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-Book Series of the International Consortium on Landslides-

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Preface by the first Editor

Contents
Title of Contribution for Progress in Landslide Research and Technology book series (do not exceed 100 characters including spaces)

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Abstract

This is an example text template for the full paper submission to the Progress in Landslide Research and Technology book series. The book series publishes original articles for practice. Contributed articles align with one of five categories: Original articles, Review articles, Case studies, IPL/WCoE/Network activities and Teaching tools with online extras (i.e., PPT, Video). The Abstract should be concise and self-contained, clearly stating main conclusions of the paper. The length should be of minimum 150 words, and within 300 words. The style to be used, according to the Template Style List, is the Normal Style with justification. At the end of the abstract a list of keywords (minimum: 3 maximum: 7) should be added as shown in this template.

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keyword1, keyword2, keyword3...

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The main text of the paper should be formatted using Normal Style according to the Template Style List. The first paragraph of each Section should not have right indentation whilst following paragraphs should, as in the following.

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Sections of the manuscript

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Fig. 1 Example of half page figure. Captions which are 2 or more rows long must be justified. Shorter caption must be column-centred. Please ensure to select the style “Figure Caption” and to place caption below figure. Figures should be cited in text using the short: “Fig.”.

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The paper should start with the title section which has a special single-column formatting (see top of first page). Please make sure to maintain section separation to ensure proper column formatting of the document. In case you inadvertently delete the section break, insert a new one on top of the beginning of manuscript main body using Microsoft Word option “insert -> break -> section break -> continuous”.

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The title should follow, according to the ICL journal “Landslides” style, the author’s names.

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\[ G = \left( \sum r_i^2 \right)^{0.3 (\cos \alpha \cos \beta)^{-1}} \]  [1]

All the units of measurement used in the paper should be in the SI system and every time a new symbol, group of symbols or specific operator is introduced, it should be explained and described along with its unit of measurement if appropriate.

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In the manuscript, tables have to be formatted according to the following example. It is possible to insert a single- or a double-column table (if needed) provided that the author insert the proper section breaks to ensure column formatting separation between sections.

Table 1 Example of table. Colours, formatting and fonts are as per template (Calibri 9 pt). Please ensure left justification for alphanumeric text and right justification for numbers. Use same number of decimals with floating point numbers. Table should be cited in text using the short: “Tab.”.

<table>
<thead>
<tr>
<th>Col Head 1</th>
<th>Col Head 2</th>
<th>Col Head 3</th>
<th>Col Head 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text</td>
<td>34.90</td>
<td>17/11/2011</td>
<td>Descr 1</td>
</tr>
<tr>
<td>Text</td>
<td>12.98</td>
<td>01/06/1998</td>
<td>Descr 2</td>
</tr>
<tr>
<td>Text</td>
<td>3.64</td>
<td>31/02/1900</td>
<td>Descr 3</td>
</tr>
</tbody>
</table>

In particular, Table colour is as follows: heading row and grid: blue RGB=(0,102,153); normal text rows: light cyan RGB=(204,236,255).

Fig. 2 Example of two-column figure. In case the caption of the figure is only one row, it must be centred.
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We suggest that each paper will have at least one Introduction section laying out the state of the art and the motivations for the study to be reported, a Materials and Methods section, one of Results and one incorporating Discussion and relevant conclusions as derived from the research outcomes.

As in the figure above, use row spacing to ensure a proper distance between figure and text according to the overall dimension of your image and caption length.

The papers contribute to the Progress in Landslide Research and Technology book series should follow the rules depicted in this Template Guideline and, furthermore.

Acknowledgments

In the Acknowledgments section, appearing just before the References, the authors may credit others for their guidance or help. Also, funding sources may be stated. The Acknowledgments section does have a section heading at level 1, as in this example. Following this section the References section begins for which authors must use the style “Reference” (Font Calibri, font size 9, first row left indented 0.4 cm) and use reference citation rules as per the journal Landslides. Please follow the rules of the same journal also for citations within the texbody.

In the following section we present some example of formatting for references related to edited books, conference proceedings, periodic journal papers, scientific reports and web sites. References must be, firstly, in alphabetical order and then in date order, descending.

For any other formatting issue please refer to the editorial guidelines and style used by the ICL journal “Landslides”, edited by Springer.

References (in the alphabetical order)


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Faculty of Civil and Geodetic Engineering, University of Ljubljana

Matjaž Mikos

Summary

In 2019, the Faculty of Civil and Geodetic Engineering of the University of Ljubljana (ULFGG) celebrated its centennial: The precursor of the faculty was the Technical Faculty established in 1919 as one of five founding faculties of UL.

ULFGG, covering technical disciplines of civil and geodetic engineering, as well as water science and technology, has been involved in landslide risk reduction activities at the national level in Slovenia (former Yugoslavia, until 1991) for decades (Fig. 1). In 2008, ULFGG became an ICL Full Member and has gradually developed its ICL engagement. ULFGG has been awarded the title of the World Centre of Excellence (WCoE) in Landslide Risk Reduction for 5 consecutive periods (2008–2011, 2011–2014, 2014–2017, 2017–2020, 2020-2023). Together with the Geological Survey of Slovenia, another ICL member in Slovenia, ULFGG hosted the 4th World Landslide Forum in Ljubljana, Slovenia, from May 29 to June 2, 2017. ULFGG strongly supports diverse activities of the International Consortium on Landslides, Kyoto, Japan, and thus contributes to the 2030 Agenda for Sustainable Development, as well as to the Sendai Framework for Disaster Risk Reduction 2015–2030 (SF DDR). ULFGG was a signatory of the Sendai Landslide Partnerships 2015–2030, and is a strong promoter of the Kyoto Landslide Commitment 2020, a SF DRR voluntary commitment by ICL.

In 2019, ULFGG hosted, together with the Slovenian Chamber of Engineers, the World Construction Forum 2019 (WCF 2019; www.wcf2019.org) in Ljubljana under the forum motto “Buildings and Infrastructure Resilience.” The Forum with one of the themes on Disaster Risk Management and Governance for Resilient Communities was co-organized by the World Federation of Engineering Organizations (WFEO) in support to the implementation of the 2030 Agenda for Sustainable Development. All lectures given at the WCF2019 are available for free on the forum web page, as a contribution to Open Science efforts.

In the field of capacity building, ULFGG offers several courses for graduate and postgraduate students in landslide mechanics and dynamics, landslide stabilization and landslide risk mitigation. In this paper, a short overview of the past activities of ULFGG as ICL Full Member is shown.

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World Centre of Excellence on Landslide Risk Reduction and IPL projects

WCoE activities

The title of World Centre of Excellence (WCoE) on Landslide Risk Reduction is given to a governmental or non-governmental entity, which contributes to the landslide disaster risk reduction at a regional and/or global level in a specific unique field of expertise, as well as helps promoting International Programme on Landslides (IPL) and landslide research intellectually, practically and financially (https://iplhq.org/category/iplhq/world-centre-of-excellence-wcoe/). ULFGG was granted the title of WCoE five consecutive times:

- WCoE 2017–2020: Landslides in Weathered Flysch: from activation to deposition.
- WCoE 2020–2023: Landslides in Weathered Heterogenous Sedimentary Rock Masses such as Flysch.

The research efforts at ULFGG were focused on:

- Mechanisms of triggering such landslides (mud flows), estimation of debris-flow magnitudes triggered as shallow or deep-seated landslides (debris slides), and triggering of shallow rainfall-induced landslides using advanced statistical methods.
- Field and laboratory investigations of suction in over-consolidated clays and flysch, such as to improve the understanding of softening in stiff over-consolidated clays and marls, using soil matrix suction as an indicator for mudflow occurrence, and executing suction long-term monitoring of the Slano Blato landslide.
- Laboratory investigations of coarse debris-flow rheological parameters and soil-water characteristic curve of residual soil from a flysch rock mass.
- Mathematical modelling of debris flows (hazard assessment in deposition areas), using different numerical models and different digital terrain models.

The WCoE activities were financially supported by the Slovenian Research Agency through the Research Programme P2-0180 “Water Science and Technology, and Geotechnical Engineering: Tools and Methods for Process Analyses and Simulations, and Development of Technologies,” as well as by several national and international (bilateral) research projects.

In Ljubljana between May 29 and June 2, 2017 (Fig. 2), followed by a three-day field study tour to see the variety of landslide forms in Slovenia and in its immediate NW surroundings. With over 600 participants from 49 countries and 5 international organizations, WLF4 was promoting the culture of living with natural hazards.

IPL projects

An important ICL activity is IPL projects (https://iplhq.org/category/iplhq/ipl-ongoing-projects/). The IPL Evaluation Committee examines the submitted proposals of ICL members by carefully reading the written proposals and by listening to their presentations at annual ICL conferences. The initially accepted proposals by the IPL Evaluation Committee are discussed and then approved at the annual Board of Representatives meeting of ICL members (Annual Assembly). Finally, the IPL projects are approved annually by the IPL Global Promotion Committee.

ULFGG has successfully submitted several proposals for IPL projects and has been so far actively involved in the following ones:

- IPL-226 Studying landslide movements from source areas to the zone of deposition using a deterministic approach (2017–2020)—coordinated by the Geological Survey of Slovenia.

ICL thematic and regional networks

Following the ICL Strategic Plan 2012–2021, several thematic networks and regional networks have been established (for an overview, see http://icl.iplhq.org/category/icl/icl-networks/).

Landslide Monitoring and Warning Thematic Network

In 2012, ULFGG proposed the ICL landslide monitoring and warning thematic network (abbr. LaMaWaThen), and almost 10 ICL members joined the initiative. The general objective of the proposed network was to compare experiences in the field of landslide monitoring and installed early warning systems for active landslides in various regions of the world. A proposal for landslide monitoring techniques database was. The network was later coordinated by the Croatian Landslide Group from the Faculty of Civil Engineering, University of Rijeka, Croatia, and the Faculty of Mining, Geology and Petroleum,
University of Zagreb, Croatia. Lately, we contributed to the network activities by preparing practice guidelines on monitoring and warning technology for debris flows.

The idea of the network was partially taken over by the web database ICL World Report on Landslides (http://iplhq.org/ls-world-report-on-landslide/), created to be a platform to share landslide case studies among the global landslide community, with monitoring and warning systems being a part of the story.

ICL Adriatic-Balkan Network

Jointly with other ICL members from Croatia and Serbia, in 2013, ULFGG proposed to establish an ICL Adriatic-Balkan Regional Network (ICL ABN; https://www.klizista-hr.com/en/organization/about-us/icl-abn/). Various network activities were proposed, the most active being the organization of biennial regional symposia on landslide risk reduction in the Adriatic-Balkan Region (called ReSyLab). ULFGG supported the 1st Symposium in Zagreb (Croatia) in 2013 (March 6–9), and the 2nd in Belgrade (Serbia) in 2015 (May 14–16), and jointly organized the 3rd in Ljubljana (Slovenia) in 2017 (October 11–13) together with the Geological Survey of Slovenia (also an ICL member).

In the last decade, ULFGG has signed bilateral research projects with the ICL members in the region: “Adriatic-Balkan Regional Network: Landslide Risk Mitigation for Society and Environment” (2012–13 with University of Belgrade, Serbia), “Study of landslides in flysch deposits: sliding mechanisms and geotechnical properties for landslide modelling and landslide mitigation SoLiFlyD” (2014–15 with University of Rijeka, Croatia), and “Laboratory investigations and numerical modelling of landslides in flysch deposits in Croatia and Slovenia” (2016–17 with the University of Rijeka, Croatia). This joint research has helped strengthen regional cooperation within the ICL ABN regional network.

Other ICL-related international activities

ULFGG served the ICL by taking different leading roles in the Consortium, i.e. ULFGG member served as Chair of IPL Evaluation Committee, twice as ICL Vice President, and was elected to Co-Chair of IPL Global Promotion Committee (https://iplhq.org/).

ULFGG has been strongly supporting the journal Landslides: Journal of the International Consortium on Landslides, published by Springer Nature (https://link.springer.com/journal/10346) since its launch in 2004. ULFGG works for the journal in the roles of reviewers and an associate editor, and regularly publishes its top research results in the journal, as well as disseminates information important for capacity building in landslide risk reduction in the journal.

ULFGG followed the development of the journal from its bibliometric perspective, and compared scientometric impacts of the journal with the other ICL publications (monographs, volumes from World Landslide Forums) in the field of landslide research.


UNESCO Chair on Water-related Disaster Risk Reduction

Experiences and knowledge accumulated in the past decades at the Chair on Hydrology and Hydraulic Engineering at ULFGG in the field of (applied) hydrology in experimental basins, landslide research, landslide risk reduction, and flood risk management, culminated in 2016 in the establishment of the UNESCO Chair on Water-related Disaster Risk Reduction (WRDRR Chair; www.unesco-floods.eu) at the University of Ljubljana. The UNESCO WRDRR Chair was positively evaluated in 2020 and prolonged for another 4 years (2020–2024). The Chair is associated to the university twinning and networking UNITWIN UNESCO = Kyoto University – ICL on “Landslide and Water-Related Disaster Risk Management”.

ULFGG supports activities of the Slovenian National Committee for UNESCO Intergovernmental Hydrological Programme (www.ncbih.si) – focus of the activities is the development of the IHP-IX Programme (2022–2029).

Conclusions

ULFGG as one of World Centres of Excellence in Landslide Risk Reduction, hosts the UNESCO Chair on Water-related Disaster Risk Reduction. ULFGG strongly supports ISDR-ICL Sendai Partnerships 2015–2025 for global promotion of understanding and reducing landslide disaster risk, and its extension to 2030 and beyond: the Kyoto 2020 Commitment for Global Promotion of Understanding and Reducing Landslide Disaster Risk that that was signed in November 2020. ULFGG is proud to be its Official Promoter, and will specifically work for its Actions 2, 5, 6, 9 and 10.

This review contribution is intentionally written without giving references to described activities. For this purpose, listed websites and web search engines may be used.

The author wants to thank numerous colleagues from ULFGG and from the wide ICL community for a long-lasting excellent cooperation with a joint vision to reduce landslide disaster risk.
Introduction

The Institute of Rock Structure and Mechanics (IRSM) of the Czech Academy of Sciences (CAS) is an academic institution specialising in the study of the structure and properties of rocks and the rock environment. The IRSM is one of the five institutes belonging to the Earth Sciences section of the CAS. As of 2007, the IRSM is a legally constituted public research institution. It is also involved in research into glass, ceramic materials for technical use, composite materials and biomaterials, their properties and application potential, and technological topics relating to the processing of inorganic as well as organic waste. Its research activities are spread across six scientific departments.

- Department of Geochemistry
- Department of Composites and Carbon Materials
- Department of Materials Structure and Properties
- Department of Neotectonics and Thermochronology
- Department of Engineering Geology
- Department of Seismotectonics

The main objectives of the research and educational activities of the IRSM include:

- Acquisition, processing and dissemination of scientific knowledge at conferences, their publishing in monographs and scientific journals
- Cooperation with universities and other scientific and professional institutions and private business companies through joint projects and cooperation agreements
- Teaching and tutoring young researchers at universities
- Management of doctoral and postdoctoral programs
- Contributing to furthering scientific knowledge and to the development of practical applications of research findings
- Involvement in international cooperation
- Management and operation of research infrastructures
- Organizing scientific meetings, conferences and seminars at the national and international level
- Publishing of scientific journals: Acta Geodynamica et Geomaterialia, and in cooperation with the University of Chemistry and Technology, Prague, Ceramics-Silikáty

Outstanding recent achievements

2015-2019

- The Global Database of Giant Landslides on Volcanic Islands summarizes statistics and knowledge of giant landslides on volcanic islands that are cubic kilometers in size. Landslides on volcanic islands – volcanic collapses – are among the largest on Earth and are fully comparable in size to the extra-terrestrial landslides observed on Mars. (Landslides 16, 2045–2052, 2019).

Fig.1 El Golfo: scarp of a giant landslide – collapse of a volcano, El Hierro, Spain

- Paleoseismic research in the Cheb basin has revealed repeated Quaternary movements at the Mariánské Lázně fault, accompanied by earthquakes that damaged Earth’s surface. Dating has shown that even during the Holocene, there were at least two major earthquakes with M = 6.3 to 6.5, the most recent of which occurred around 1000 A.D. (Geomorphology 327, 472–488, 2019).

Fig.2 Photograph from the Kopanina paleoseismic trench in the Cheb basin with several types of tectonic deformation of late Quaternary sediments


- The influence of uranium mineralisation and spontaneous combustion processes on the physical and chemical properties of coal components was studied at the “Novátor” mine heap in Bečkov. Uranium minerals have caused local radioactive changes in organic compounds. Organic substances located in burned and burntout zones pose a potential risk to the environment, in particular to local river basins, soil and vegetation. (International Journal of Coal Geology 168, 162–178, 2016).

- In collaboration with the Pacific Northwest National
Laboratory in the USA, we have provided an innovative explanation of the formation, thermal properties and subsequent interactions in the “cold-cap” – a layer of reacting melter feed that floats on the surface of molten glass during the vitrification of nuclear waste. (Ceramics International 45, 2019).

Selected results in 2020
The Institute achieved a number of significant research results during the year via international research cooperation and cooperation with both domestic and foreign universities, other institutes of the Academy of Sciences of the Czech Republic and various industrial companies (TARPO, s.r.o., DEKONTA, a.s., etc.). Two examples are presented below:

1) The calculation of sediment volumes in a landslide dammed lake employing electrical resistance tomography and sonar profiles (sound navigation ranging) of the lake. The calculation procedure is based on the use of an innovative geophysical resistance profiling application that records measurements from the lake surface in a series of profiles. Using this and other methods, i.e. sonar depth measurements, sediment contribution monitoring and conductivity measurements, it was possible to reconstruct the original relief of the bottom of the Mladotice lake immediately following the landslide and to calculate the volume of sediments and the sedimentation rate, thus allowing for the estimation of the future development of the lake. The most interesting result was that the sedimentation rate has decreased significantly over the last 20 years, suggesting that the lake may survive much longer than previously expected.

2) The hypogenetic versus the epigenetic origin of deep underwater caves applying the example of the Hranice abyss (Czech Republic)-the world’s deepest freshwater cave
A range of geophysical measurements were taken so as to determine the extent and form of the Hranice abyss. The geophysical results suggested that the depth of the abyss is up to ~ 1 km. Further, karst structures were identified, including a buried tower-like karst formation. The new geophysical results, interpreted in the context of the local tectonic development and the morphology of karst structures, indicate the epigenetic origin of the formation of the abyss despite the traditionally accepted theory of its hypogenetic origin, which has implications in terms of the local and regional development of karsts in areas that feature deep karst systems.
Institute of Cold Regions Science and Engineering, Northeast Forestry University

Firstname Firstsurname, Secondname Secondsurname

Introduction

Northeast Forestry University (NEFU) is located in Harbin, Heilongjiang Province, an institution of higher education and research under jurisdiction of the Ministry of Education of the People’s Republic of China, serve as the largest forestry university in China. It is a Chinese Ministry of Education Double First Class Discipline University, with Double First Class status in certain disciplines. NEFU is presently a multidisciplinary university with forestry as its leading field and offers a unique specialization in forestry engineering. NEFU has also specializes in forestry-related aspects of agriculture, science, engineering, economy, management, liberal arts and law. The university at present is composed of sixteen schools and two departments. There are five post-doctoral scientific research programs, four first-level and thirty-two second-level doctoral degree programs. In addition, there are also ten first-level, seventy-five second-level master’s degree programs, three types of special discipline master’s degree programs in nine fields and fifty-seven undergraduate programs. NEFU has two national first-level key disciplines, two national second-level key disciplines, six key disciplines authorized by the State Forestry Administration, two key discipline groups authorized by Heilongjiang Province, four Heilongjiang Provincial first-level key disciplines, and fifteen Heilongjiang Provincial subordinate key disciplines. With the approval of National Planning Commission and Ministry of Education, NEFU runs the national training centers of life science and technology. In addition, NEFU operates the teaching and research centers of basic sciences particularly in biology, which are also approved by the Ministry of Education. NEFU has a national scientific observation key station (Maoershan forestry ecological system location station), three key laboratories of Ministry of Education, four key laboratories of the State Forestry Administration, and forty-nine research institutions. There are also nine practice sites within the school, including the Maoershan Experimental Forestry Center and Liangshui Experimental Forestry Center and 180 bases outside the school.

Research Center of Cold Regions Landslide

This research center was based on Institute of Cold Regions Science and Engineering of Northeast Forestry University in China, and cold region landslide network (CRLN-ICL) in ICL. The main activities of this research center are: Formation mechanism research, disaster warning, and universal education of landslides in permafrost regions.

In cold mountainous and hilly areas, the stability of mountain slope not only affected by its own gravity, precipitation, coverage, geological and geomorphologic conditions, but also affected by permafrost degradation and surface seasonal freeze-thaw function, that made the factor of slope instability became more complicated. By Geological Survey, using remote sensing tools, permafrost distribution maps from global scale have been obtained, and different temperature zones had been divided. Using a wireless sensing and GPS positioning technology, through the establishment of a monitoring station, surface deformation monitoring of cold area had achieved automation. Through laboratory experiments and computer simulation, the mechanism and movement of landslides in cold region were studied further. The study results could provide mitigation consulting to international organizations, national governments.

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Fig.1 Training and education

Fig.2 Determination the sling surface
Marui & Co. Ltd. celebrates its 100th anniversary in 2020. Marui, as one of the leading manufacturers of testing apparatuses in Japan, has been constantly striving to further improve its service since its foundation in 1920, thus contributing to the sustainable development of our nation and society. Our main products cover a wide variety of destructive and non-destructive testing apparatuses in the fields of geotechnical engineering, concrete engineering (mortar, aggregates, etc.), and ceramic engineering (Fig. 1). Of special note is that Marui has been helping to manufacture ring-shear apparatuses (Fig. 2) for the past half-century based on the leading-edge ideas of Dr. Kyoji Sassa, Professor Emeritus at the Kyoto University. Marui has delivered a total of seven ring-shear apparatuses to the Disaster Prevention Research Institute, Kyoto University, and two to the International Consortium on Landslides. Also, the apparatuses have been exported to the United States of America, China, Croatia and Vietnam.

Since 2002, Marui has been a supporter of the International Consortium on Landslides (ICL) and has gradually been intensifying its contribution to the ICL worldwide efforts for landslide risk reduction and international promotion of landslide research. According to NASA, more frequent and intense rainfall events due to climate change have been causing frequent landslides particularly in mountains of Asian regions including Japan where waters can be stored in various ways. Summer monsoon rains as well as snow and glacier melt waters can destabilize steep mountainsides, triggering landslides, which are down-slope movements of rocks, soils, water, trees, etc. Marui, as an engineering supporter, commits deeply to various activities of research particularly on triggering mechanisms of landslides.
Stress / Speed Dual Control

Ring Shear Apparatus

ICL-2 type: High-Stress Landslide Simulator

Fig. 2 High stress landslide simulator
Nippon Koei Co., Ltd.,
Geohazard Management Division

Introduction

The Nippon Koei Group (NK) has been a leading international consultant in providing engineering consulting services to over 5500 multi-disciplinary infrastructure and development projects in 160 countries all over the world (Fig. 1). The landslide prevention specialist team (at present called Geohazard Management Division, Fig. 2) was established in 1966 to specifically provide countermeasures against sediment disasters. Over the last 50 years, we have significantly improved the capacity of countries to respond and reduce risk from debris flows, slope instabilities, landslides, avalanches and rock falls due to torrential rains, large-scale earthquakes, and volcanic eruptions that threaten a country’s vital economic infrastructure lifelines, especially the road networks. At present, approximately 160 engineers provide engineering consulting services to protect communities from a variety of disasters. During disasters, we provide experienced professional engineers to quickly make a risk assessment and promptly respond with a series of engineering design analyses, emergency and permanent measures based on our extensive experience and know-how. To maximize the effectiveness of infrastructures, we address efficient countermeasure plans, design and research in terms of cost reduction and cost-effectiveness using various numerical analyses such as finite element method (FEM) and discrete element method (DEM), etc.

In Japan, we have worked hard to restore and recover from sediment-related disasters caused by earthquakes and heavy rainfalls that have frequently occurred in recent years (the 2011 Great East Japan Earthquake, the Northern Kyushu Flood in 2017, etc.). We have received letters of appreciation for our efforts from the national and local governments.

Our major international projects include “The Project for Countermeasure Construction Against the Landslides on Sindhuli Road Section II, Nepal,” “The project for the rehabilitation of Sindhuli road affected by the 2015 Gorkha Earthquake, Nepal,” and “The project for landslide prevention for National Road 6 in Honduras”; all funded by the Japan International Cooperation Agency (JICA) grants-in-aid. Through these projects, we are contributing to the socioeconomic development of each country by improving vulnerable locations in road networks against sediment disasters, promoting traffic safety, and providing logistics assistance for road users. In particular, the 1st of the three NK’s projects mentioned above won the “3rd JAPAN Construction International Award” from the Ministry of Land, Infrastructure, Transport and Tourism as the project that has realized “high-quality infrastructures” through its excellent know-how, technical capabilities, and project management capabilities.

NK is an ICL member and has been using its technology to reduce geohazard risk. Through various projects, NK is continuously contributing to the 2030 Agenda for Sustainable Development and the Sendai Framework for Disaster Reduction 2015–2030. Using our full capability with abundant experiences in Japan and Asia prone to natural disasters, we hope to contribute much more to a reduction of global sediment disasters including landslides. In line with this, NK has signed the KLC 2020, and will strongly support its actions, especially KCL2020 actions 1, 2, 3, 5, 6, and 8.
**Geohazard Management**

**Response to natural disasters with various technologies from space to the surface**

Integrated technologies and engineers—Application of spaceborne, airborne, and ground-based technologies for disaster risk reduction.

**Remote Sensing Technology**

Potential hazards around the globe are assessed by optical remote sensing and InSAR which can detect land-resources, topographic features, and ground deformation. Example of InSAR, shown below, is a new effective way to detect deformation of slopes along infrastructures such as roads and railways.

Landslide monitoring using InSAR

**AI Technology**

Our AI technology helps quickly identify morphological features of past and current landslides.

Near a volcano, our AI technology can help identify unstable masses of volcanic matter perching on the flanks of the volcano.

Data for machine learning: DEM and landslides identified by an expert

**Numerical simulation**

We can predict the extent of damage in the event of a disaster and the effectiveness of countermeasure works by numerical analysis.

**R&D center**

State-of-the-Art Nippon Koei’s R&D Center

- Soil & Environmental Science Lab
- Hydraulic Model Test Lab
- Multi-Purpose Lab

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Fig. 2 Geohazard Management Division
Introduction

Ever since its foundation in 1965, Godai Kaihatsu Co.Ltd. a civil engineering consulting firm, has long been providing a variety of software and measures particularly for natural disaster mitigation. With its rich expertise in both civil engineering and information technology (IT), the company has its primary goal to address real-world needs of disaster mitigation. All the staff of Godai Kaihatsu Co. Ltd. feels it more than happy that their cutting-edge technologies help mitigate natural disasters.

Fig 1. Integrated model simulating of earthquake & rain induced rapid landslides (LS-RAPID)

Fig 2. Tsunami model (LS-Tsunami)

Fig 3 Power SSA PRO-Two-dimensional slope stability calculation of earthquake and rain induced landslide.

Fig 4. Anchor software- Slope stability analysis for ground anchor
Chuo Kaihatsu Corporation

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Introduction

Chuo Kaihatsu Corporation (CKC) was founded in 1946, and has been aiming to become the “Only One” consultant for our customers. We engage in the hands-on work that will “Remain with the earth, Remain in people’s hearts, and Lead to a prosperous future”. We focus on road, river and dam engineering to flesh out industrial infrastructures specifically by means of geophysical/geotechnical/geological investigations, civil engineering surveys and project implementations. In recent years, we make significant efforts on earthquake disaster mitigation, sediment disaster prevention/mitigation and ICT information services. Many achievements of ours have already contributed to the mitigation of natural disasters such as landslides, earthquakes and slope failures in Japan, Asia and the Pacific Region. We aim to provide technological contributions so that a sustainable society will continue to develop in the future.

Fig 1. Design for various structures

Fig 2. Deepwater drilling surveys

Fig 3. The early warning monitoring system of slope failure using multi-point tilt change and volumetric water content

Fig 4. Making hazard map for sediment disaster, tsunami, flood, earthquake, liquefaction, etc…
Kokusai Kogyo Co. Ltd.

Introduction

Kokusai Kogyo Co. Ltd. as a leading company of geospatial information technologies has long been providing public services with its comprehensive expertise to address real-world needs and cutting-edge measurement technologies. Kokusai Kogyo Co. Ltd. helps rebuild “Green Communities,” which has been of our great concern in terms of “environment and energy,” “disaster risk reduction” and “asset management”. Kokusai Kogyo Co. Ltd. offers advanced and comprehensive analyses of geospatial information for developing new government policies, maintaining and operating social infrastructures safe and secure, and implementing low-carbon measures in cities. Influenced by the recent global climate change, extreme rainfall events have become more frequent worldwide and resultant hydro-meteorological hazards are creating more deaths and devastations particularly in many developing countries where effective advanced countermeasures are not readily available. Kokusai Kogyo Co. Ltd. is proud of its achievements in establishing resilient infrastructure systems and implementing effective monitoring/early warning systems in developing countries, which have long been helping reduce the risks from natural hazards.

Fig.1 Our Realtime Hazard Map reflects up-to-date information of soil natures and precipitations at landslide hazard sites, etc. that can constantly be changing, and evaluates area-wide hazard risk in real-time

Fig.2 ELSAMAP is our cutting-edge 3D terrain visualization method allowing great geomorphological details to be visualized in one glance with gray-scaled slope inclinations and colored altitudes. ELSAMAP has been used to interpret micro-topographies, landslides and some other things.

Fig.3 3D-GIV can help grasp the ground surface displacement caused by natural phenomena such as landslide by analyzing differences between digital geomorphic images obtained through ad hoc Airborne Laser Surveys

Fig.4 “Shamen-net” is a total monitoring system integrating GNSS and other monitoring device (Measurement precision: ±1mm, on a real time basis)

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OSASI Technos, Inc. has been making its best efforts to develop its cutting-edge technologies for landslide early warning. Its unique compact and lightweight sensors making up the Landslide Early Warning System enable long-term monitoring of unstable landslide mass movements, precipitations, porewater pressure buildups, etc. in a remote mountainous area where commercial power is often unavailable. OSASI Technos, Inc. is also proud of its advanced technology to transfer observed data even in areas with poor telecom environments as proven in the successful implementations in South Asia. All staff members of OSASI Technos work together for mitigation of landslide disasters worldwide.
Introduction

Kiso-Jiban Consultants, established in 1953, is an engineering consulting firm especially well known in the field of geotechnical engineering. The areas of its comprehensive services are listed below:

- Geological and Geotechnical Survey
- Geotechnical Analysis and Design
- Disaster Prevention and Management
- GIS (Geographic Information Systems)
- Soil and Rock Laboratory Tests
- Instrumentation and Monitoring
- Geophysical Exploration and Logging
- Distribution of Geosynthetics Products.

Much-talked-about new service is the Kiso-SAR System allowing accurate estimation of both extent and rate of landslide movements based upon a comprehensive interpretation of InSAR results from geotechnical and landslide engineering viewpoints. With the Kiso-SAR system, the following pieces of important geotechnical information can be provided:

1) The extent of a deforming landslide mass (and the rate of its movement)
2) Consolidation buildup in soft clay underlying a fill
3) Deformation buildups induced by slope cutting.

Fig.1 Nationwide geological survey and 3D-Geological model

Fig.2 Ground deformation of landslide observed by Kiso-SAR system

Firstname Firstsurname, Secondname Secondsurname

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Introduction

Ellegi srl provides worldwide monitoring services and produces Ground Based synthetic aperture radar (GBInSAR) for remote measurement of displacements and deformations on natural hazards and manmade buildings using its own designed and patented LiSALab system.

Its activities started in 2003 as a spin off project to exploit commercially the Ground Based Linear Synthetic Aperture Radars technology developed by European Commission’s Ispra Joint Research Centre and based on the results of more than 10 years of research. Since then, Ellegi has industrialized and developed the core technology of the LiSALab system and latest LiSAMobile system represents the 5th generation of development.

In 2003 it was the first commercial company in the world to provide GBInSAR measurements of natural hazards and structure.

Ellegi srl offers:

- Displacement fields measurement, control and monitoring of the deformation caused by natural hazards, like landslides, rockslides, sinkhole, volcanic deformation in every operative condition, including emergencies,
- Structural strain fields measurement, control, monitoring and diagnosis of the deformation affecting buildings, viaducts, dams,
- GBInSAR monitoring systems, installation, management and maintenance in order to provide information about natural hazards or anthropic activity, that can generate or cause slopes failures or buildings instabilities.

In all the above-mentioned activities Ellegi srl uses the GBInSAR LiSALab technology that represents a real “break-through”.

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Progress in Landslide Research and Technology

-Book Series of the International Consortium on Landslides-

Progress in Landslide Research and Technology is the Open Access book series of the International Consortium on Landslides (ICL). The series provides a common platform for the publication of recent progress in landslide research and technology for practical applications and the benefit for the society contributing to the Kyoto Landslide Commitment 2020, which is expected to continue up to 2030 and even beyond to globally promote the understanding and reduction of landslide disaster risk, as well as to address the 2030 Agenda Sustainable Development Goals. The contributions include the following seven categories:

1. Original articles (minimum 8 pages): Original articles reporting progress of landslide research and technology.
2. Review articles (minimum 8 pages): Review of landslide research and technology in a thematic area of landslides. A review article integrating a series of research and technology of the author or its group.
3. IPL/WCoE/Kyoto Commitment activities (minimum 8 pages): Progress or achievements of the projects of the International Programme on Landslides (IPL) and the World Centres of Excellence on Landslide Risk Reduction (WCoEs), and Kyoto Landslide Commitment.
4. Teaching tools with online extras (minimum 8 pages): User-friendly teaching tools with extras (i.e., photos, illustration, videos, guidelines & manuals) online to fill the gap between the available level of science and technologies and the practical use in the society.
5. Technical note & Case studies (minimum 4 pages): Technical note and case studies on landslides and landslide disaster risk reduction practice.
6. World Landslide Reports (2-4 pages): Landslide reports from landslide-prone developing countries and urbanizing areas of the developed countries from around the world. No processing charge, but limited to approximately 10 reports per issue.
7. Introduction of KLC2020 Official Promoters (1-3 pages): KLC2020 Official Promoters are eligible for this category. The introduction of the official promoters is published throughout the year.

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