

---

# Introduction to ICL Landslide Teaching Toolbox

Kyoji SASSA, Leader of the ICL Landslide Teaching Tools Project

ICL obtained ODA (Official Development Assistance) funds to support UNESCO activities to promote Education, Science, and Culture by non-governmental organizations. The application was requested by the Director-General's office for International Affairs of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan. The target of this budget was Asia and the Pacific area. The ICL Strategic Plan for 2012-2021 indicates a need to develop teaching materials for use in developing countries. Therefore, ICL has compiled these landslide teaching tools including original texts made for this purpose, pdfs of already published documents, and Powerpoint® presentations (.ppt) for lectures. ICL called for contributions from ICL members in Asia such as Indonesia, Thailand, India, Malaysia, Iran, Vietnam, as well as Japan and New Zealand (for English review). An inaugural meeting was held at UNITWIN headquarters in Kyoto University's Uji-campus in June 2012. The concept and outline of the teaching tools gradually emerged and consolidated at a series of meeting in October (Kyoto), November (UNESCO, Paris), January and February 2013 (UNITWIN headquarters, Kyoto). Some members from developed countries (Croatia, Italy, and Chinese Taipei) also contributed tools. The first edition of these teaching tools are presented in this **480 page full-color** Toolbox which includes a CD of .pdf files of guidelines, laws, published papers and Powerpoints® for lectures.

An outline of the teaching tools in the 1st edition of the Landslide Teaching Toolbox is presented below.

## **Copyright and Responsibility for each teaching tool.**

ICL called for contributions and compiled the accepted teaching tools. Copyright and responsibility for the content of each tool lies with its contributing organization. Each tool may be updated by the contributing organization.

## **The Teaching Toolbox contains five parts:**

1. Mapping and Site Prediction
2. Monitoring and Early warning
3. Testing and Numerical Simulation

- 
4. Risk Management and Others
  5. Country Practices and Case Studies

### **The Teaching Toolbox contains three types of tools.**

1. The first type are TXT-tools consisting of original texts with figures.
2. The second type are PDF-tools consisting of already published reference papers, manuals, guidelines, laws, codes and others. They are on the accompanying CD as **.pdf files**.
3. The third type are PPT-tools consisting of Powerpoint® files made for lectures. They are on the accompanying CD as **.ppt files**.

This book of the TXT-tools also includes an appendix of abstracts for the PDF-tools and PPT-tools.

### **Identifiers used for each tool**

The identifier of each tool consists of three parts:

1. the number of the part of the tool box in which it appears (Parts 1 to 5);
2. the country telephone code and an assigned unique number for each contributing organization (for example 081-1 signifies Japan-ICL headquarters, and 081-3 signifies Japan- Erosion and Sediment Control Department, Ministry of Land, Infrastructure, Transport and Tourism);
3. the last part of the identifier is a consecutive number assigned to the teaching tool by its contributing organization.

### **Example teaching tools**

TXT-tool 1.886-1.1 Landslide Susceptibility Mapping

- Appears in Part 1, contributed from Chinese Taipei (886), by the National Taiwan University (1), and is their TXT-tool number 1.

PDF-tool 3.081-1.2 Manual of integrated computer simulation programme “LS-RAPID”

- Appears in Part 3, contributed from Japan (081), by ICL Headquarters and is their PDF-tool number 2

PPT-tool 4.039-1.1 Definition & Use of Empirical Rainfall Thresholds for Possible Landslide Occurrence

- Appears in Part 4, contributed from Italy (039), by the National Research

---

Council CNR-IRPI, and is their PPT-tool number 1

### **Planned updates of the Teaching Toolbox**

The first edition of the Teaching Toolbox will be circulated to ICL members and ICL supporting members as well as the contributing organizations listed below. ICL will call for modifications, updates and new contributions from members. During the ICL Board of Representative meetings on 18-22 November 2013, an update of the 1<sup>st</sup> edition will be discussed. A 2<sup>nd</sup> edition of the toolbox is planned for 2014 in time for World Landslide Forum 3 on 2-6 June 2014 in Beijing, China.

### **List of contributing organizations with identifier number and email of leader**

- 039-1 Istituto di Ricerca per al Protezione Idrogeologica, CNR, Italy  
Email: Fausto GUZZETTI <F.Guzzetti@irpi.cnr.it>
- 062-1 Department of Geological Engineering, Universitas Gadjah Mada, Indonesia  
Email: Dwikorita KARNAWATI <dwiko@ugm.ac.id>,  
Faisal FATHANI <[tfathani@gmail.com](mailto:tfathani@gmail.com)>
- 064-1 GNS Science, New Zealand  
Email: Mauri McSAVENEY <m.mcsaveney@gns.cri.nz>
- 066-1 Asian Disaster Preparedness Center (ADPC), Thailand  
Email: NMSI ARAMBEPOLA <arambepola@adpc.net>
- 081-1 ICL Headquarters, Japan  
Email: Kyoji SASSA <[sassa@iclhq.org](mailto:sassa@iclhq.org)>
- 081-2 Tohoku Gakuin University, Japan  
Email : Toyohiko MIYAGI <[miyagi@izcc.tohoku-gakuin.ac.jp](mailto:miyagi@izcc.tohoku-gakuin.ac.jp)>
- 081-3 Erosion and Sediment Control Department, Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Japan
- 084-1 VNU University of Science, Vietnam  
Email: DUC Do Minh <ducgeo@gmail.com>
- 385-1 Croatian Landslide Group from Faculty of Civil Engineering, Rijeka University and Faculty of Mining, Geology and Petroleum Engineering, University of Zagreb  
Email: Željko ARBANAS <[zeljko.arbanas@gradri.hr](mailto:zeljko.arbanas@gradri.hr)>  
Snježana MIHALIĆ ARBANAS <snjezana.mihalic@rgn.hr>
- 886-1 National Taiwan University, Department of Civil Engineering, Chinese Taipei  
Email: Ko-Fei Liu <kfliu@ntu.edu.tw>

---

# Content of Book

**Preface:** Aim and background of teaching tool

## Content

**Introduction:** Development of teaching tool and planned use

### Part 1. Mapping and Site Prediction

TXT-tool 1.081-2.1	Landslide topography mapping through aerial photo interpretation.....	1
TXT-tool 1.081-2.2	Interpreting topography from a historical perspective - A case study of a tropical deeply weathered region.....	11
TXT-tool 1.081-2.3	Abstracting unstable slopes (landslide topography) using aerial photos and topographic maps: Concept and frameworks.....	22
TXT-tool 1.081-2.4	Risk Evaluation using the Analytic Hierarchy Process (AHP) – Introduction to the process concept.....	36
TXT-tool 1.886-1.1	Landslide Susceptibility Map.....	50
TXT-tool 1.886-1.2	Potential debris flow torrent investigation methods.....	56

### Part 2. Monitoring and Early Warning

TXT-tool 2.062-1.1	A Landslide Monitoring and Early Warning System.....	69
TXT-tool 2.062-1.2	A Monitoring and Early Warning System for Debris Flows in Rivers on Volcanoes.....	80
TXT-tool 2.081-1.1	Key Points in Field Work for Landslide Engineers	89
TXT-tool 2.385-1.1	Landslide Comprehensive Monitoring System: The Grohovo Landslide Case Study, Croatia.....	146
TXT-tool 2.385-1.2	A Comprehensive Landslide Monitoring System: The Kostanjek Landslide, Croatia.....	158
TXT-tool 2.886-1.1	Guidelines for Landslide Monitoring Systems .....	169
TXT-tool 2.886-1.2	Debris Flow Monitoring Guidelines.....	183
TXT-tool 2.886-1.3	Early warning criteria for debris flows and their application in Taiwan.....	194

### Part 3. Testing and Numerical Simulation

TXT-tool 3.081-1.1	Landslide Initiation Mechanism .....	205
TXT-tool 3.081-1.2	Landslide Dynamics.....	215
TXT-tool 3.886-1.1	Introduction to Debris-2D – A Debris Flow Simulation Program.....	238

### Part 4. Risk Management and Others

TXT-tool 4.062-1.1	A Socio-Technical Approach for Landslide Mitigation and Risk Reduction.....	249
TXT-tool 4.062-1.2	Community Hazard Maps for Landslide Risk Reduction.....	259
TXT-tool 4.066-1.1	Community-based Landslide Risk Management Approaches.....	267
TXT tool 4.084-1.1	Soil Slope Stability Analysis.....	281
TXT-tool 4.886-1.1	Taiwan Typhoon Loss Assessment System (TLAS Taiwan) Web Tool.....	298
TXT-tool 4.886-1.2	Emergency Post-landslide Disaster Documentation.....	304

### Part 5. Country Practices and Case Studies

TXT-tool 5.084-1.1	Landslide Vulnerability Assessment: A Case Study of Backan Town, Northeast Vietnam.....	313
--------------------	---	-----

TXT-tool 5.886-1.1	Procedures for Constructing Disaster Evacuation Maps: Guidelines and Standards.....	332
TXT-tool 5.886-1.2	Ecological Countermeasure Guidelines and Case Histories in Taiwan.....	337

## Appendix: Abstracts of PDF and PPT tools

### Part 1. Mapping and Site Prediction

PDF-tool 1.064-1.1	Field guide for the identification and assessment of Landslide and Erosion features and hazards affecting pipelines (88 pages).....	349
PPT-tool 1.039-1.1	Remote Sensing data and methodology for event landslide recognition and mapping (30 pages).....	350
PPT-tool 1.064-1.1	Landslides in New Zealand – identifying the hazard (50 pages).....	351
PPT-tool 1.064-1.2	Earthquake-Induced landslides in New Zealand (40 pages).....	352
PPT-tool 1.064-1.3	Probabilistic landslide hazard, North Island, New Zealand (54 pages).....	353
PPT-tool 1.886-1.1	Construct a Landslide Susceptibility Map (54 pages).....	354
PPT-tool 1.886-1.2	Potential debris flow torrent investigation method (41 pages).....	355

### Part 2. Monitoring and Early Warning

PDF-tool 2.091-1.1	Status of Landslide Monitoring in India (10 pages).....	356
PPT-tool 2.039-1.1	Italian National Landslide Warning System (29 pages).....	358
PPT-tool 2.062-1.1	Landslide Monitoring and Early Warning System (31 pages).....	359
PPT-tool 2.062-1.2	Monitoring and Early Warning System for Debris Flows in Rivers on Volcanoes (37 pages).....	360
PPT-tool 2.886-1.1	Landslide Monitoring System Guidelines (39 pages).....	361

### Part 3. Testing and Numerical Simulation

PDF-tool 3.081-1.1	Manual for ICL-1 - a Transportable Ring Shear Apparatus (46 pages).....	362
PDF-tool 3.081-1.2	Manual for the LS-RAPID software (43 pages).....	363
PDF-tool 3.081-1.3	Undrained dynamic- loading ring shear apparatus and its application to landslide dynamics (13 pages).....	364
PDF-tool 3.081-1.4	Dynamic properties of earthquake induced large-scale rapid landslides within past landslide masses (10 pages).....	365
PDF-tool 3.081-1.5	An integrated model simulating the initiation and motion of earthquake and rain induced rapid landslides and its application to the 2006 Leyte landslide (18 pages).....	366
PDF-tool 3.081-1.6	A hypothesis of the Senoumi submarine megaslide in Suruga Bay in Japan - based on the undrained dynamic-loading ring shear tests and computer simulation (17 pages).....	367
PPT-tool 3.039-1.1	Landslide Hazards and Risk Assessment (52 pages).....	368
PPT-tool 3.039-1.2	Probabilistic approach to physically based landslide modeling (29 pages).....	369
PPT-tool 3.039-1.3	Landslide-related WPS services (46 pages).....	370
PPT-tool 3.039-1.4	Advanced 2D Slope stability Analysis by LEM by SSAP software: a full freeware tool for teaching and scientific community (52 pages).....	371
PPT-tool 3.064-1.1	Numerical analysis of slopes (53 pages).....	372
PPT-tool 3.886-1.1	Debris-2D Tutorial (43 pages).....	373

### Part 4. Risk Management and Others

PDF-tool 4.091-1.1	Guidelines for Landslides Management in India (190 pages).....	374
PDF-tool 4.091-1.2	Training Module on Comprehensive Landslide Risk Management (304 pages).	375
PDF-tool 4.091-1.3	Community-based Landslide Risk Reduction (24 pages).....	376
PPT-tool 4.039-1.1	Definition and Use of Empirical Rainfall Thresholds for Possible Landslide Occurrence (39 pages).....	377
PPT-tool 4.039-1.2	Landslide Risk to the Population of Italy (37 pages).....	378
PPT-tool 4.062-1.1	Socio-Technical Approach for Landslide Mitigation and Risk Reduction (10 pages).....	379
PPT-tool 4.062-1.2	Community Hazard Maps for Landslide Risk Reduction (10 pages).....	380
PPT-tool 4.064-1.1	Case History: The 1979 Abbotsford Landslide, Dunedin, New Zealand (37 pages).....	381
PPT-tool 4.064-1.2	Qualitative landslide risk assessment in New Zealand (30 pages).....	382
PPT-tool 4.064-1.3	Quantitative landslide risk assessment in New Zealand (30 pages).....	383
PPT-tool 4.064-1.4	Three Recent GNS Science Landslide Responses (28 pages).....	384
PPT-tool 4.064-1.5	Case study – Utiku Landslide, central North Island, New Zealand (27 pages)...	385
PPT-tool 4.064-1.6	What are Landslides in New Zealand? ( 36 pages).....	386
PPT-tool 4.064-1.7	Quantifying the benefits for floodplain management of targeted reforestation of landslide-prone terrain in New Zealand (23 pages).....	387
PPT-tool 4.066-1.1	Course on Landslide Disaster Risk Reduction for Local Government Level Stakeholders ( 416 pages).....	388
PPT-tool 4.886-1.1	Typhoon Loss Assessment System (TLAS) Taiwan Web Tool ( 8 pages).....	391
PPT-tool 4.886-1.2	Assessment Social Impact of debris flow disaster by Social Vulnerability Index ( 17 pages).....	392
<b>Part 5. Country Practices and Case Studies</b>		
PDF-tool 5.001-1.1	The Landslide Handbook: A Guide To Understanding Landslides (60 pages)	393
PDF-tool 5.064-1.1	Guidelines for assessing planning policy and consent requirements for landslide prone land ( 78 pages).....	394
PDF-tool 5.064-1.2	Shut happens - Building hazard resilience for businesses in NZ ( 9 pages).....	395
PDF-tool 5.064-1.3	Working from the same page consistent messages for CDEM: PART B: Hazard-specific information – Landslides (14 pages).....	396
PDF-tool 5.081-3.1	Japanese Laws, Codes, Guideline and Standard Procedure in regarding to disaster Prevention and Risk reduction in Japan (874 pages).....	397
PPT-tool 5.886-1.1	Tutorial: Procedures for Constructing Disaster Evacuation Maps (56 pages)...	399
<b>Member of ICL</b>	.....	401