Date of Submission	May 14, 2025

IPL Project 253 Annual Report Form

Period of activity under report
from 1 January 2024 to 31 December 2024
(Final Report, Project ended)

1. Project Number and Title:

IPL 253 "Integrated Landslide Disaster Risk Research in Mexico"

2. Main Project Fields

Select the suitable topics. If no suitable one, you may add new field.

(1) Technology Development

    B. Hazard Mapping, Vulnerability and Risk Assessment

(2) Targeted Landslides: Mechanisms and Impacts

    A. Catastrophic Landslides

(3) Capacity Building

    B. Collating and Disseminating Information/ Knowledge

(4) Mitigation, Preparedness and Recovery

    A. Preparedness

3. Name of Project Leader

Affiliation:

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Core members of the Project:

Irasema Alcántara Ayala

Adán Montes de Jesús

Ricardo J. Garnica Peña

Gema Velásquez Espinoza

4. Objectives (5 lines maximum)

To support the goals of the ICL Kyoto Commitment and the Landslide Partnerships, we aim to advance comprehensive research on landslide disaster risks in mountainous regions. Our focus is on strengthening the connection between scientific findings and policy development. This includes studying hazards, vulnerability, and exposure to landslides, enhancing communication about landslide risks among various stakeholders and communities, and researching communities

particularly susceptible to landslides.

5. Study Area

The project was carried out in several municipalities of the Sierra Norte de Puebla, Mexico.

6. Project Duration

5 years (2020-2024)

7. Report

1) Progress in the project (30 lines maximum)

A comprehensive array of activities has been implemented to map and analyse the occurrences of landslides effectively. These initiatives have employed advanced technologies, such as Unmanned Aerial Vehicles, which facilitate the acquisition of high-resolution imagery and the development of detailed digital terrain models on a micro-scale. These tools are instrumental in evaluating landslides' risks, susceptibility, and exposure, enhancing our understanding and informing mitigation strategies for these geological hazards.

In parallel with technological advancements, the project has significantly emphasised community engagement, particularly within local educational institutions. By collaborating with local authorities, we have created opportunities for active participation and awareness among students and educators. These stakeholders have been pivotal in creating localised landslide disaster risk maps reflecting the affected communities' unique geographic and societal contexts.

In Mexico, student involvement has extended to participation in surveys that assess their awareness and perceptions of landslide risks within their localities. This method has proven instrumental in capturing valuable data regarding community understanding and reactions to potential hazards. Furthermore, localised assessments have been conducted to identify specific landslide vulnerabilities, facilitating the development of educational resources and scholarly publications centred on effective landslide risk communication.

The outcomes of these initiatives have culminated in the production of vulnerability and exposure maps as well as comprehensive evaluations of disaster risk. These materials serve not only to inform local planning and response strategies but also to enhance overall community resilience to geological hazards. Our active participation in numerous conferences has allowed us to disseminate our findings and progress, where experts and stakeholders convened to discuss recent advancements in landslide research.

To further disseminate the knowledge acquired through this project, we have prepared various publications addressing landslides and mountainous regions, including several chapters for the ICL Open Access Book Series, "Progress in Landslide Research and Technology" (P-LRT). Additionally,

various research theses have been completed, with others currently underway, contributing to the expanding knowledge of landslide dynamics and risk management.

Planned future activities or statement of completion of the Project (15 lines maximum)

This research project has successfully fulfilled its objective of supporting the ICL Kyoto Commitment and the Landslide Partnerships by advancing integrated research on landslide disaster risks in mountainous regions. Over the final year, we implemented a comprehensive set of activities combining technological innovation with community engagement. UAVs enabled high-resolution terrain mapping and detailed micro-scale landslide susceptibility and exposure analysis. Concurrently, we engaged local educational institutions and authorities, fostering student participation in surveys and risk mapping exercises that captured local knowledge and enhanced risk awareness. Localised assessments informed the development of educational materials and scholarly outputs focused on landslide risk communication. The project culminated in producing vulnerability and exposure maps and integrated disaster risk evaluations, contributing to community resilience and risk-informed planning. Findings were shared at multiple international conferences, strengthening science-policy linkages and broadening the impact of our work.

2) Beneficiaries of Project for Science, Education and/or Society (15 lines maximum)

The authorities of Civil Protection from various municipalities in the Sierra Norte de Puebla, along with their residents, the National Center for Disaster Prevention, the Civil Protection Coordination Unit of Puebla State, students from UNAM, and all members of the affected communities and society involved in the project.

3) Results (15 lines maximum, e.g. publications)

Research articles
Lucatello, S., & Alcántara-Ayala, I. (2024). Sustainable Synergy: Strengthening Disaster Risk Reduction in Latin America and the Caribbean through Nature-Based Solutions, International Journal of Disaster Risk Reduction1, 104860 https://doi.org/10.1016/j.ijdrr.2024.104860

Book Chapters
Alcántara-Ayala I., Ramos-Hernández, S.G. (2024). Integrated volcanic disaster risk management in Mexico: insights, challenges, and opportunities, In: Schneiderbauer, S., Szarzynski, J., Pisa, P. F., & Shroder, J. F. (Eds.). (2024). Safeguarding Mountain Social-Ecological Systems, Vol 2: Building Transformative Resilience in Mountain Regions Worldwide. Elsevier.

Velásquez Espinoza G., Alcántara-Ayala I. (2024). Spatio-Temporal Distribution of Rainfall-Induced Landslides in Nicaragua (2000–2022): Preliminary Insights to Communicate Landslide Disaster Risk. In: Abolmasov, B., et al. Progress in Landslide Research and Technology, Volume 3 Issue 1, 2024. Progress in Landslide Research and Technology. Springer, Cham. https://doi.org/10.1007/978-3-031-55120-8_8

Hernández-Cadena, K.M., Garnica-Peña, R.J., González-Sánchez, J., Alcántara-Ayala, I. (2024) Understanding Landslide Awareness: Exploring Students' Disaster Risk Perception in Higher Education Institutions. In: Abolmasov, B., et al. Progress in Landslide Research and Technology, Volume 3 Issue 2, 2024. Progress in Landslide Research and Technology. Springer, Cham.

Alcántara-Ayala I. (2024). Landslide Disaster Risk: Refreshing Notions and Terminology in the Context of the Sendai Framework for Disaster Risk Reduction, In Sarmiento, F. and Gunya A. (Eds.) Mountain Lexicon, A Corpus of Montology and Innovation, Springer Cham, 262 p. ISBN 978-3-031-64884-7, DOI: 10.1007/978-3-031-64884-7

Books
Abolmasov, B. Alcántara-Ayala, I., Arbanas, Ž., Huntley, D., Konagai, K., Mihalić Arbanas, S., Mikoš, M., Ramesh, M.V., Sassa, K., Sassa, S., Tang, H., Tiwari, B. (Editors) (2024) Progress in Landslide Research and Technology, Volume 3 Issue 1, 2024, Springer Cham, ISBN: ISBN 978-3-031-55119-2 DOI: 10.1007/978-3-031-55120-8, 474 pp.

Abolmasov, B. Alcántara-Ayala, I., Arbanas, Ž., Huntley, D., Konagai, K., Mikoš, M., Sassa, K., Sassa, S., Tiwari, B. (Editors) (2024) Progress in Landslide Research and Technology, Volume 3 Issue 2, 2024, Springer Cham, ISBN: 978-3-031-72735-1, 559 pp.