

A Call for Participatory Convergence: Community-Based Strategies for Landslide Risk Reduction



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Natural Hazards Center



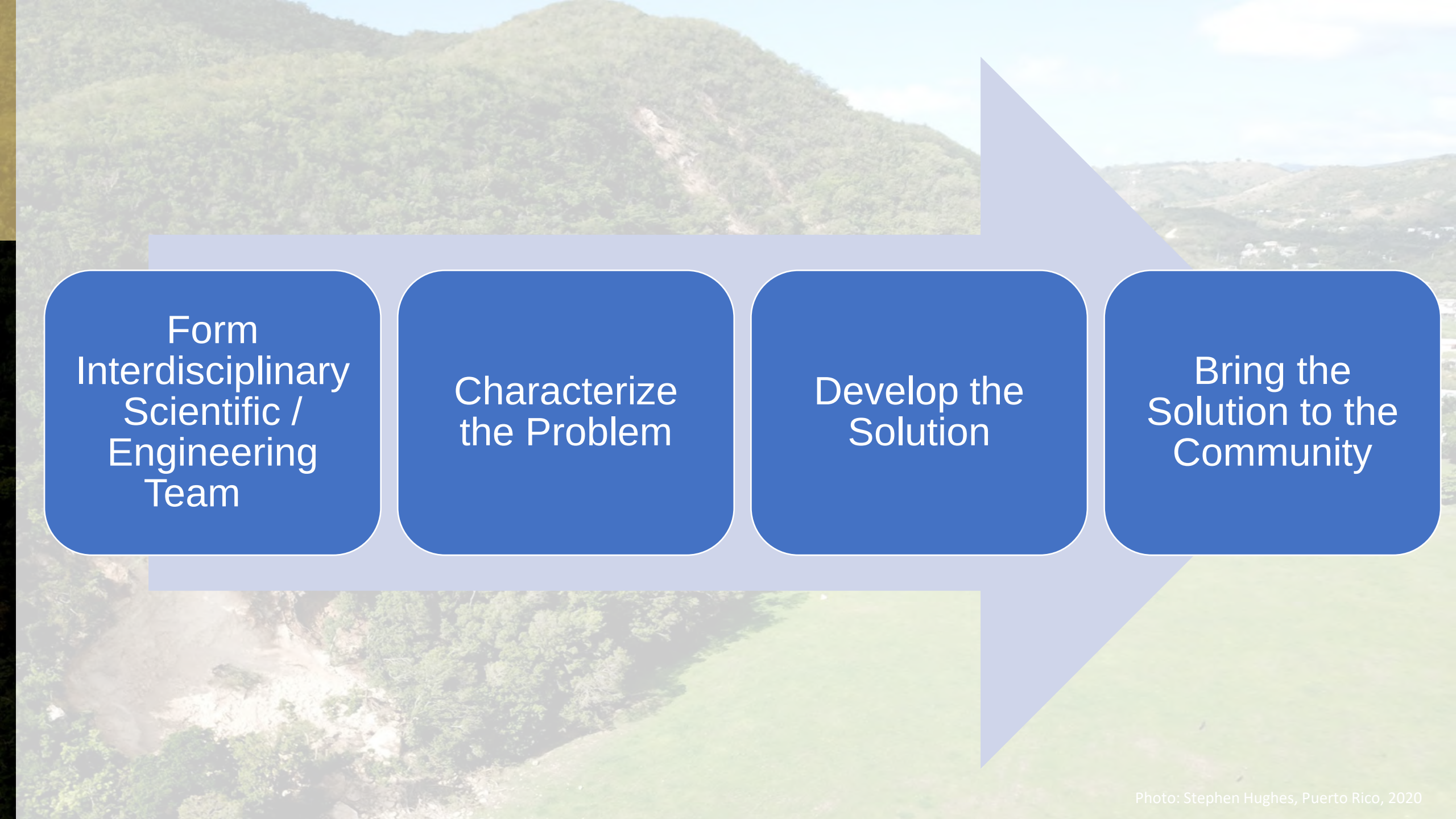
CONVERGE

An aerial photograph showing a steep, forested hillside. A prominent, light-colored, diagonal scar from a landslide runs down the center of the hill. In the foreground, a large, flat, green field is visible. To the right of the field, a school building with a white roof is situated. The background shows more hills under a blue sky with scattered clouds.

**Convergent
Research:**

**Addressing
Socio-
Environmental
Challenges**

School



Form
Interdisciplinary
Scientific /
Engineering
Team

Characterize
the Problem

Develop the
Solution

Bring the
Solution to the
Community



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In Utuado,
landslides are a
“**24/7/365**” issue.

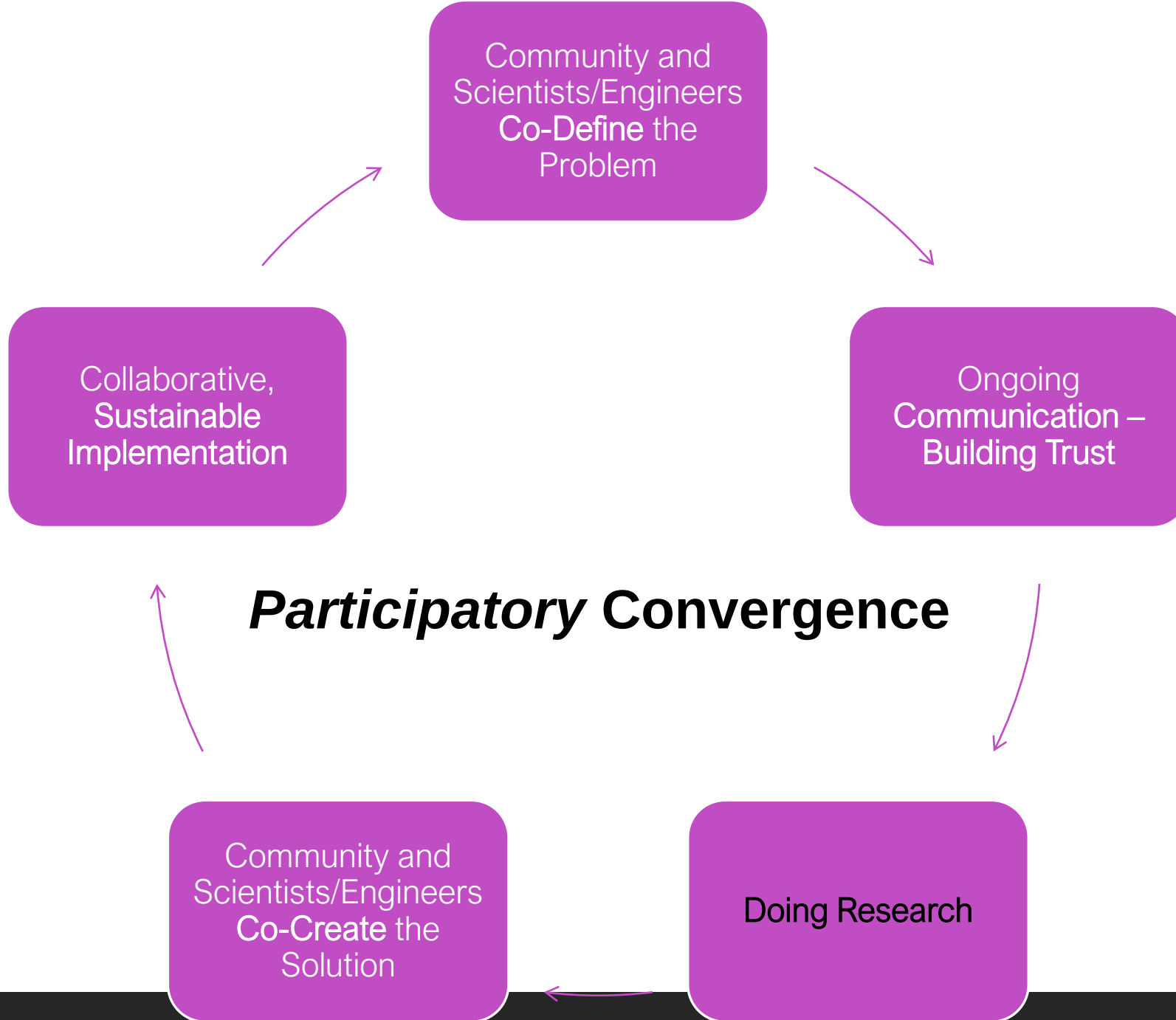
–Resident, Puerto Rico,
2022

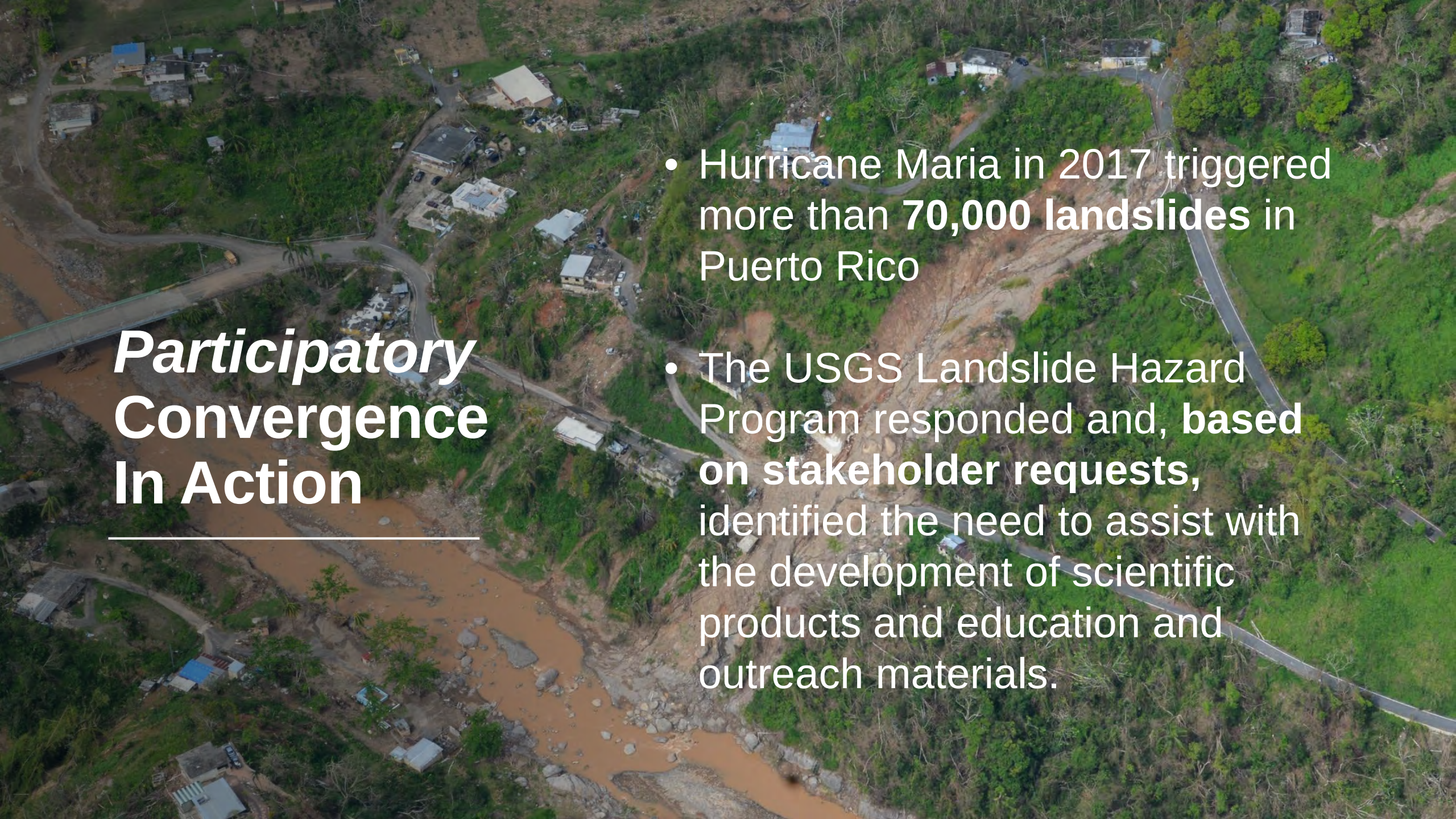


Participatory Convergence

a research approach that is ***participatory*** (community-centered, ethical, equitable, collaborative) and ***convergent*** (interdisciplinary, problem-focused, solutions-oriented)





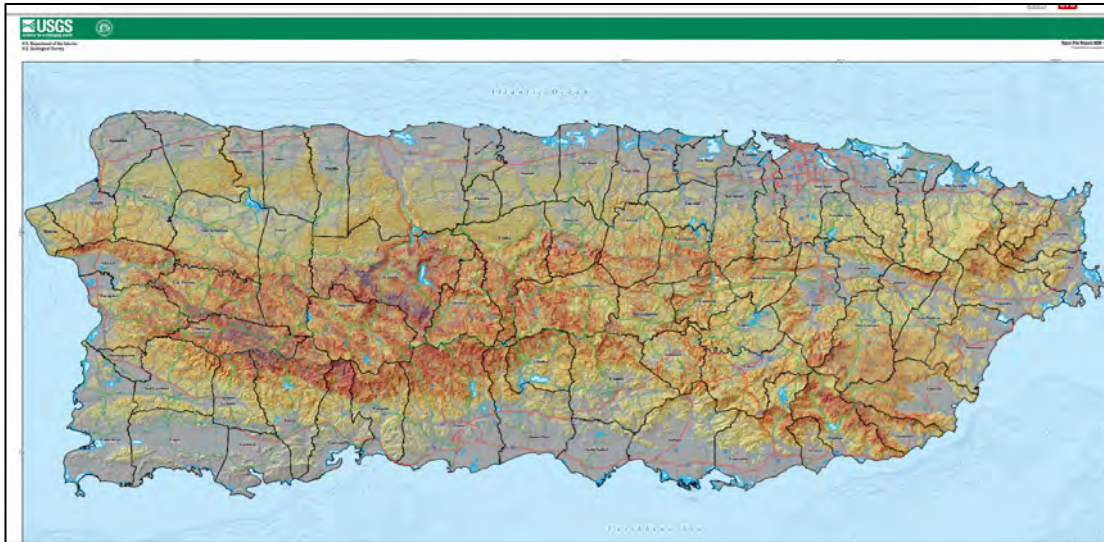
An aerial photograph showing a large landslide in a tropical area. A muddy, brown river flows through the center, surrounded by green vegetation and some buildings. A road is visible on the right side, and a bridge is on the left. The landslide area is a mix of brown earth and green trees.

Participatory Convergence In Action

- Hurricane Maria in 2017 triggered more than **70,000 landslides** in Puerto Rico
- The USGS Landslide Hazard Program responded and, **based on stakeholder requests**, identified the need to assist with the development of scientific products and education and outreach materials.

Scientific Products

- Landslide inventory
- Landslide susceptibility map
- Products for hardest hit municipalities

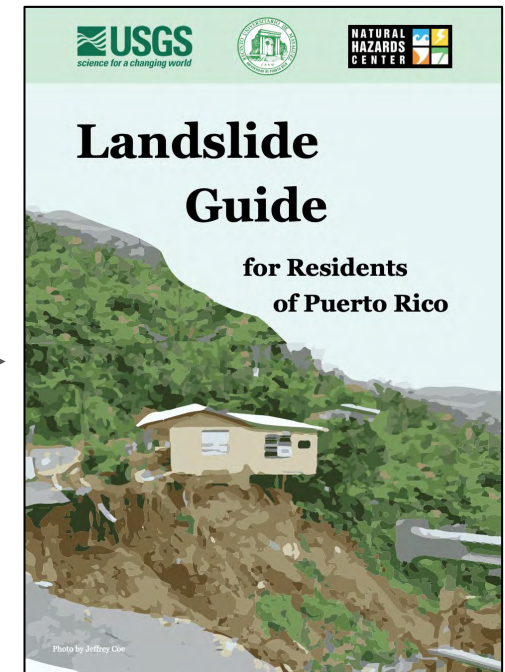
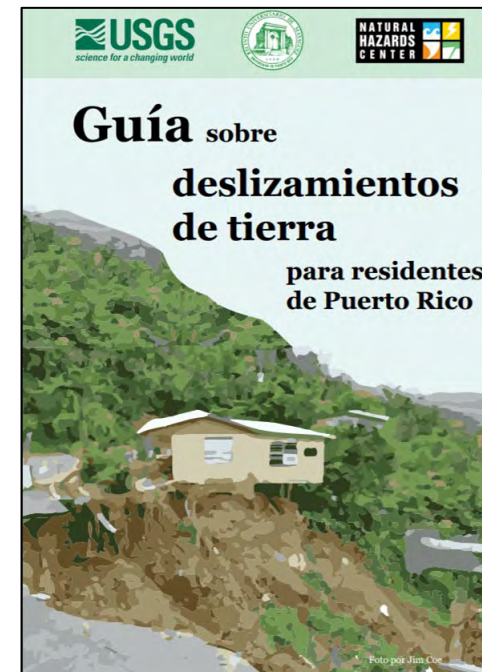


pubs.er.usgs.gov/publication/ofr20201022

Hughes and Schulz, 2020

Education and Outreach Products

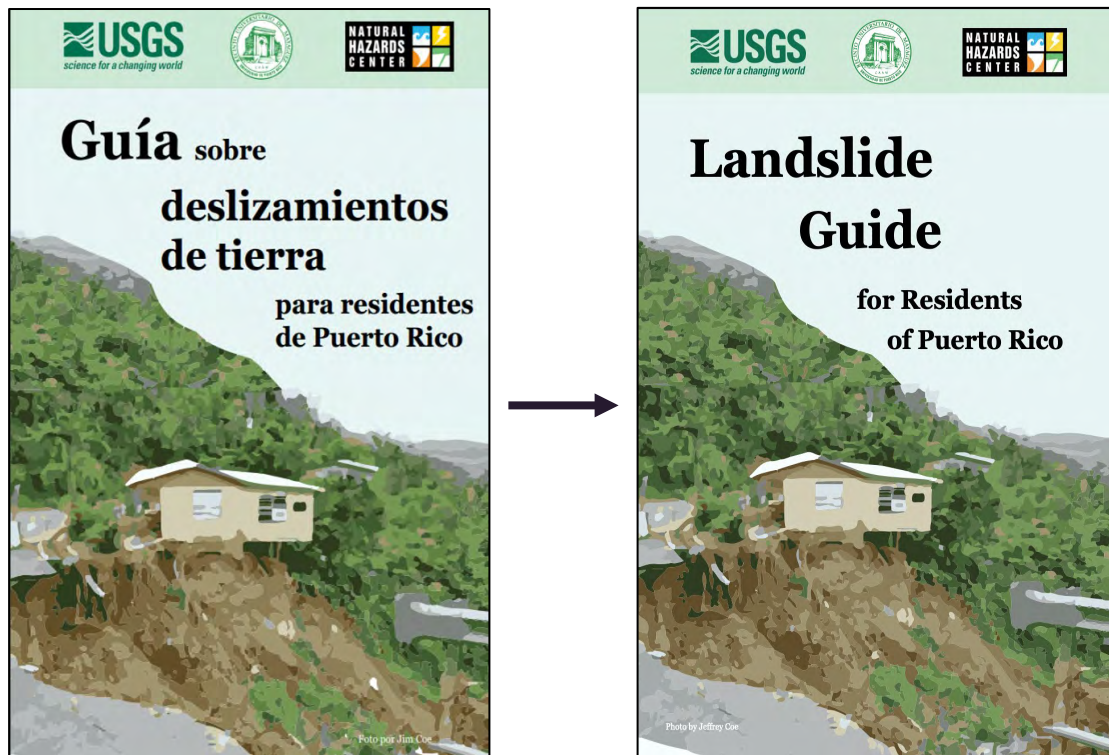
- Landslide guide (Spanish/English)
- Complementary risk communication products



Download the Guides: hazards.colorado.edu/puertorico

Core Project Team: Lindsay Davis, Jocelyn West, (co-leads)
Godt, Hughes, Lugo Bendejú, Álvarez, Peek

Why was the Landslide Guide created?



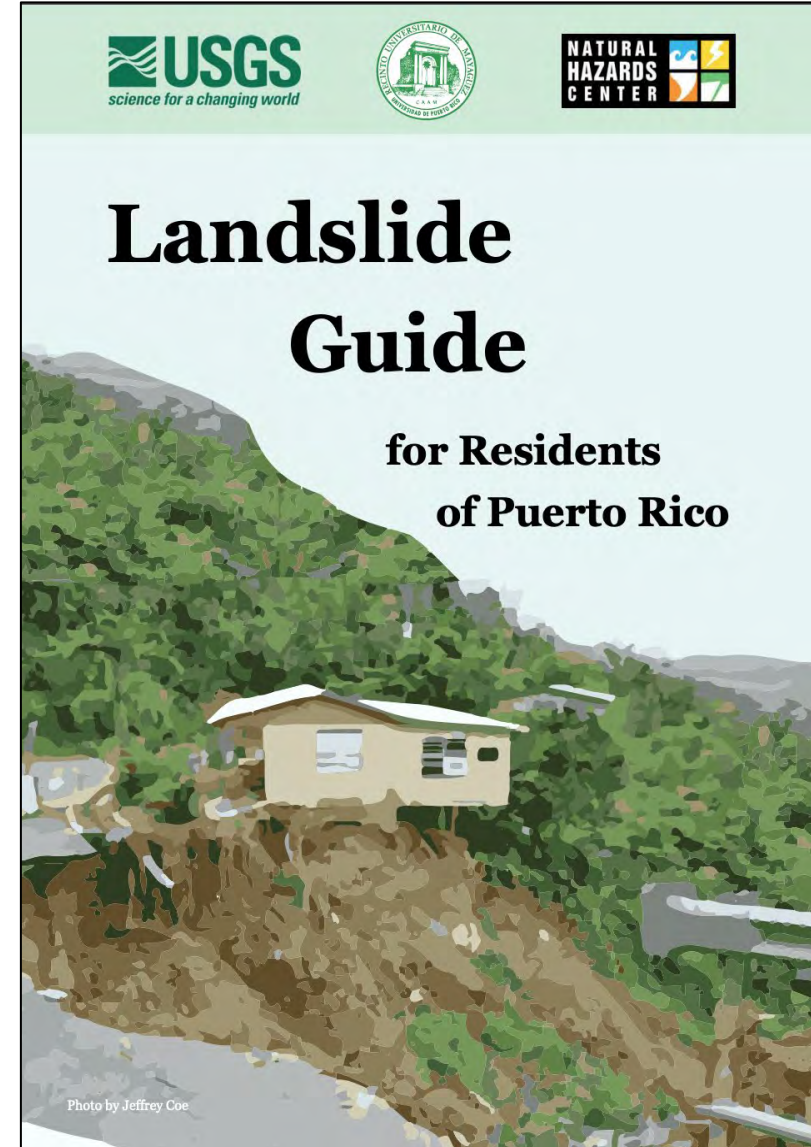
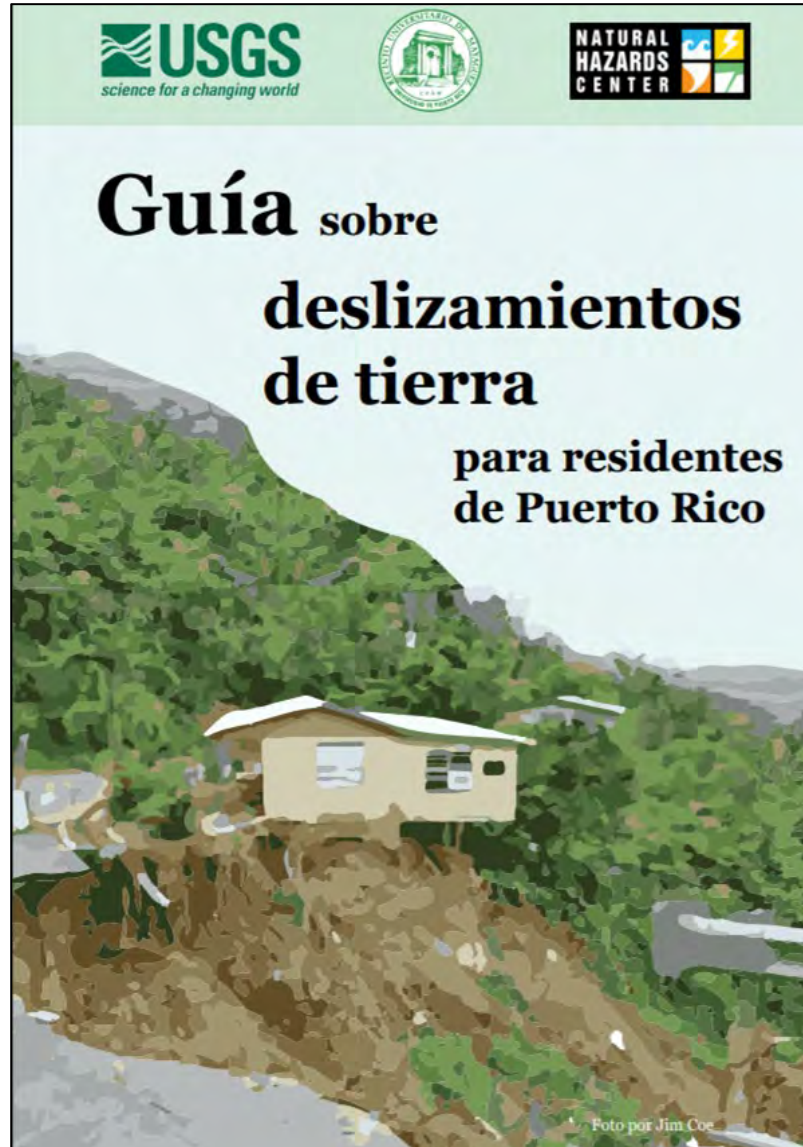
1. To **support the risk reduction objectives** of residents and professionals in Puerto Rico.
2. To **engage, inform, and raise awareness** about landslide risks in communities in Puerto Rico.
3. To **serve as a foundation for various additional modes of risk communication** including multimedia, workshops, and presentations.

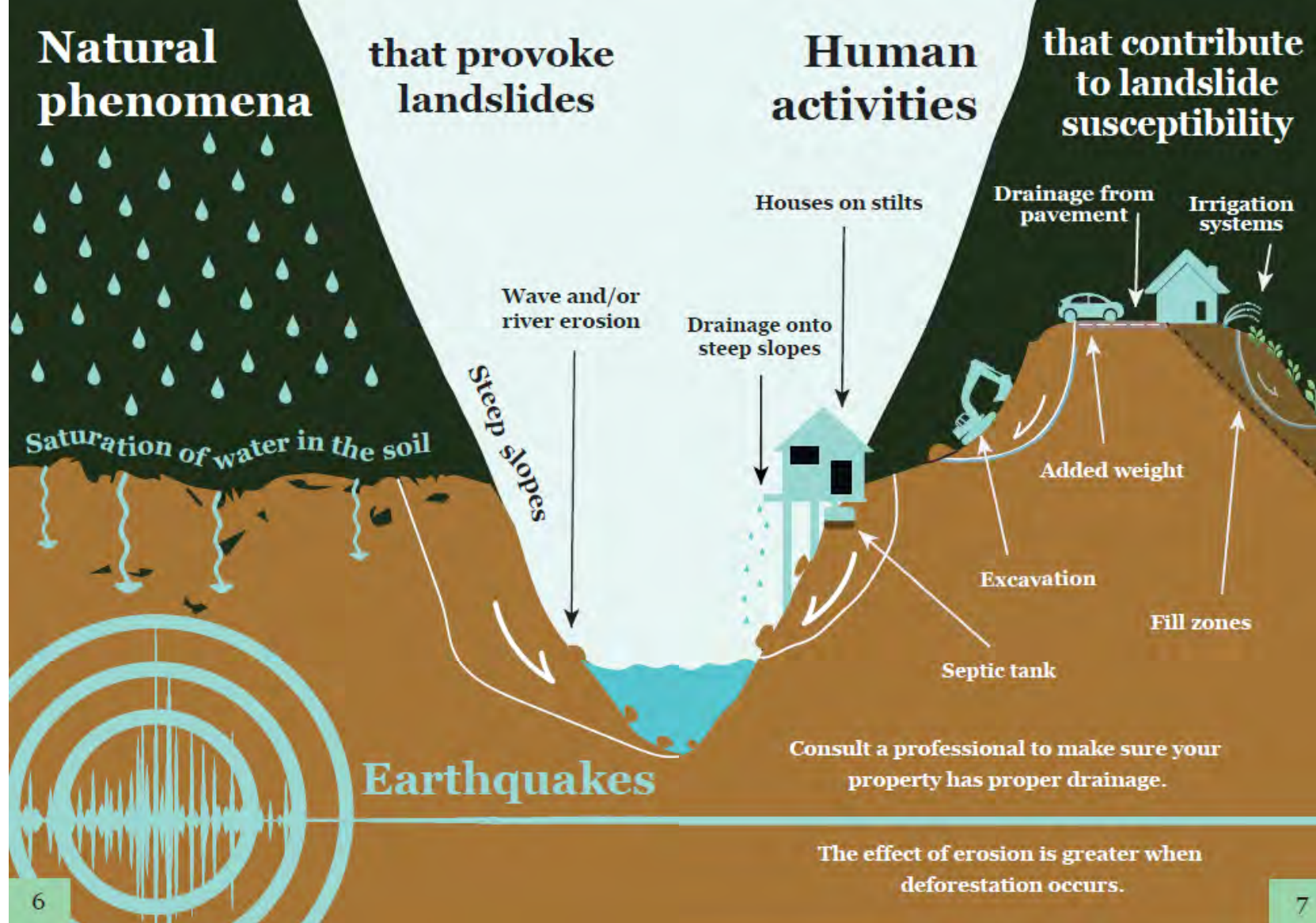
Our Why

“Before [Hurricane] Maria there were landslides, but you never felt that sense of insecurity that... now it's raining and you're almost crying... because there could be landslides all the time. But now with these downpours one worries even more, because the house is already affected in the sense of [earthquake] tremors, landslides, and all that” –

**Resident of Utuado, Puerto Rico (West,
Rodriguez-Cruz, Hughes, 2023)**







What can cause landslides?

In nature

Tilted trees are evidence that a slow movement of land is occurring.



Photo by K. Stephen Hughes



Springs develop in new places at the surface, or streams stop flowing suddenly due to landslides obstructing the passage of water.

Cracks in terrain facilitate the infiltration of water.



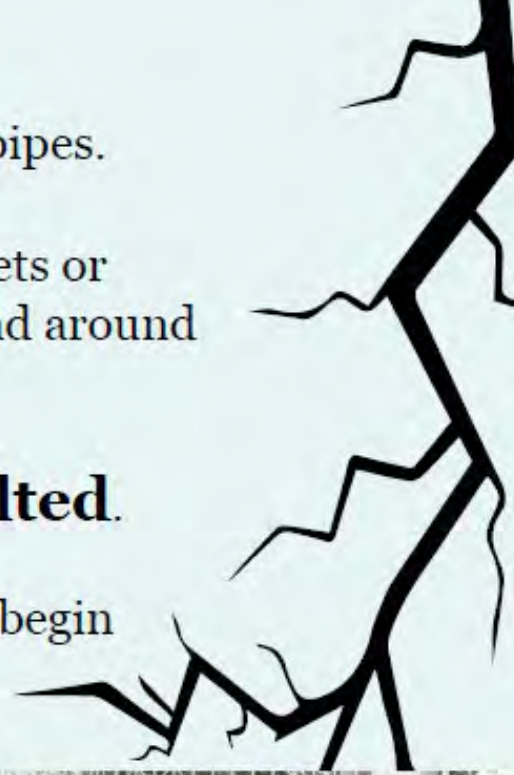
Signs of landslides in nature

Distortion of structures;
broken, displaced, or dislocated pipes.

Cracks that extend in the streets or
in the walls or floors of houses and around
windows or doors.

Floors, posts, or walls that are **tilted**.

Windows or doors that suddenly begin
to **stick**.



Signs of landslides in infrastructure



In infrastructure

Photos by K. Stephen Hughes



Avoid making cuts
in steep slopes.



Use drains and culverts to direct
water away from slopes and
areas prone to landslides.



Avoid deforestation and increase
the planting of trees on slopes.



Do not build in areas prone to
landslides and consult with
a professional.

Guide highlights
recommended mitigation
measures

Keep yourself prepared with an **emergency backpack**



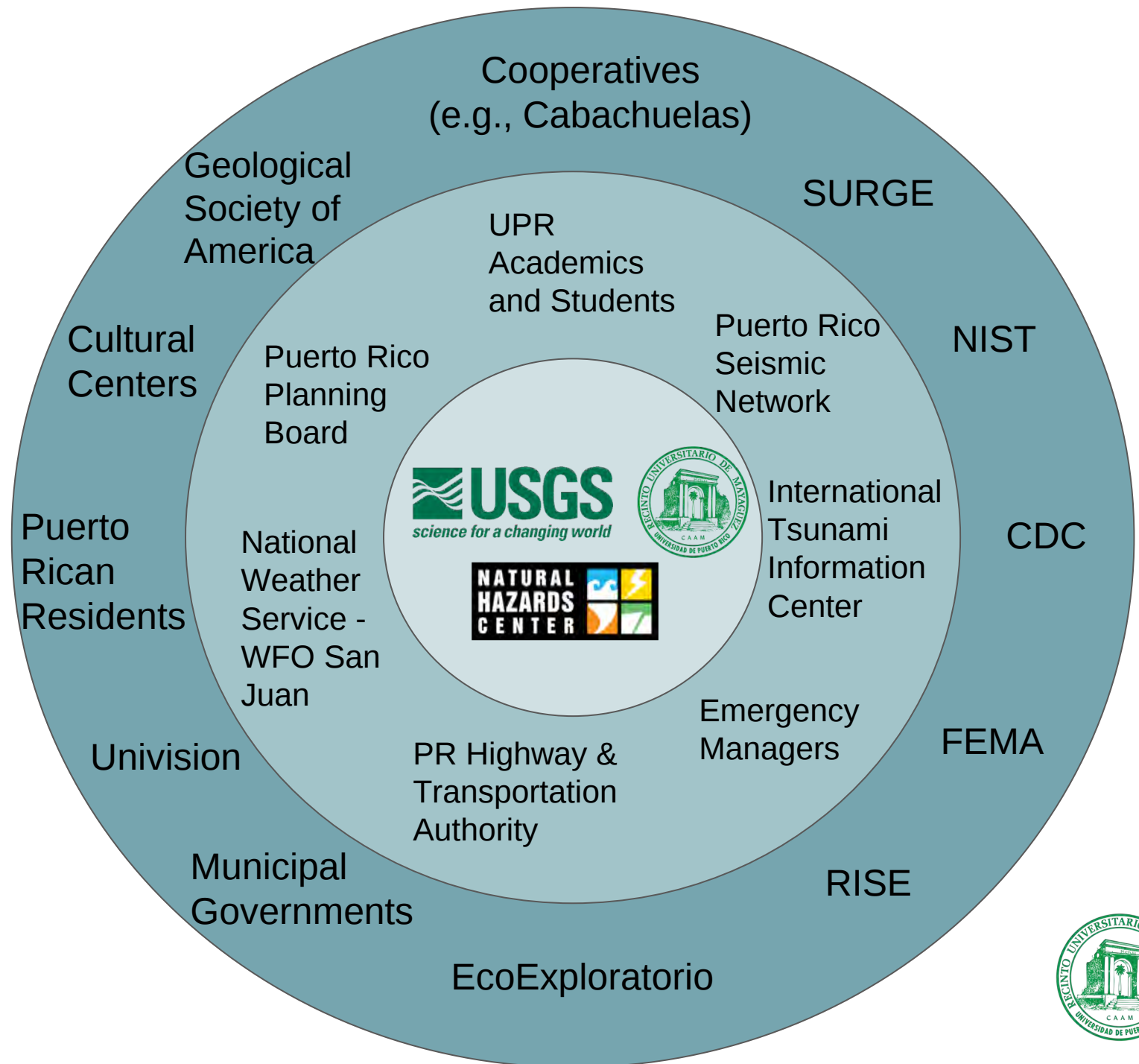
Guide also highlights
recommended
preparedness actions

For more information: www.listo.gov/es

*Participatory
convergence
requires *trusting
relationships* and
*long-term
collaboration**



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Participatory Convergence Success Story

Puerto Rico's **LandslideReady Program**, led by the Puerto Rico Landslide Hazard Mitigation Office, gets scientific and risk communication products into the hands of emergency managers, planners, and community members. This is possible because of a **social science-informed, participatory process**.

- **15 municipalities** currently participate in the program.
- More than **5,000 *Landslide Guides*** have been distributed.
- Countless **conversations** and **numerous preparedness** and **risk reduction actions** have been initiated.



Photo by Karla Torres, 2026

THANK YOU



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hazards.colorado.edu
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