

Progress in Landslide Research and Technology

Volume 3, Issue 2, 2024



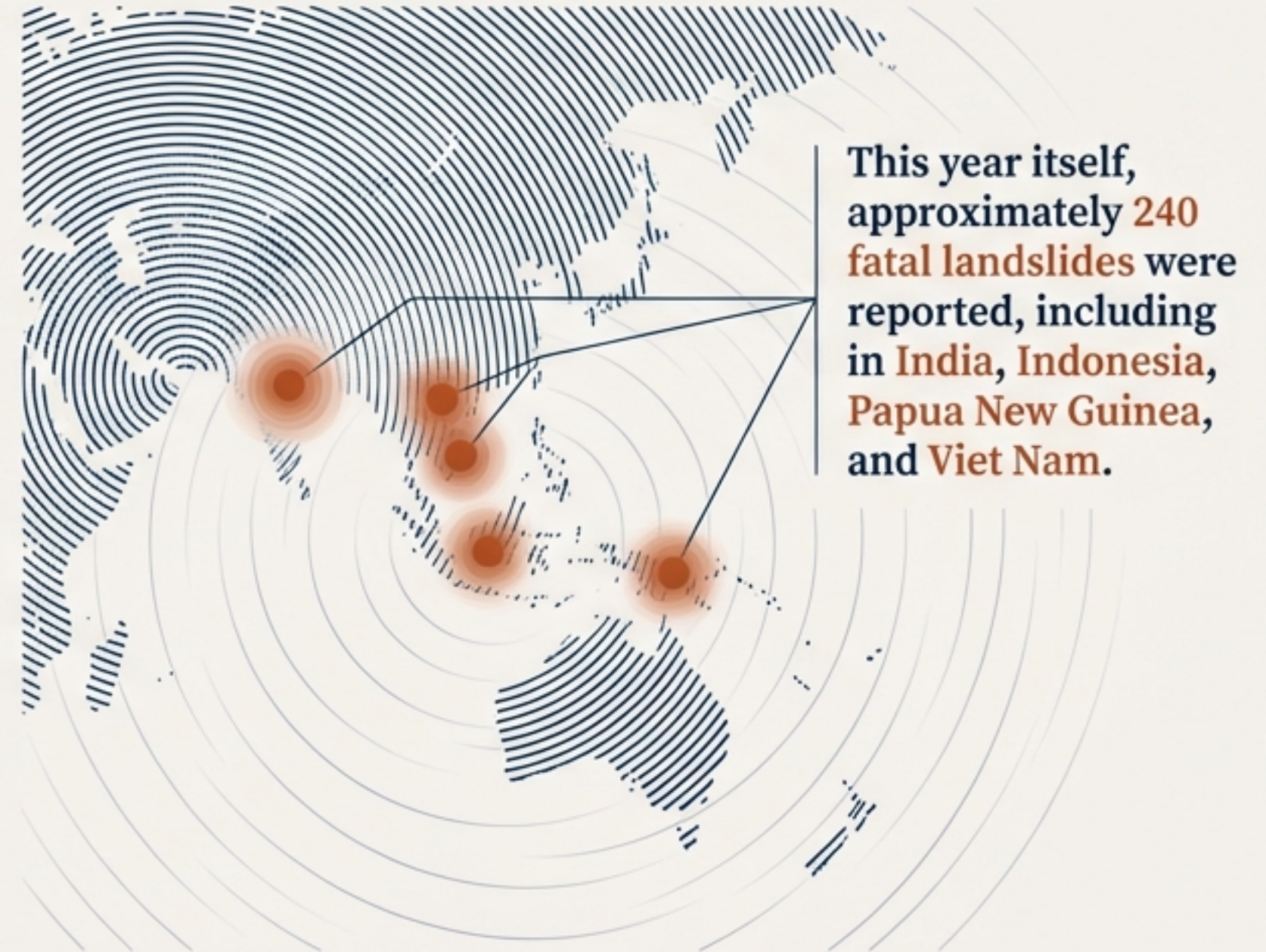
International Consortium
on Landslides (ICL)

A Growing Global Threat Demands a Coordinated Scientific Response

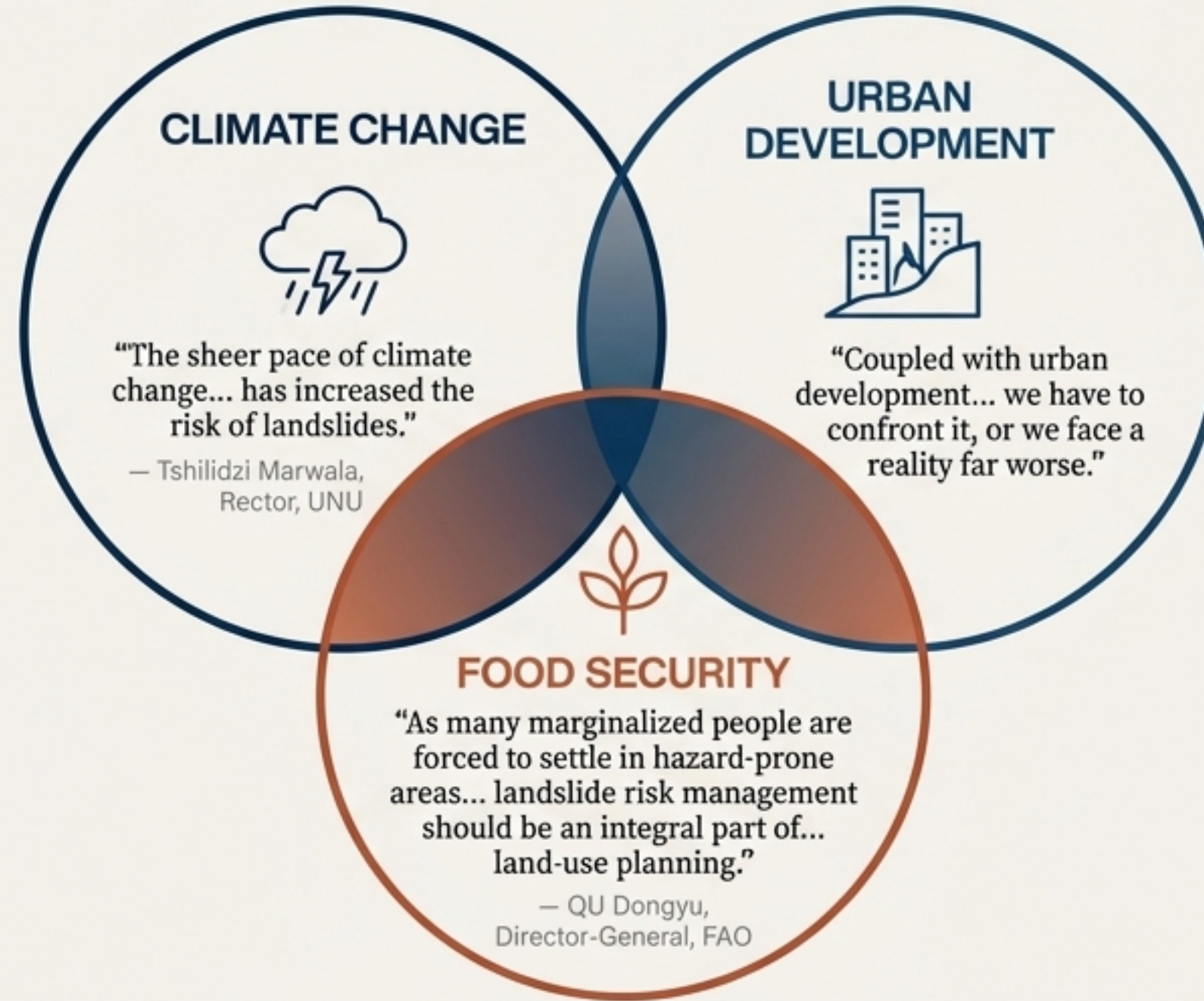
Landslides, triggered by factors like heavy rainfall, earthquakes, and glacial lake outbursts, pose a substantial threat worldwide, leading to loss of life, property damage, and destruction of infrastructure. The impacts of climate change are intensifying extreme weather, further escalating these risks.

“Disaster risk reduction has been a cornerstone of WMO’s mission for over 150 years... Climate change further complicates this landscape, influencing rainfall patterns and hydrological conditions.”

— Celeste Saulo, Secretary-General, World Meteorological Organization (WMO)



A Multi-faceted Challenge at the Intersection of Climate, Development, and Food Security



Central Message: The global response must be integrated, addressing landslides not in isolation but as part of a multi-hazard approach that considers social vulnerability, land use, and indigenous knowledge.

A Unified Platform for Global Progress

Introduction

Presenting ‘Progress in Landslide Research and Technology,’ the Open Access book series of the International Consortium on Landslides (ICL).

Mission Statement

The series aims to be the common platform for publishing recent progress in landslide research and technology for practical applications and the benefit of society.



Content Scope

The publication includes original articles, case studies, activity reports, and teaching tools to promote understanding and reduce landslide disaster risks.

Strategic Alignment



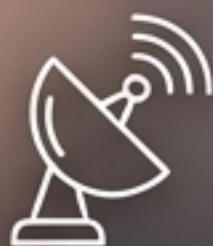
The Kyoto Landslide Commitment 2020 (extending to 2030)



The 2030 Agenda Sustainable Development Goals (SDGs)

The Research Frontier: From Science to Action

This volume showcases cutting-edge research and field experience from across the globe.
We explore these contributions through three critical themes of comprehensive action.



Monitoring the Unstable Earth

Highlighting new techniques for prediction,
monitoring, and early warning.



Learning from Catastrophe

Distilling critical lessons from recent and
historical major landslide events.



Building Resilient Communities

Showcasing practical tools, models, and
strategies for risk reduction on the ground.

Monitoring the Unstable Earth: Reading the Seismic Pulse of a Rock Slope Failure

CASE STUDY SPOTLIGHT

The Changing Seismic Site Response of the Brienz/Brinzauls Rock Slope Instability.

Methodology

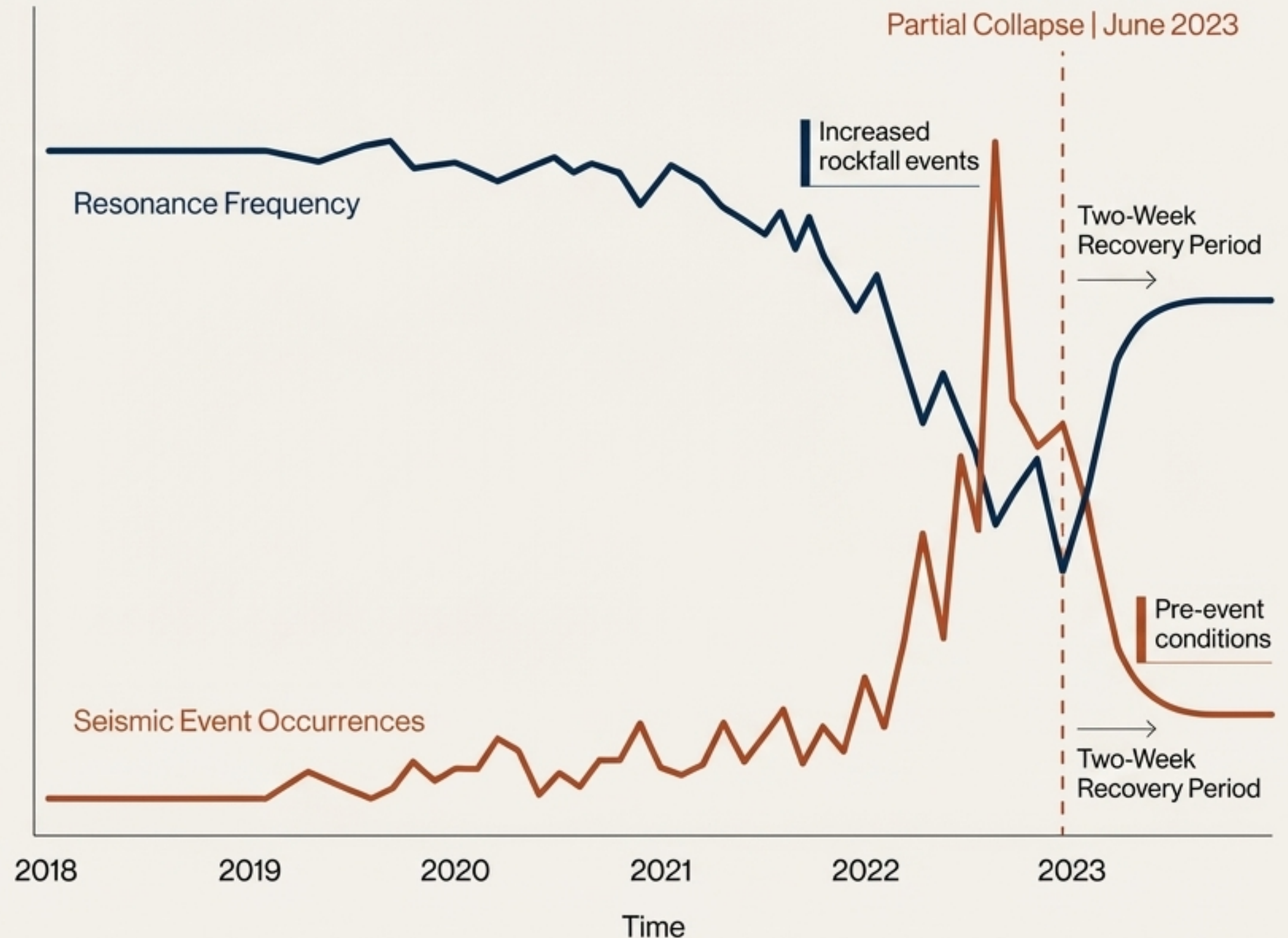
Researchers deployed automated tracking of seismic parameters over 5 years (2018–2023), monitoring resonance frequencies, wavefield polarization, and seismic event occurrences on the active slope.

Key Finding

The monitoring captured significant shifts in seismic parameters associated with increased rockfall events leading up to the partial collapse in June 2023. Immediately post-collapse, seismic parameters gradually reverted to pre-event conditions within two weeks.

THE BOTTOM LINE

This data provides new, data-driven insights into unstable rock slope behavior, contributing to the development of more sophisticated seismic early-warning systems.



Learning from Catastrophe: Anatomy of the Response to the 2024 Noto Peninsula Earthquake

EVENT:

M7.6 Earthquake | Jan 1, 2024

IMPACT:

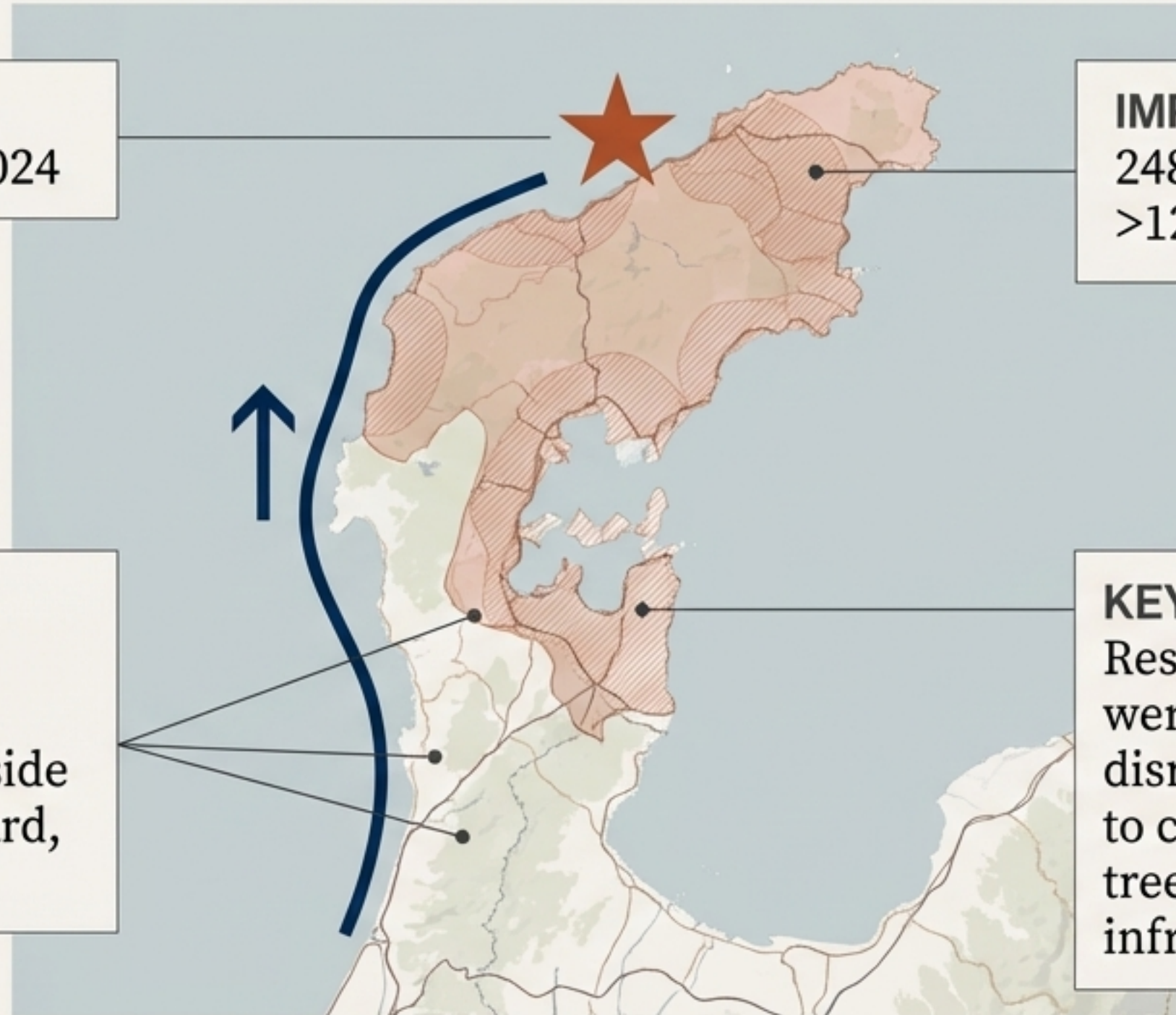
248 Fatalities & Missing |
>120,000 Buildings Damaged

THE RESPONSE:

Massive rescue operation involving 90,000 police personnel by April 1, alongside fire departments, Coast Guard, and Self-Defence Forces.

KEY CHALLENGE:

Rescue and restoration efforts were severely hampered by disrupted road traffic due to collapsed slopes, fallen trees, and damaged infrastructure.



Learning from Catastrophe: The Decade-Long Relocation of Gramalote, Colombia

THE EVENT:

In December 2010, following an intense La Niña-driven rainy season, a large rotational landslide completely destroyed the town of Gramalote, affecting 3,000 people and 974 homes.

THE CONSEQUENCE:

The scale of destruction made stabilization unviable, forcing the entire town to be relocated.



A COMPLEX PROCESS:

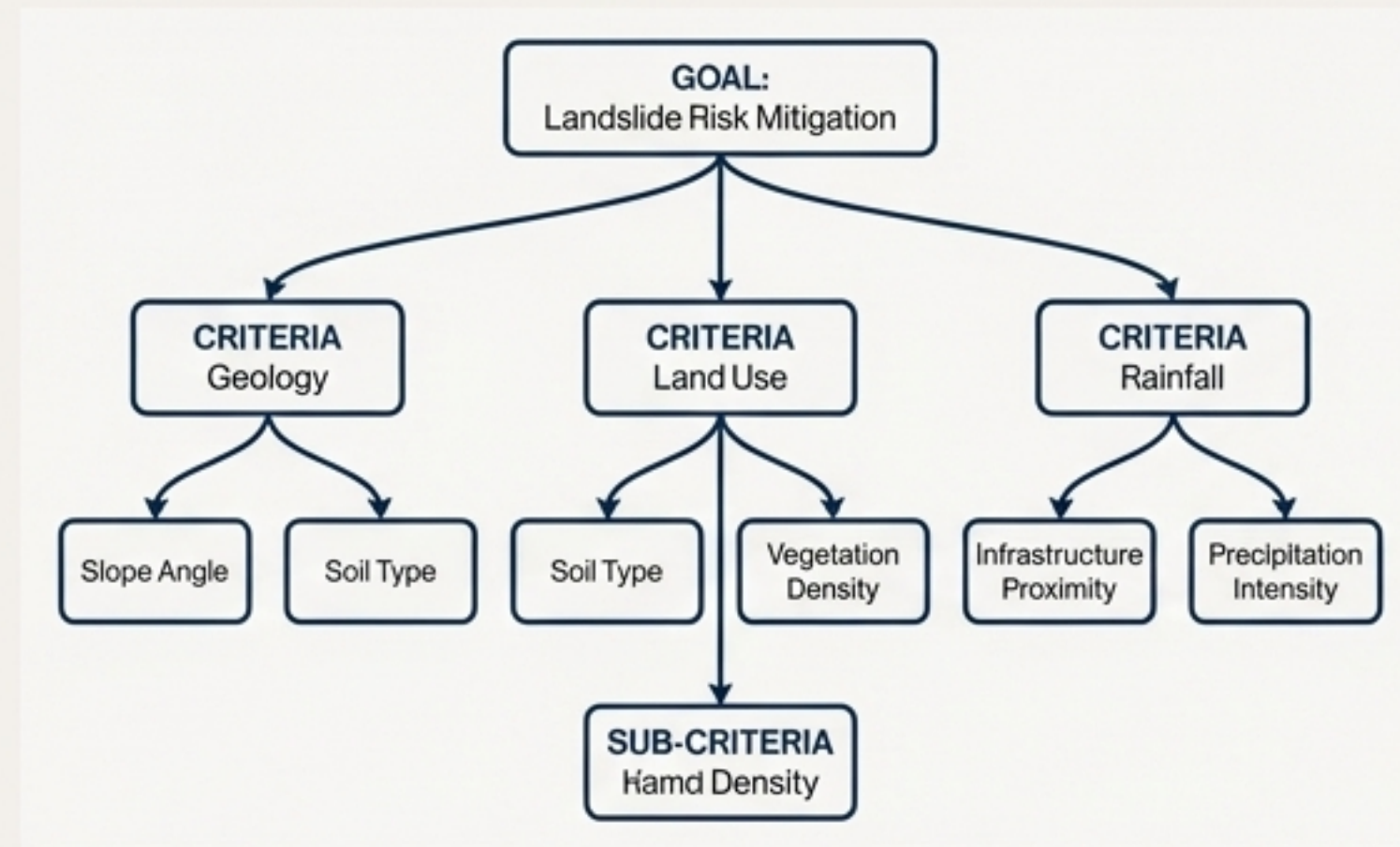
Selecting a new site and reconstruction was a massive undertaking, facing technical, social, and political challenges. The first new homes were delivered six years after the landslide.

THE LESSON

The Gramalote case highlights the profound, long-term disruption caused by major landslides and the complexities of "building back better," demonstrating the need for comprehensive risk management that includes post-disaster governance and resettlement planning.

Building Resilient Communities: From Prioritizing Factors to Practical Tools

Insight 1: Prioritizing Causes with AHP



The Analytical Hierarchical Process (AHP) is a quantitative technique for prioritizing the multiple factors contributing to landslide risk. It provides a systematic way to quantify qualitative judgments, eliminating subjectivity and focusing mitigation efforts on the most critical factors.

The Connection: Together, these approaches show a clear pathway from high-level scientific analysis (AHP) to accessible, field-ready technology (MaPLoRds), empowering local communities and authorities to take proactive steps in risk reduction.

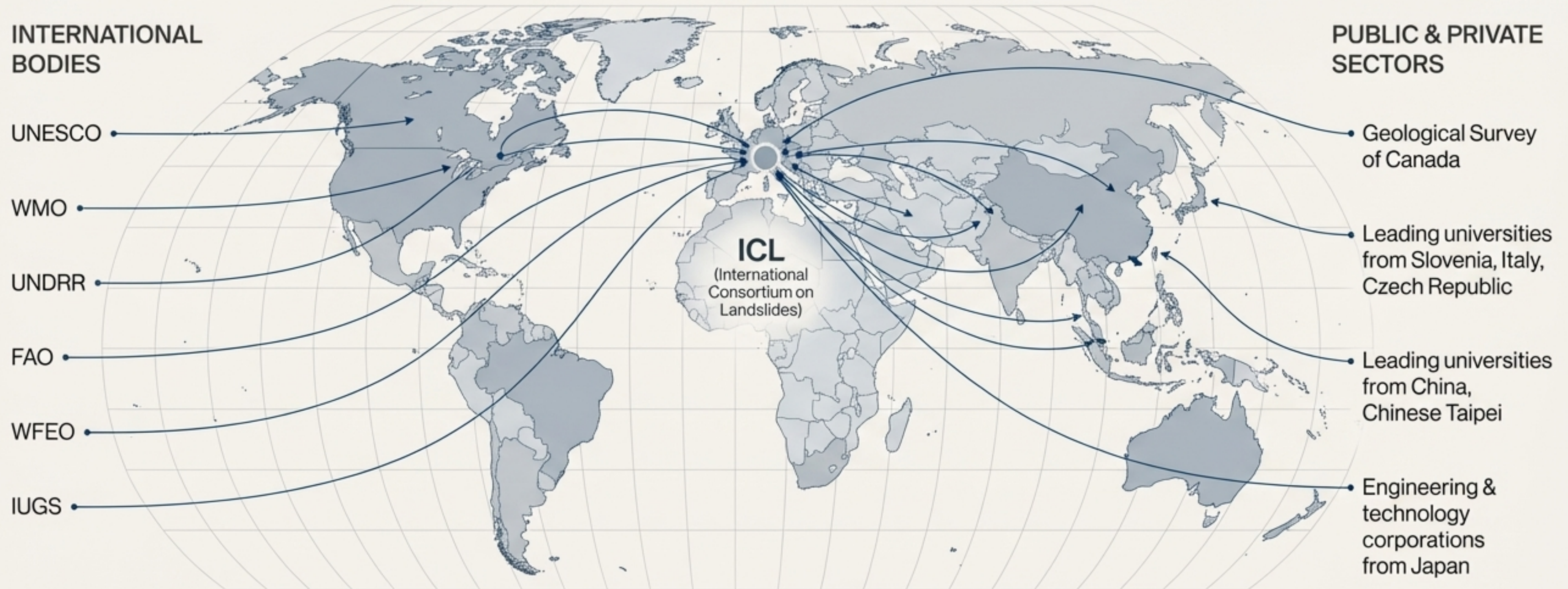
Insight 2: Mobile Tech for Risk Assessment



The 'MaPLoRds' project is a Mobile Application for Local Road Network Risk Assessment. This teaching tool demonstrates how technology can be used to conduct simple, on-site risk assessments, making complex analysis more accessible.

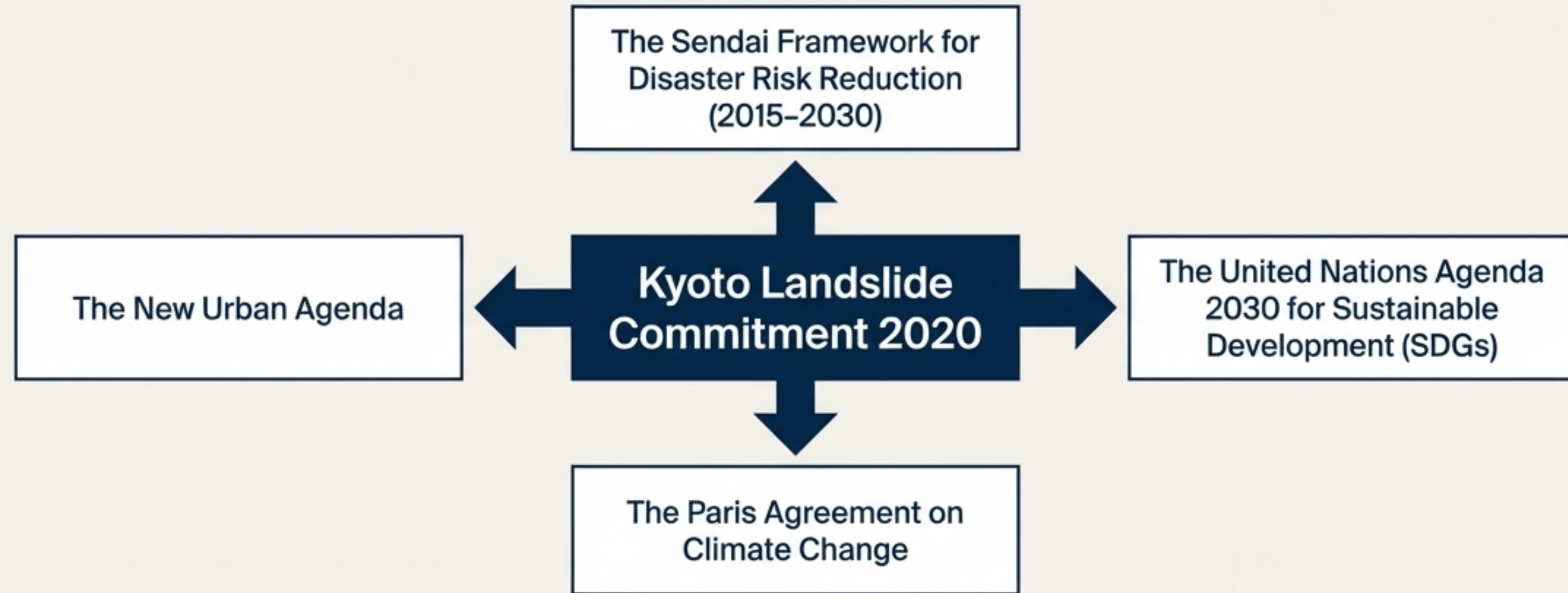
A Global Coalition Forged to Reduce Landslide Risk

The work presented in this publication is the result of a powerful international collaboration, convened by the International Consortium on Landslides (ICL).



Anchored in Strategy: The Kyoto Landslide Commitment 2020

The KLC2020 is the central commitment guiding this international effort. It serves as a strategic link between landslide science and global policy.



“[The conference theme] is carefully selected to serve as a commitment to the Sendai Landslide Partnership... WFEO wish to inform this distinguished gathering of its total commitment to the works and resolutions that will be generated.”

— Mustafa B. Shehu, President, World Federation of Engineering Organizations (WFEO)

The Path Forward: Leveraging Science for Early Warnings for All



WMO remains steadfast in its commitment to the Kyoto Landslide Commitment 2020 and is eager to advance progress through the Early Warning for All initiative.

— Celeste Saulo, WMO