

How can natural hazard scientists enhance their contribution to building sustainable and resilient societies?

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Summary: We outline how natural hazard research scientists can better contribute to the planning and development of sustainable and resilient communities through improved engagement in disaster risk reduction (DRR).

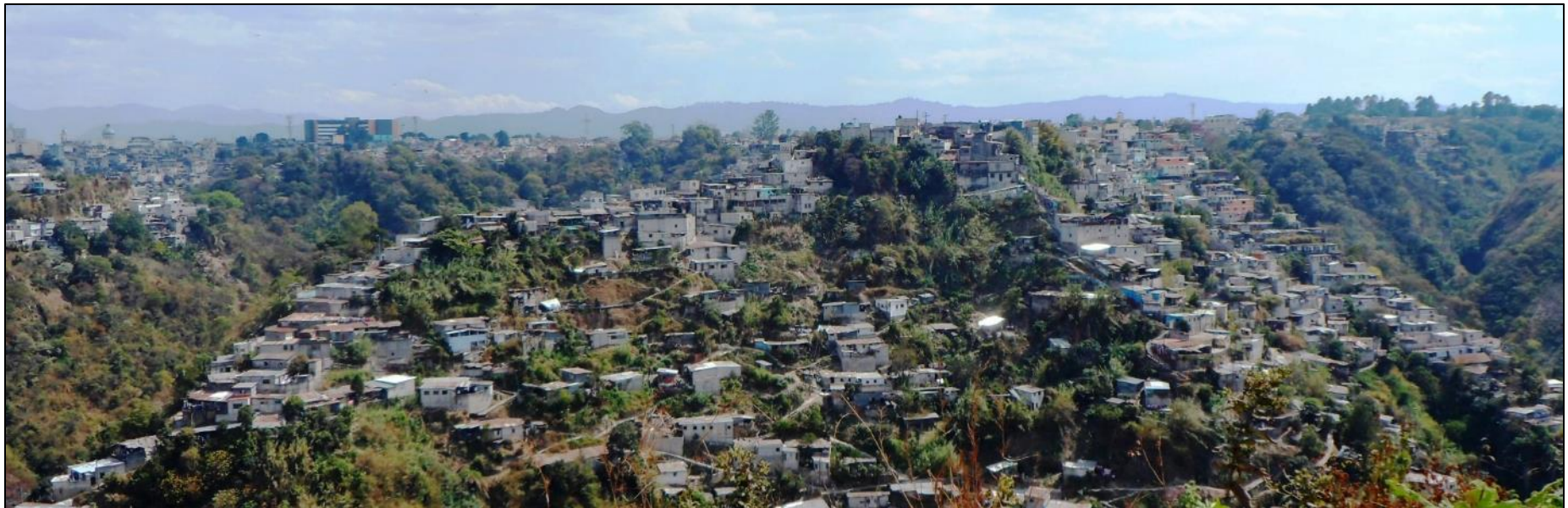
Seven recommendations for enhancing the integration of natural hazard science into DRR:

1. **Characterise multi-hazard environments**
2. **Prioritise effective, positive, long-term partnerships,**
3. **Understand and listen to your stakeholders,**
4. **Embed cultural understanding into natural hazards research,**
5. **Ensure improved and equitable access to hazards information,**
6. **Champion people-centred DRR (leaving no one behind)**
7. **Improve links between DRR and sustainable development.**



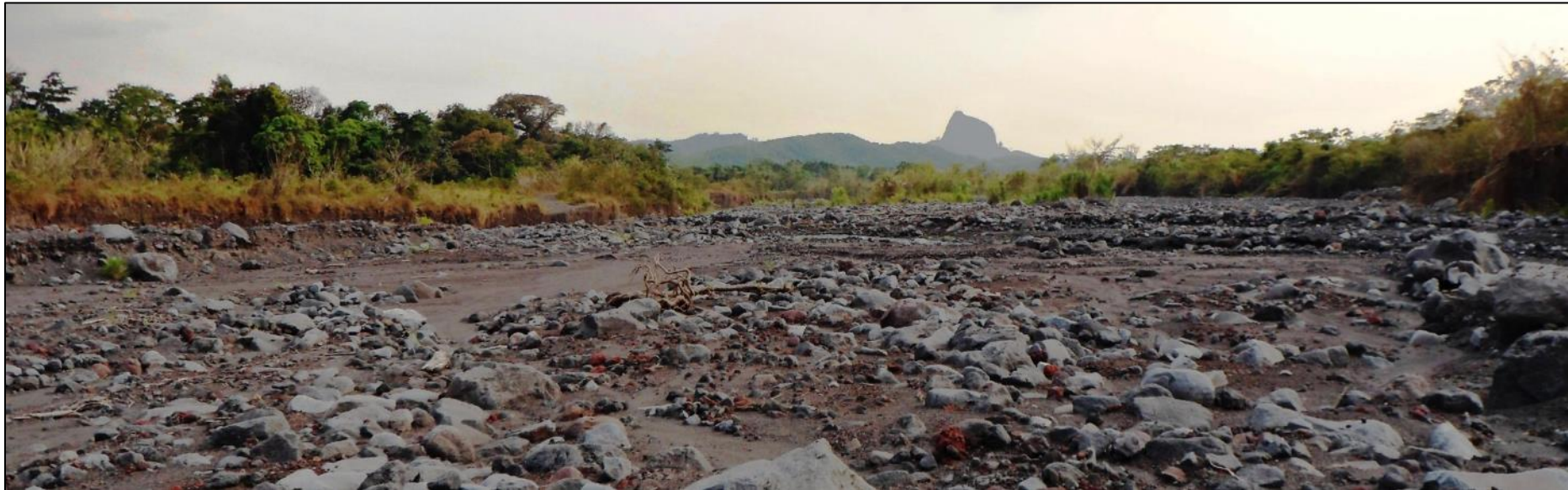
A. Background. Natural hazards (e.g., landslides, earthquakes, floods) have a significant impact on lives, livelihoods and economic growth, disproportionately affecting the most vulnerable in society and threatening development progress (Pelling *et al.*, 2004).

Between 1998 and 2017, disasters resulted in direct economic losses of US\$2,908 billion, 1.3 million fatalities, and 4.4 billion people injured, rendered homeless, displaced or needing emergency assistance (CRED/UNISDR, 2018).



B. Seven Recommendations: Building on existing good practice, here we collate seven recommendations for improving the integration of natural hazard science into disaster risk reduction.

We hope to provoke discussion in the natural hazard science community and include key actions that natural hazards scientists and research funders can take to improve education and training, research design and methods, and partnerships and practice.



Recommendation 1. Characterise (Multi-)Hazard Environments

Consider the range of hazard types, multi-hazard relationships and hazard scales that could occur in a region, and how hazard landscapes may change over time.

Key Actions:

- Create space for cross-disciplinary working to help identify a fuller range of hazards and their potential interactions (or coincidence in time).
- Develop new ways to collect data on, and analyse, multi-hazards, progressing from the consideration of two hazard types in simulated scenarios to multiple hazard types in real-world contexts.
- Enhance communication across disciplines to facilitate dialogue relating to risk from 'multi-hazards', with geoscience unions, research funders, and professional associations helping to facilitate more cross-hazard cooperation.



Recommendation 2. Prioritise Effective, Positive, Long-Term Partnerships

Partnerships are key to harnessing knowledge, to better understand and address the problems faced by those at risk. Effective partnerships can increase the impact of DRR initiatives by ensuring their sustainability, replicability, and better use of resources (Twigg, 2015).

Key Actions:

- Include partnership development topics in higher education and ongoing professional development training.
- Implement ethical frameworks for building equitable partnerships.
- Funding opportunities should provide resources to build partnerships.
- Institutional support for partnerships can ensure mutually agreed expectations, codes of practice and ethics.
- Funding for overseas researchers helps to strengthen knowledge exchange and sustainability of the impact.

Recommendation 3. Understand and Listen to your Stakeholders

Understanding the priorities, ambitions and challenges of stakeholders is essential to developing and undertaking effective DRR research. Consultation with stakeholders should help inform the types of research activities undertaken.

Key Actions:

- Include stakeholder mapping, facilitation skills, and transdisciplinary working in higher education and ongoing professional development training.
- Train hazard scientists to ethically identify stakeholders and co-produce research questions.
- Develop long-term relationships with applied partners (e.g., NGOs, national institutions) who have a long-term presence in countries.
- Ensure mechanisms (e.g., funding for time, networking) to include non-academic partners and stakeholders in research proposals.



Recommendation 4. Embed Cultural Understanding into Hazards Research

DRR policy and practice should integrate cultural perspectives, to help enrich data and contextual understanding, and to improve dissemination approaches. We are part of and affected by culture as researchers, and this can shape the way in which we approach ideas or partnerships as natural hazard scientists.

Key Actions:

- Consider including those with ethnographic training (e.g., geographers, historians, anthropologists) in research partnerships, or identify existing and relevant ethnographic knowledge in publications and reports.
- When planning research dissemination strategies, public outreach, and hazards education initiatives, in addition to their partners and stakeholders, natural hazard scientists could consult literature, historians, anthropologists to understand cultural constraints, challenges and opportunities.
- Train natural hazard scientists to understand and reflect on their own positionality.

Recommendation 5. Ensure Improved/Equitable Access to Hazard Information

Hazard information should reach those in need, be understood, and be acted on if it is to help reduce risk. It is often those most vulnerable to the impacts of disasters who struggle to access useable hazards information. The natural hazards science community should consider not only equitable access, but also how to ensure that all stakeholders can act on hazards information.

Key Actions:

- Natural hazard scientists should pursue open-access publishing, and/or write short, accessible summaries of their research for stakeholders.
- Good communication practice should be essential training for natural hazard scientists.
- Co-develop hazard information products with intended audiences. Work with partners and stakeholders to create useable hazards information.



Recommendation 6. Champion People-Centred DRR - Leave No-One Behind

The poorest and most vulnerable in society should have access to the resources, information, and support required to effectively reduce risk and encourage sustainable development. For natural hazard scientists, this means active reflection on where we work, with whom we work, and how we work.

Key Actions:

- Increase reflection on how natural hazard scientists ensure meaningful participation in research and outreach activities by underrepresented, vulnerable and marginalised groups.
- Include training on integrating local and indigenous knowledge into natural hazard assessments and disaster risk reduction.
- Introduction of natural hazard and DRR-related topics in the curriculum at lower education levels.



Source: Parsquake

Recommendation 7. Improve Links between DRR & Sustainable Development

DRR can drive forward and protect development progress, yet of the 1268 abstracts submitted to sessions within the Natural Hazards Division of the 2019 EGU General Assembly, only two referred to ‘sustainable development’.

Key Actions:

- Increase awareness of how individual natural hazards research projects join-up and relate to regional, national and local sustainable development, disaster risk reduction and disaster risk management strategies.
- Embed training in public policy into natural hazards science courses at university level.



C. Discussion and Cross-Cutting Themes.

Recommendations advocate for:

- **Changes to natural hazard science education and training**, introducing new skills and exposing scientists to a wider range of disciplinary knowledge, along with the option to learn interdisciplinary and transdisciplinary research approaches.
- **Adoption of different research approaches, including** to determine research questions, build research partnerships, and connect research to decision makers.
- **Better partnership practice** (equitable and ethical), listening to the needs and priorities of natural hazard scientists and stakeholders in Global South nations, and working with them to address these.
- **Institutional and financial transformations**, such as improving funding mechanisms to include non-academic partners, supporting new training schemes and providing funding for open-access publishing.

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Acknowledgements

The authors acknowledge the colleagues, partners and stakeholders with whom which they have worked with over their collective research and practitioner careers in DRR and sustainable development. These experiences have informed the authors' contributions to this paper. JCG and MJD contribution to this article were supported by British Geological Survey NC-ODA grant NE/R000069/1: Geoscience for Sustainable Futures.

Manuscript prepared as a perspective piece for NHESS, to be submitted in 2020.

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