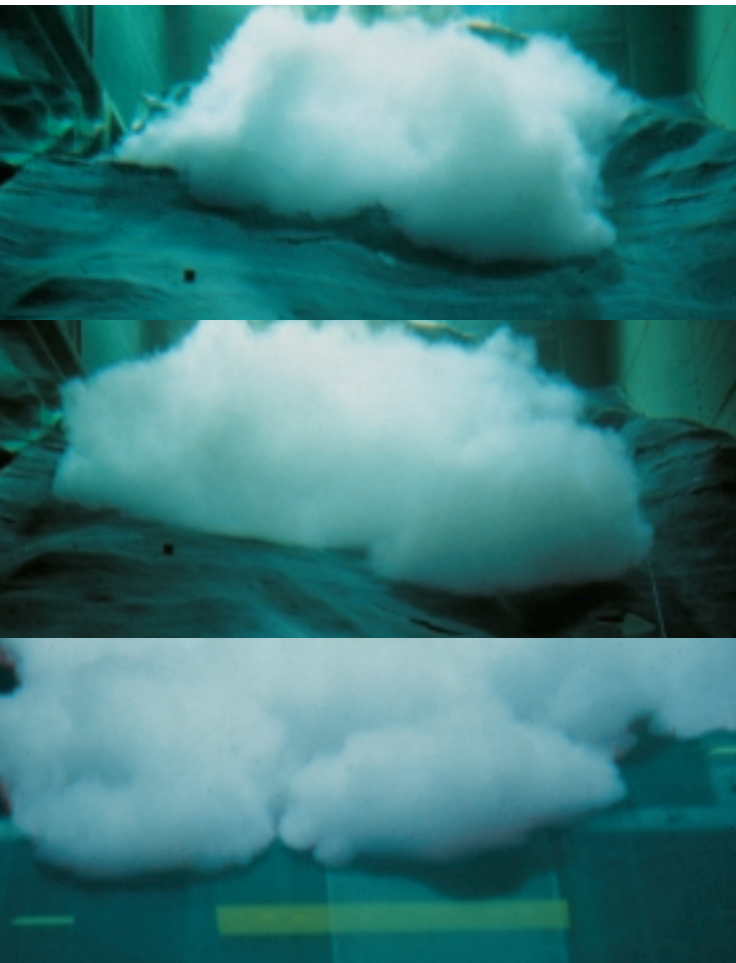
DRM will contribute to this paradigm shift by providing scientific bases, application tools and the necessary operational framework to allow evolution toward sustainable risk management and to address the above-mentioned key natural and man-made risks across the board.

DRM will focus on an integrated strategy of risk management both for natural and man-made technical risks: assessment of hazards and their characteristics in spatial and time scales, analysis of

the vulnerability of civil engineering structures and of complex societal systems, integrated assessment of risk at local, regional and national levels, and design of risk mitigation and management strategies.

Key efforts of DRM will be to provide support for a culture of risk perception, public awareness and mitigation of risks, for the development of new methods in multidisciplinary investigation of complex, interacting natural and technical phenomena, the development of accurate risk scenarios, the improved capacity to forecast the occurrence of large-scale events and of the associated damage patterns, as well as the evaluation of the ability of our societies to contain the long-term effects of disasters. Support for the implementation of effective and comprehensive outreach programs, with education and technology transfer components at all levels, is also of primary importance.

Social and economic development requires new strategies in risk management and risk prevention. The disasters of the last few years have demonstrated that attainable security in natural hazards management remains limited despite existing effective preventive measures. Increasingly intensive land use and the fact that natural hazards protection is limited by financial, security-technical and ecological barriers are creating a need for an 'integrated risk management and sustainable risk prevention culture'. Comprehensive and interdisciplinary risk management and risk prevention strategies in areas exposed to different types of natural hazards must be based on integrated, professional hazard and risk assessment. The prevention and mitigation measures that have to be taken are driven by the technical, socio-economic and ecological vulnerability of the various systems — which calls for a profound knowledge of the event-dynamics of disasters (process-oriented research).



The involvement of the technical, natural, social, and economic sciences is equally necessary. Sustainable management of natural hazards needs intensified inter- and trans-disciplinary research and well defined implementation strategies. Thus knowledge transfer will be an important goal of DRM. An increasing number of developing countries have attained basic know-how and implementation techniques that can be applied by other countries with similar exposure, including industrialized countries. The transfer of methods and approaches to solutions in the area of technical and natural risks also needs to be better understood.

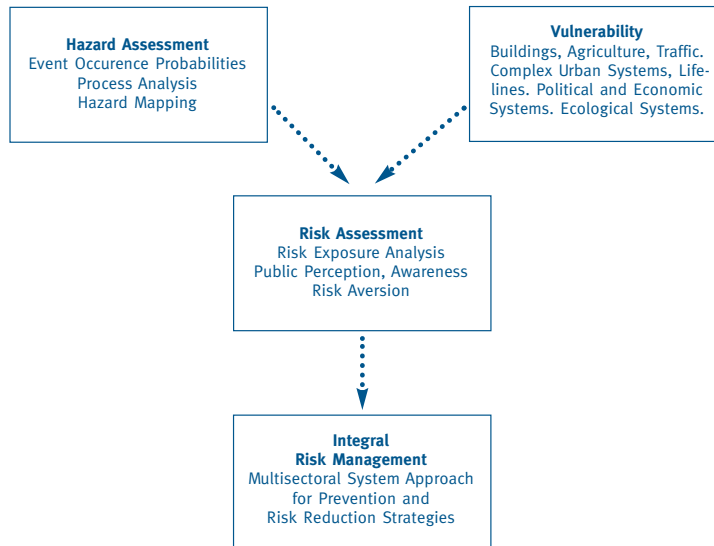
Science, education, industry, and politics have to face up to this challenge and support this difficult decision-making process with adequate research, knowledge, the development of practical tools and insurance and legislation strategies.

It is a fact that public awareness of natural disasters is generally low and therefore progress in risk prevention and mitigation is based mostly on the harm experienced by the people directly affected. This applies not only to investments in risk prevention and mitigation measures but especially to legislation, standardization and governmental implementation, and control. The creation of tools which increase public awareness, together with broadly-based education programs, has to be one of DRM's principal goals.

Four "modules" for efficient disaster prevention and mitigation need to be considered. These modules focus on different but complementary questions. They identify key issues and corresponding research needs and will lead to specific research and development projects.



The risk management model



Module 1: Hazard assessment

Natural hazards result from the interaction of three distinct elements:

1. Physical systems at different geographic levels (e.g. slopes, river basins, mountains)
2. Triggering factors (precipitation, temperature variations, earthquakes)
3. System reactions (floods, mass instabilities, ground movements)

Natural hazards interact at different spatial and temporal levels, varying from the local and regional to the international scale. So far, individual hazards and physical processes have been, and will continue to be, studied individually as this is the core activity of most research institutes. DRM therefore supports the multidisciplinary understanding and integrated analysis of different physical processes acting on the same physical systems. A similar model can be depicted for technical hazards.

