Date of Submission	21 November 2024

Progress Report of ICL Network

1. Title of Network:

Landslides and Cultural & Natural Heritage Network

2. Name of Coordinator

Vit Vilimek (vilimek@natur.cuni.cz); **Daniele Spizzichino** (daniele.spizzichino@isprambiente.it)

3. List of member organizations

Italian Institute for Environmental Protection and Research (ISPRA).
UNESCO Chair on Prevention and Sustainable Management of Geo-Hydrological Hazards, University of Florence.
Charles University, Faculty of Science, Prague

4. Progress report of activities

The recent activities implemented by the network are listed below:

a) WLF5 (2021) – support to the organization of the Session ***1.3 Landslides at UNESCO designates sites and contribution from WMO, FAO, IRDR***. - Convener: Qunli Han & Vít Vilímek. (10 oral contributions).

b) WLF6 (2023) - support to the organization of the Session ***1.7: Cultural heritage threatened by landslides: from earth observation and in situ investigation to sustainable mitigation measures.*** (CONVENERS: Claudio Margottini, William Frodella, Daniele Spizzichino, Nacho Gallego Revilla, Stefano Morelli, Roberta Boni, Rosa María Mateos Ruiz (11 oral contributions). International Scientific Committee (Vit Vilimek) and Local Organize Committee (Daniele Spizzichino).

5. Plan of future activities

Support the implementation of WLF7 and specific thematic session on network topics.
Network meeting during the 2025 ICL-KLC Memorial Conference

Publication (ICL Journal Landslides, ICL Book Series, etc.)

Culture Heritage sites

Beni, T., Boldini, D., Crosta, G.B. et al. Rock instabilities at the archaeological site of Dadan (Kingdom of Saudi Arabia). Landslides 20, 2455–2478 (2023). https://doi.org/10.1007/s10346-023-02122-7

Jon Ander Clemente, Jesus A. Uriarte, Daniele Spizzichino, Francesco Faccini, Tomás Morales, Rockfall hazard mitigation in coastal environments using dune protection: A nature-based solution case on Barinatxe beach (Basque Coast, northern Spain) Engineering Geology,Volume 314,2023,107014, ISSN 0013-7952, https://doi.org/10.1016/j.enggeo.2023.107014. (https://www.sciencedirect.com/science/article/pii/S0013795223000315).

Clemente, J.A., Spizzichino, D., Leoni, G. et al. Rockfall susceptibility analysis through 3D simulations in marine protected areas of the Portofino coastline: case studies of San Fruttuoso and Paraggi bays. Bull Eng Geol Environ 82, 122 (2023). https://doi.org/10.1007/s10064-023-03133-3.

Spizzichino, D. et al. (2023). Slope Instability Induced by Climate Changes on the UNESCO Etruscan Necropolis of Monterozzi (Tarquinia, Italy). In: El-Qady, G.M., Margottini, C. (eds) Sustainable Conservation of UNESCO and Other Heritage Sites Through Proactive Geosciences. Springer Geology. Springer, Cham. https://doi.org/10.1007/978-3-031-13810-2_9

Spizzichino, D. et al. (2023). Geotechnical Design and Mitigation Measures for the Conservation of Akapana Pyramid in the Tiwanaku Archaeological Site (Bolivia). In: El-Qady, G.M., Margottini, C. (eds) Sustainable Conservation of UNESCO and Other Heritage Sites Through Proactive Geosciences. Springer Geology. Springer, Cham. https://doi.org/10.1007/978-3-031-13810-2_2

Margottini, C., Spizzichino, D., Pandolfi, O. (2023). Landslide Mitigation Measures for the Conservation of the Archaeological Site of Mata Ngarau, Orongo Village (Easter Island-Chile). In: El-Qady, G.M., Margottini, C. (eds) Sustainable Conservation of UNESCO and Other Heritage Sites Through Proactive Geosciences. Springer Geology. Springer, Cham. https://doi.org/10.1007/978-3-031-13810-2_1.

J.A. Fernández-Merodo, R.M. Mateos, J.C. García-Davalillo, J.M. Azañón, C. Novo, R. Castellanza, D. Spizzichino, C. Margottini (2022). Multi-scale stability analysis at San Pedro Cliff in the Alhambra Cultural Heritage. In Geotechnical Engineering for the Preservation of Monuments and Historic Sites III, Lancellotta, Viggiani, Flora, de Silva & Mele. 1193-1205.

Gallego J.I., Margottini C., Spizzichino D., Boldini D., Abul J.K. (2022): “Geomorphological processes and rock slope instabilities affecting the AlUla archaeological region”. In Geotechnical Engineering for the Preservation of Monuments and Historic Sites III, Lancellotta, Viggiani, Flora, de Silva & Mele eds, 456-466.

Domej, G., Previtali, M., Castellanza, R., Spizzichino, D., Crosta, G., Villa, A., et al. (2022). High-Resolution 3D FEM Stability Analysis of the Sabereebi Cave Monastery, Georgia. ROCK MECHANICS AND ROCK ENGINEERING, 55(8), 5139-5162 [10.1007/s00603-022-02858-z].

Frodella, W., Rosi, A., Spizzichino, D. et al. Integrated approach for landslide hazard assessment in the High City of Antananarivo, Madagascar (UNESCO tentative site). Landslides 19, 2685–2709 (2022). https://doi.org/10.1007/s10346-022-01933-4.

Margottini C., Spizzichino D. (2021) Traditional Knowledge and Local Expertise in Landslide Risk Mitigation of World Heritages Sites. In: Sassa K., Mikoš M., Sassa S., Bobrowsky P.T., Takara K., Dang K. (eds) Understanding and Reducing Landslide Disaster Risk. WLF 2020. ICL Contribution to Landslide Disaster Risk Reduction. Springer, Cham. https://doi.org/10.1007/978-3-030-60196-6_34

Frodella W., Spizzichino D., Ciampalini A., Ascanio R., Margottini C., Casagli N. (2021) Shallow Landslide Susceptibility Assessment in the High City of Antananarivo (Madagascar). In: Sassa K., Mikoš M., Sassa S., Bobrowsky P.T., Takara K., Dang K. (eds)

Understanding and Reducing Landslide Disaster Risk. WLF 2020. ICL Contribution to Landslide Disaster Risk Reduction. Springer, Cham. https://doi.org/10.1007/978-3-030-60196-6_37.

Frodella W. Spizzichino D., Gigli G., Elashvili M., Margottini C., Villa A., Frattini P., Crosta G., Casagli N. (2021) Integrating Kinematic Analysis and Infrared Thermography for Instability Processes Assessment in the Rupestrian Monastery Complex of David Gareja (Georgia). In: Sassa K., Mikoš M., Sassa S., Bobrowsky P.T., Takara K., Dang K. (eds) Understanding and Reducing Landslide Disaster Risk. WLF 2020. ICL Contribution to Landslide Disaster Risk Reduction. Springer, Cham. https://doi.org/10.1007/978-3-030-60196-6_36

Vilímek V., Klimeš J., Ttito Mamani R.V., Bastante Abuhadba J., Astete Victoria F., Champi Monterroso P.Z., (2020): Contribution of the collaborative effort of the Czech WCoE to landslide risk reduction at the Machupicchu, Peru. Landslides. 17, 8, 2683-2688.

Mateos, R.M., Ezquerro, P., Azañón, J.M., D. Spizzichinoet al. Landslides (2018) Coastal lateral spreading in the world heritage site of the Tramuntana Range (Majorca, Spain). The use of PSInSAR monitoring to identify vulnerability. 15: 797. https://doi.org/10.1007/s10346-018-0949-5.

Boldini, D., Guido, G.L., Margottini, C. And Spizzichino D. Stability Analysis of a Large-Volume Block in the Historical Rock-Cut City of Vardzia (Georgia). Rock Mech Rock Eng (2017). https://doi.org/10.1007/s00603-017-1299-7.

Margottini C., Bobrowsky P., Gigli G., Ruther H., Spizzichino D., Vlcko J. (2017) Rupestrian World Heritage Sites: Instability Investigation and Sustainable Mitigation Open image in new window. In: Sassa K., Mikoš M., Yin Y. (eds) Advancing Culture of Living with Landslides. WLF 2017. Springer, Cham.

Natural heritage sites

Vilímek V., Mark B., Emmer A. eds. (2024): Geoenvironmental Changes in the Cordillera Blanca, Peru. Springer, 300 p. ISBN 978-3-031-58244-8… book publication

Stefanelli C.T., Vilímek V., Emmer A., Catani F. (2018): Morphological analysis and features of the landslide dams in the Cordillera Blanca. Landslides, 15, 3, 507-521.

Emmer A., Vilímek V., Zapata M.L. (2018): Hazard mitigation of glacial lake outburst floods in the Cordillera Blanca (Peru): The effectiveness of remedial works. Journal of Flood Risk Management,
11, 5489-5501.

Education:

Bacelor Thesis: 2022, T. Brezna, Influence of tourism on Machu Picchu heritage site. (Charles University in Prague).
Master Thesis: (assigned 2023), T. Brezna, Hazard analysis of selected UNESCO cultural heritage sites. (Charles University in Prague).

Supervisor of following recent Graduation:

Co_tutor PhD Thesis, Jon Ander Clemente Momoitio, dell'Università dei Paesi Baschi. Visiting student in ispra 10 Jan. to 30 Apr. 2022. Title Análisis de inestabilidades en acantilados costeros del País Vasco y Liguria como base para el desarrollo de estrategias de protección y gestión sostenible

DICAM - Department of Civil, Chemical, Environmental and Materials Engineering - SCHOOL OF ENGINEERING AND ARCHITECTURE. Department of Civil, Chemical, Environmental and Materials Engineering Master's Degree in Environmental and Land Engineering, Master's Degree Thesis in Rock Engineering, student: Chiara Chierichini: Title: Analysis of instability processes in the archaeological area of the necropolis of Norchia A.A. 2021/22

DICAM - Department of Civil, Chemical, Environmental and Materials Engineering - SCHOOL OF ENGINEERING AND ARCHITECTURE. Department of Civil, Chemical, Environmental and Materials Engineering Master's Degree in Environmental and Land Engineering, Master's Degree Thesis in Rock Engineering, student: Milena Diletto: Title: Analysis of instability processes in the archaeological area of Cuma A.A. 2021/22.

Tutoring for the 250-hour internship within the II level Master in Geospatial Science & Technology – GEO-G.S.T. – Active at the Department of Computer Engineering of the University of Tor Vergata. Intern Francesco Menniti. Final thesis on Characterization of geological risks of archaeological heritage and monitoring via satellite radar interferometry (academic year 2018-2019);