

DEBRIS-FLOW HAZARD MITIGATION. Bridging Science and Practice in Debris Flow Management

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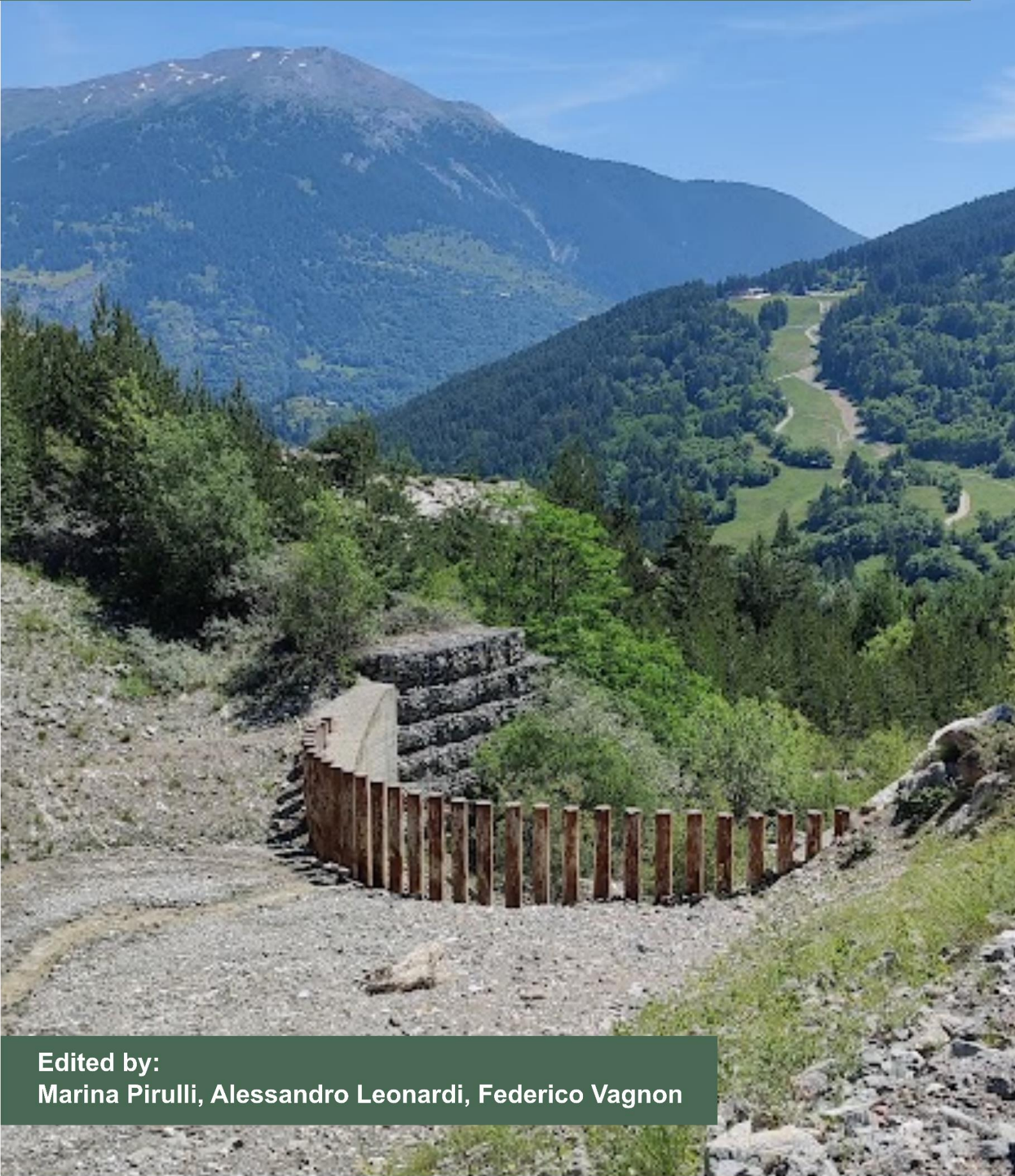
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DEBRIS FLOW HAZARD MITIGATION

Bridging Science and Practice in Debris Flow Management



Edited by:
Marina Pirulli, Alessandro Leonardi, Federico Vagnon

PROCEEDINGS OF THE EIGHT INTERNATIONAL CONFERENCE ON
DEBRIS-FLOW HAZARD MITIGATION, TORINO, ITALY, JUNE 26-29, 2023

DEBRIS-FLOW HAZARD MITIGATION

Bridging Science and Practice in Debris Flow Management

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2023



DFHM8 logo by Alessandro Leonardi

On the Cover: Filter barrier for debris flows, Bardonecchia, Italy. Alessandro Leonardi

Preface

The Eighth International Conference on Debris-Flow Hazard Mitigation was held in Torino, Italy on June 26-29, 2023.

The conference gathered together some 250 participants from 22 countries, representing a global community of researchers and practitioners who deal with challenges on debris flow hazards and mitigation strategies. The agenda consisted of 11 keynote presentations, 40 shorter oral presentations, and 124 poster presentations. The conference sessions were preceded by a 1-day field trip in the Susa Valley and followed by a 2-day field trip in the Aosta Valley.

This proceedings volume contains 174 papers that accompanied all three types of presentations. The papers are arranged over 7 thematic sessions:

- Processes and Mechanics
- Experiments and Modelling
- Monitoring, Detection and Warning
- Role of Disturbance
- Case Studies and Hazard Assessment
- Engineering and Mitigation
- Needs of End Users

All papers underwent blind peer review, with each paper receiving at least one technical and one editorial review. Reviewer names and affiliations are given on the following pages.

For all the work done in organizing this event, we want to address our deepest gratitude to the International Scientific Committee, and to the institutions, companies and volunteers who have directly and indirectly contributed to this event. Special thanks go to Claudio Scavia, Giulia La Porta, Giulia Messina and Andrea Pasqua, who worked behind the curtains and greatly contributed to the success of the conference. Several organizations provided sponsorship through financial support. Their names are listed on the following pages. Our sincerest thanks goes out to all of these individuals and groups.

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Naoki Nishimura, Nobuhiro Usuki, Masaru Touhei, Takahisa Mizuyama, Atsushi Okamoto

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Alexander Gorr, Luke McGuire, Ann Youberg

A novel downstream flood hazard grade index incorporating upstream hydrograph characteristics to predict debris flow runoff

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Reconstruction of debris flow in the Gerkhozhan-Su river valley based on the chain modeling

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Definition of rainfall thresholds for shallow landslides in Colombian tropical mountainous catchments as debris flow triggering mechanism

Ricardo Jaramillo-González, Luis Martínez, Edier Aristizábal, Edwin García, Roberto J. Marín

A Study on the comparative analysis of the FLO-2D model according to debris flow sediment amount

Hang-Il Jo, Chang-Deok Jang, Kye-Won Jun, Ho-Jin Lee, Bae-Dong Kang

Impact of climate change on hydro-meteorological trigger conditions for debris flows in Austria

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Field investigations of sandstone escarpment stability at East Mountain, Utah, USA

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Morphological characteristics of drainage networks related to landslide cluster in the Colombian Andean

Karolina Naranjo, Edier Aristizábal, Johnnatan Palacio

Integration of meteorology and geomorphology for enhanced understanding of post-fire debris-flow hazards

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Topographical criteria for the occurrence of landslides causing debris flows in the 2017 torrential rain in northern Kyushu, Japan

Takehiro Ohta, Kanako Hamamoto, Seiya Eguchi

Anthropogenic gravitational mass movements and the fluvial geomorphological changes: The Vale (2019) and Samarco (2015) tailing dam disasters, Brazil

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Modeling the runout behavior of the July 23rd, 2015 Cancia debris-flow event using two numerical models

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Satellite-based monitoring of an open-pit mining site using Sentinel-1 advanced radar interferometry: A case study of the December 21, 2020, landslide in Toledo city, Philippines

Ryan Ramirez, Rajiv Eldon Abdullah, Woojae Jang, Shin-Kyu Choi, Tae-Hyuk Kwon

Using integrated growth to delineate debris-flow inundation

Mark E. Reid, Dianne L. Brien, Collin Cronkite-Ratcliff, Jonathan P. Perkins

Keynote lecture. The debris flow event of 29 October 2018 in the Rio Rotiano (Italy) and its challenges for the mathematical and numerical modelling

Giorgio Rosatti, Daniel Zugliani, Luigi Fraccarollo

Extreme precipitation on dry ground in western Norway – characteristics of induced landslides call for adaption of the Norwegian practice in landuse planning

Denise Christina Rùther, Lena Rubensdotter, Heidi Hefre

Rockfalls change the runout and frequency of debris flows at Punta Nera (Eastern Italian Alps)

Alessandro Simoni, Matteo Barbini, Leonardo Battistel, Martino Bernard, Matteo Berti, Osvaldo Cargnel, Pier Paolo Ciuffi, Carlo Gregoretti

Development of debris flow vulnerability curve for data-driven method

Chang-Ho Song, Ji-Sung Lee, Ho-Hong Duy Nguyen, Yong-Soo Ha, Yun-Tae Kim

Quantifying debris-flow hazard and risk based on fan sector

Alex Strouth, Sophia Zubrycky, Scott McDougall

Spatial variation in specific sediment discharge volume from first-order catchment due to heavy rainfall and its factors

Misa Tsushima, Taro Uchida

Debris flows and debris avalanches initiation and runout susceptibility assessment in Campania region (Italy)

Rita Tufano, Davide Mazza, Francesco Maria Guadagno, Pantaleone De Vita, Giacomo Russo, Paola Revellino

Advancing debris flow hazard and risk assessments using debris flow modeling and radar derived rainfall intensity data

Thad Wasklewicz, Richard Guthrie, Graham Knibbs, Rebecca Rossi

Probabilistic prediction method of erosion volume and deposition area from rainfall observation data
Kazuki Yamanoi, Kaori Shikakura, Kenji Kawaike, Satoru Oishi

Bridge obstruction caused by debris flow: A practical procedure for its management in debris-flow simulations

Daniel Zugliani, Atousa Ataieyan, Raffaele Rocco, Nathalie Betemps, Paolo Ropele, Giorgio Rosatti

Engineering and Mitigation

Design of two retention basins along the torrent Liera on the Gares Valley (Dolomites, North East Italy) after the storm Vaia

Matteo Barbini, Martino Bernard, Mauro Boreggio, Fabio Da Re, Carlo Gregoretti

Log crib check dam performance under multiple debris-flow loadings – East Gate Landslide, British Columbia, Canada

Matthias Busslinger, Matthias Jakob, Richard Singer, Ryan Calder

Keynote lecture. Modelling flow-landslides impact against protection structures

Sabatino Cuomo

Application of physical models to improve the mitigation structures of debris flow in a case study

Davood Farshi, Dany Suter

Debris flow mitigation by using biopolymers as a soil stabilizer

Hadi Fatehi, Dominic Ong, Jimmy Yu, Ilhan Chang

Propose of design method on Level II load of open Sabo dam

Toshiyuki Horiguchi, Satoshi Katsuki, Yoshiharu Komatsu

Effect of multiple debris flow countermeasures on flow characteristics and topographic changes through real-scale experiment

Woojae Jang, Beom-Jun Kim, Shin-Kyu Choi, Tae-Hyuk Kwon, Chan-Young Yune

Field investigation and design of debris nets in an environmentally sensitive area

William Kane, Joseph McElhany, Brian Forsthoff

Mitigation strategy for low-frequency large-magnitude debris flows in Hong Kong

Florence Ko, Chris Chan, Hoi-yan Ho, Kevin So

Deciphering controls for the impact of geophysical flows on a flexible barrier: Insights from coupled CFD-DEM modeling

Yong Kong, Mingfu Guan

Analysis of mitigation effect of the open- and closed-type check dam

Seungjun Lee, Hyunuk An, Minseok Kim

Flow-type landslides impacting V-shaped diversions: Physical modelling

Ruoying Li, Clarence E. Choi

Multiple debris-resisting barriers with basal clearance: a study on impact force

Haiming Liu, Clarence E. Choi, Charles W.W. Ng

The Cheekeye debris-flow barrier - unique features of a proposed open check dam in Canada

Emily Mark , Alex Strouth

Spatial distribution of natural debris-flow impact

Georg Nagl, Roland Kaitna, Johannes Hübl

Coupled Eulerian-Lagrangian debris flow model with flexible barrier

Shiyin Sha, Ashley P. Dyson , Gholamreza Kefayati , Ali Tolooyan

Experimental study on structural behaviour of steel wire mesh under impact loading

Masakazu Sugimoto, Kanako Koizumi, Takeshi Arita, Toshiyuki Horiguchi

Physical model investigation of the transition of a debris flow from the aerial to the water phase

Christian Tognacca, Enea Toschini, Mattia Benagli, Gioele Maddalena

Static and dynamic impact forces on a rigid barrier due to dry debris flow simulated by a DEM-based granular column collapse

Aman Ujjwal, S. Sureka, Govind Kant Mishra, Mousumi Mukherjee, Arindam Dey

Sediment control and logs capturing in sand pocket with combination of sabo dam with large conduit and iron bars

Haruki Watabe, Satoshi Tagata, Tatsuki Yuzawa, Takahiro Itoh

A simplified numerical model for evaluating sediment control by open-type sabo dams in the Joganji River basin

Yusuke Yamazaki, Tomoyuki Noro, Kenji Miwa, Takahisa Mizuyama, Masaharu Fujita, Shusuke Miyata, Akihiko Ikeda, Tomohiko Furuya, Takahiko Nagayama, Takahiro Itoh

Keynote lecture. Impact dynamics of debris flow against slit dam: Experimental and numerical investigation

Gordon G.D. Zhou, Kahlil F.E. Cui, Junhan Du, Nanjun Li, Xueqiang Lu, Yunxu Xie

Needs of End Users

Runout model evaluation based on back-calculation of building damage

Katherine R. Barnhart, Jason W. Kean

MurGame: Protect your village from debris flows!

Catherine Berger, Florian Zimmermann, Ralf Mauerhofer, Marc Christen

A new statistical method to assess debris flow erosion

Gabriele Bertoldi, Tommaso Baggio, Francesco Bettella, Vincenzo D'Agostino

Risk assessment of transport linear infrastructures to debris flow

Francesco Castelli, Enrico Foti, Valentina Lentini, Marina Pirulli

Debris-flow risk-to-life: Upper-bound preliminary screening

Tim Davies, Mark Bloomberg, Dave Palmer, Tom Robinson

Practical guide for debris flow and hillslope debris flow protection nets and its application in case studies

Nadine Feiger, Corinna Wendeler

A CFD-DEM based numerical investigation of debris flow on ballasted railway track

Yufeng Gong, Yu Qian

Tensile stress development and critical behavior of a flexible barrier

Miao Huo, Fucheng Huang, Maojun Yang, Chenjie Jiang

Debris flow hazard mapping along linear infrastructure: An agent based model and GIS approach
Graham Knibbs, Richard Guthrie, Thad Wasklewicz

A time-independent reliability based design approach for debris flow flexible barriers
Maddalena Marchelli, Chiara Deangeli

Keynote lecture. Defining protection works against debris-flow hazards: Industrial standard, tailor-made or haute-couture?
Guillaume Piton

A regional early warning system for summer debris flows
Michel Ponziani, Denise Ponziani, Andrea Giorgi, Hervé Stevenin, Sara Maria Ratto

Modelling of debris-flow deposition: terrain slope, mobility coefficient, and back-calculated basal friction coefficient
Dieter Rickenmann, Christian Scheidl