

Kyoji Sassa  
Hiroshi Fukuoka  
Fawu Wang  
Gonghui Wang  
Editors

# LANDSLIDES

Risk Analysis  
and  
Sustainable  
Disaster  
Management



 Springer

Kyoji Sassa  
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**Landslides**

Risk Analysis and Sustainable Disaster Management

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Kyoji Sassa  
Hiroshi Fukuoka  
Fawu Wang  
Gonghui Wang  
(Editors)

# Landslides

## Risk Analysis and Sustainable Disaster Management

Proceedings of the First General Assembly of the International Consortium on Landslides

With 417 Images



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# Preface

Population growth, increasing urbanization, and mountain and coastal development are magnifying the risk of various kinds of disasters. The imperatives of Earth system risk reduction will be even more pressing for sustainable development and environmental protection in the coming decades.

Landslides are various types of gravitational mass movements of the Earth's surface that pose the Earth-system risk; they are triggered by earthquakes, rainfall, volcanic eruptions and human activities. Landslides cause many deaths and injuries and great economic loss to society by destroying buildings, roads, life lines and other infrastructures; they also pose irrecoverable damage to our cultural and natural heritage. Landslides are multiple hazards, involving typhoons/hurricanes, earthquakes, and volcanic eruptions, and sometimes causing tsunamis. Landslide disaster reduction requires cooperation of a wide variety of natural, social, and cultural sciences.

The International Consortium on Landslides (ICL) was founded at the Kyoto Symposium in January 2002, through the adoption of the Statutes of the ICL and the 2002 Kyoto Declaration "Establishment of an International Consortium on Landslides", with participation from the Divisions of Earth Sciences, Water Sciences, and Cultural Heritage of the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Meteorological Organization (WMO), the United Nations Secretariat for International Strategy for Disaster Reduction (UN/ISDR), the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the Ministry of Foreign Affairs (MOFA) of the Government of Japan, and worldwide universities and institutes involved in landslide studies. The ICL has convened its Board of Representatives and Steering Committee meetings at UNESCO in Paris 2002, at the Food and Agriculture Organization of the United Nations (FAO) in Rome 2003, at the United Nations Building "Palace de Nation" in Geneva 2004, and at universities in Vancouver, Bratislava, and Cairo.

On 19 January 2005 in Kobe, Japan, the ICL organized the theme session "New International Initiatives for Research and Risk Mitigation of Floods (IFI) and Landslides (IPL)" at the United Nations World Conference on Disaster Reduction together with UNESCO, WMO, FAO, UNU (United Nations University), MEXT, Kyoto University, and others. In this session, the ICL proposed a "Letter of Intent" to United Nations organizations, as well as to the International Council for Science (ICSU) and the World Federation of Engineering Organizations (WFEO), in order to strengthen learning and research on "Earth System Risk Analysis and Sustainable Disaster Management" within the framework of the United Nations International Strategy for Disaster Risk Reduction (ISDR). These functions must be effective in order to create a sound basis of international cooperation in the field of Earth-system risk reduction, including landslides. This Letter of Intent was approved and signed by seven global stakeholders of UNESCO, WMO, FAO, UN/ISDR, UNU, ICSU, and WFEO by 30 June 2005. The electronically combined Letter of Intent is attached below.

Study and learning of landslide risk analysis and sustainable disaster management, including close cooperation with experts and organizations specializing in other types of disasters, must be our task in the coming decades. For the occasion of the ICL First General Assembly, to be held at the Keck Center of the National Academy of Sciences,

## LETTER OF INTENT

"United Nations World Conference on Disaster Reduction (WCDR)", Kobe, Japan, 18-22 January 2005

This 'Letter of intent' aims to provide a platform for a holistic approach in research and learning on 'Integrated Earth system risk analysis and sustainable disaster management'.

### Rationale

- Understanding that any discussion about global sustainable development without addressing the issue of Disaster Risk Reduction is incomplete;
- Acknowledging that risk-prevention policies including warning systems related to Natural Hazards must be improved or established;
- Underlining that disasters affect poor people and developing countries disproportionately;
- Stressing that after years of under-investment in preventive scientific, technical and communicational infrastructure activities it is time to change course and develop all activities needed to better understand natural hazards and to reduce the vulnerability notably of developing countries to natural hazards, and
- Acknowledging that a harmful deficiency in coordination and communication measurements related to Disaster Risk Reduction exists.

### Proposal

Representatives of United Nations Organisations, as well as the Scientific (ICSU) and Engineering (WFEO) Communities propose to promote further joint global activities in disaster reduction and risk prevention through

**Strengthening research and learning on 'Earth System Risk Analysis and Sustainable Disaster Management' within the framework of the 'United Nations International Strategy for Disaster Risk Reduction' (ISDR).**

More specifically it is proposed,




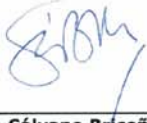



based on the existing structural framework of the ISDR and plan of action of the UN-WCDR, as well as other relevant networks and institutional and international expertise,

**to establish specific, goal-oriented 'Memoranda of Understanding' (MoUs) between international stakeholders targeting Disaster Risk Reduction, for example focusing on landslide risk reduction, and other natural hazards.**

### Invitation

Global, regional and national competent institutions are invited to support this initiative by joining any of the specific MoUs following this letter through participation in clearly defined projects related to the issues and objectives of any of the MoUs.

### Signatories:

			
<b>Mr. Koichiro Matsuura</b> Director-General United Nations Educational, Scientific and Cultural Organization	<b>Mr. Michel Jarraud</b> Secretary-General World Meteorological Organization	<b>Mr. Jacques Diouf</b> Director-General Food and Agriculture Organization of the United Nations	<b>Mr. Sálvamo Briceño</b> Director UN International Strategy for Disaster Risk Reduction
4 MAR 2005	22. 3. 2005	21. 31. 2005	19. 01. 05
Date	Date	Date	Date
			
<b>Mr. Hans van Ginkel</b> Rector United Nations University	<b>Ms. Jane Lubchenco</b> President International Council for Science	<b>Ms Françoise Come</b> Executive Director World Federation of Engineering Organizations	
19. 01. 05.	21. 04. 05	24/ 2/ 2005	
Date	Date	Date	

The International Consortium on Landslides (ICL) proposed the "Letter of Intent" at the thematic session 3.8 "New International Initiatives for Research and Risk Mitigation of Floods (IFI) and Landslides (IPL)" of the United Nations World Conference on Disaster Reduction held on 19 January 2005 in Kobe, Japan. This is the Letter of Intent, which was electronically combined based on the original Letters of Intent, formally approved and signed by all parties. All of the original Letters of Intent with signatures are deposited in the secretariat of the International Consortium on Landslides which is located in the Research Centre on Landslides of the Disaster Prevention Research Institute, Kyoto University.



### International Consortium on Landslides

Secretariat : Research Centre on Landslides, Disaster Prevention Research Institute, Kyoto University, Kyoto, Japan  
Web: <http://ICL.dpri.kyoto-u.ac.jp>, E-mail: [jimu@landslide.dpri.kyoto-u.ac.jp](mailto:jimu@landslide.dpri.kyoto-u.ac.jp), Tel: +81-774-38-4110, Fax: +81-774-32-5597

Washington, D.C., we decided to organize a panel discussion on “Earth-system risk analysis and sustainable disaster management, especially in regard to landslides”. This volume, which includes the proceedings of papers submitted to the First General Assembly, is titled “Landslides – Risk Analysis and Sustainable Disaster Management –” to symbolize our target in the coming decades.

It is hoped that this volume will visualize the objectives and activities of the International Consortium on Landslides and result in intensified international cooperation in learning and research for landslide disaster reduction within global and regional entities involving in landslides. We request cooperation and support from scientists and engineers working on other disasters, and particularly from those organizations and entities that are willing to contribute to Earth-system risk reduction, including that of landslides.

### Acknowledgments

I express my gratitude for the cooperation of the staff of the National Cooperative Geologic Mapping Program and the Landslide Hazard Program of the U.S. Geological Survey and the Research Centre on Landslides, Disaster Prevention Research Institute, Kyoto University, for organization of the First General Assembly and for edition of this volume. Thanks also go to UNESCO, WMO, FAO, UN/ISDR, UNU, IUGS, and to the governments of Japan, U.S.A., Italy, Canada and Norway for their continued support of ICL activities. It is acknowledged that the organization of the First General Assembly of ICL and this publication are financially supported by the UNESCO fund supporting IPL/ICL activities, the Presidential leadership fund of Kyoto University, and the twenty-first century COE (Centre of Excellence) fund from the Ministry of Education, Culture, Sports, Science and Technology of the Government of Japan allocated to the Disaster Prevention Research Institute, Kyoto University.

Kyoto University, UNESCO and ICL launched the UNITWIN Cooperation Programme “Landslide Risk Mitigation for Society and the Environment” on 18 March 2003, then jointly constructed the UNITWIN Headquarter building as the activity-base on the Uji campus of Kyoto University. It is acknowledged that worldwide cooperation through the UNITWIN network and the facilities of the UNITWIN Headquarter were very helpful for the preparation of the General Assembly and editing this volume.



A handwritten signature in blue ink that reads "Kyoji Sassa". The signature is fluid and cursive, with the first name "Kyoji" and the last name "Sassa" clearly distinguishable.

Kyoji Sassa

*President, International Consortium on Landslides*

*Director of the Research Centre on Landslides,  
Disaster Prevention Research Institute,  
Kyoto University, Japan*



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## Welcome Address

Today, many parts of the world, including the United States, are at significant risk from natural disasters. Escalating population and increased development on the coast, fault zones, mountainous areas, and flood plains mean that increasing numbers of people are at risk from hazards. Each year the importance of assessing, preparing for and mitigating the potential effects of natural hazards, including landslides, increases. For this reason, the U.S. Geological Survey (USGS) and the National Research Council (NRC) of the National Academy of Sciences are pleased to host this important General Assembly of the International Consortium on Landslides (ICL).

It is an honor that the first General Assembly of the ICL is meeting in the Washington, DC area – the center of the U.S. government with numerous Federal agency headquarters, including the USGS, NRC, Federal Emergency Management Agency, Federal Transportation Administration, and the National Oceanic Atmospheric Administration (NOAA). The city is also home to numerous international organizations such as the World Bank, the Organization of American States, the Inter American Bank, and others. We hope that you will have an opportunity to visit this very beautiful city and some of the organizations that would benefit from the work of ICL.

Landslides threaten lives and property in every state in the U.S. Fall and winter of 2004–2005, were especially active landslides seasons with numerous landslides caused by hurricanes in the east coast and heavy rainfall in the west coast, throughout the intermountain states of Utah and Colorado and the east coast states of Ohio, Pennsylvania and New York. Landslides in 2004–2005 caused many deaths and extensive property damage. Communities are still cleaning up after some of the most damaging events. Those members of ICL who will visit southern California will be able to see, first hand, two very heavily impacted areas.

The USGS currently has two important efforts to lessen the impact of natural hazards. The first is the “Initiative to Protect Communities and Resources from Natural Disasters.” The USGS is working toward implementing this initiative by 2007, which will focus on delivering USGS science to public officials and private industry to help them reduce the vulnerability of communities and the environment to hazards including: earthquakes, droughts, floods, landslides, and wildfires. Landslide hazards and debris-flow hazards following wildfires are important elements of this initiative. The second effort is the NOAA-USGS Debris Flow Warning System, which is a demonstration project which combines the expertise of the two agencies in precipitation forecasting, debris-flow prediction, and debris-flow hazard assessment in order to establish a debris-flow warning system for recently burned areas of southern California. This demonstration project, if successful and if funded, will be expanded to reach other parts of the U.S. which face similar hazards. More detailed explanations about these two important efforts by the USGS will be given during the General Assembly.

International meetings such as this one provide a unique opportunity for managers and researchers to share new research findings, knowledge, and experiences that can lead to better understanding of how to mitigate the devastating effects of natural

hazards. I look forward to learning from the presentations and discussions during the next few days and reading the proceedings of this First General Assembly of the International Consortium of Landslides.

Good luck and best wishes for a successful assembly,



A handwritten signature in blue ink, appearing to read "P. Patrick Leahy". The signature is stylized and cursive.

P. Patrick Leahy

*Honorary Chairman of the First General Assembly of the  
International Consortium on Landslides*

*Acting Director of the U.S. Geological Survey*

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