RIESGOS

MULTI-RISK ANALYSIS AND INFORMATION SYSTEM COMPONENTS
FOR THE ANDES REGION

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Towards an integrated Framework for Distributed, Modular Multi-Risk Scenario Assessment

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RIESGOS – Motivation & Goal

In recent decades, the risk to society due to natural hazards has increased globally. To counteract this trend, an efficient risk management is necessary, for which reliable information is essential.

From single-hazard to **multi-hazard risk assessment**, including exposure and dynamic vulnerability, and progressing towards the analysis of cascading effects

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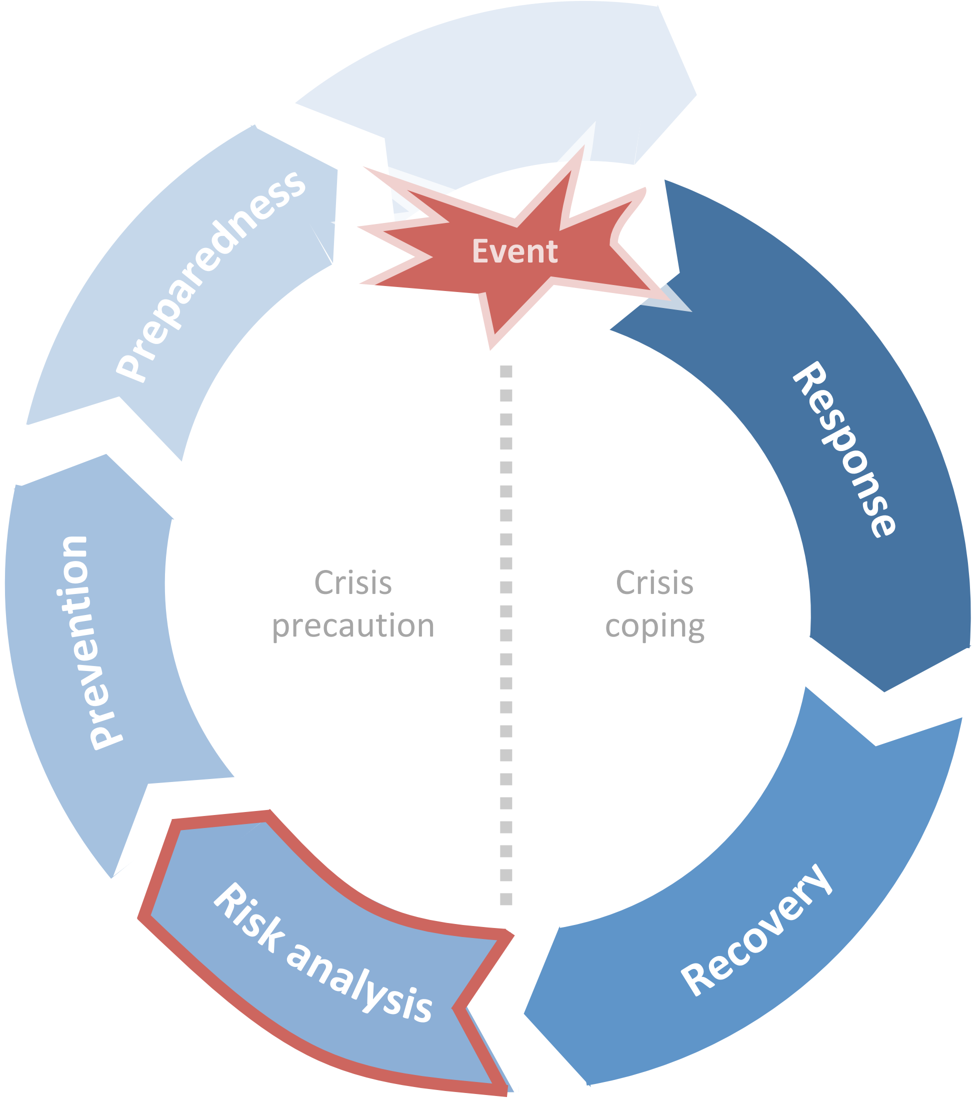
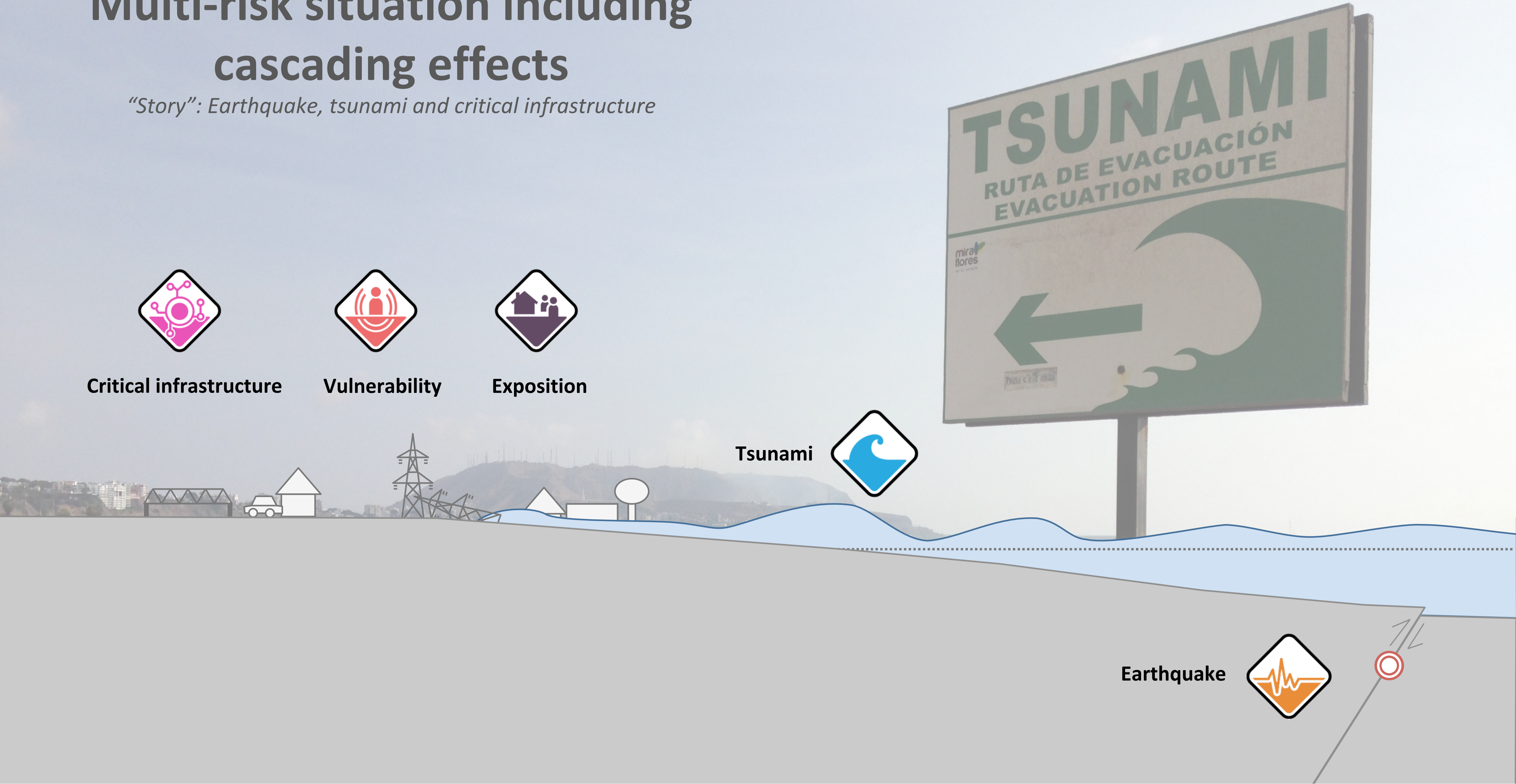


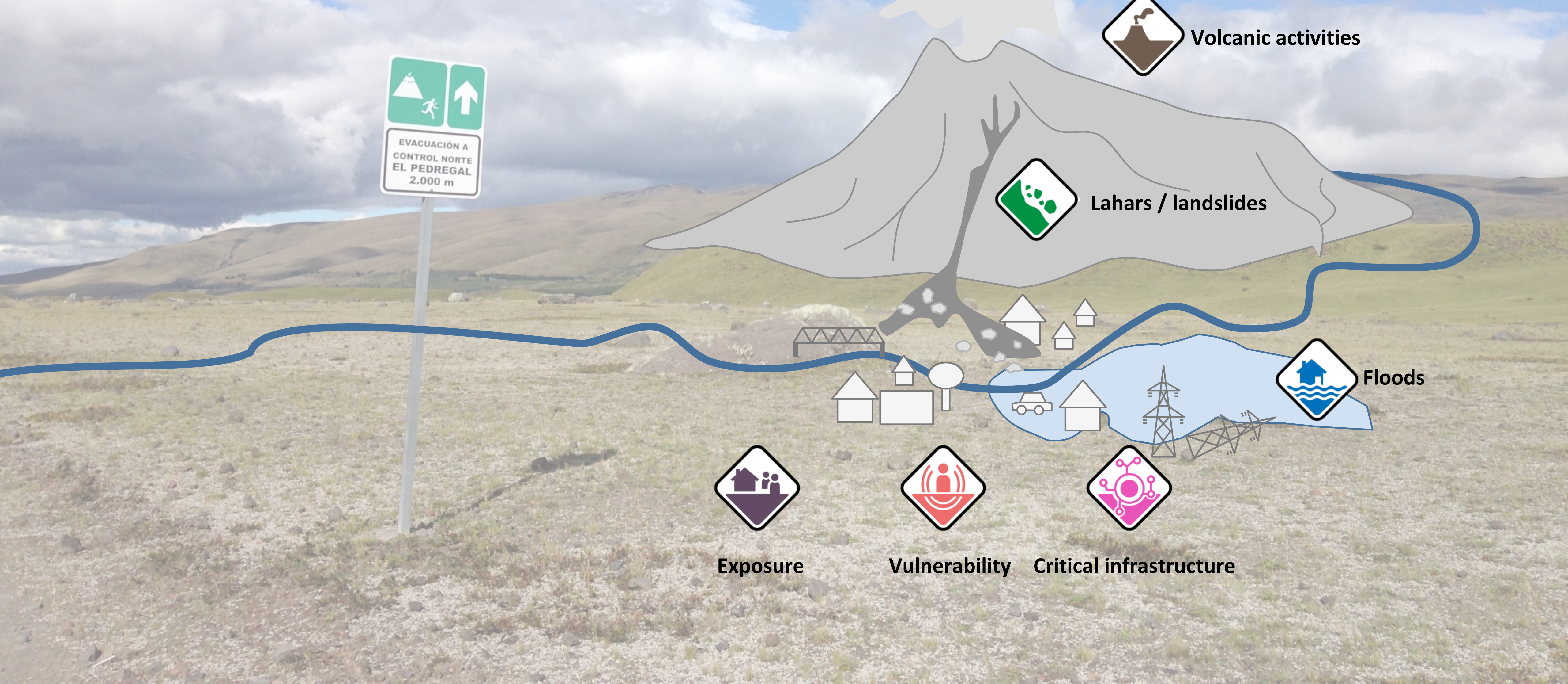
Multi-risk situation including cascading effects

"Story": Earthquake, tsunami and critical infrastructure



Multi-risk situation including cascading effects

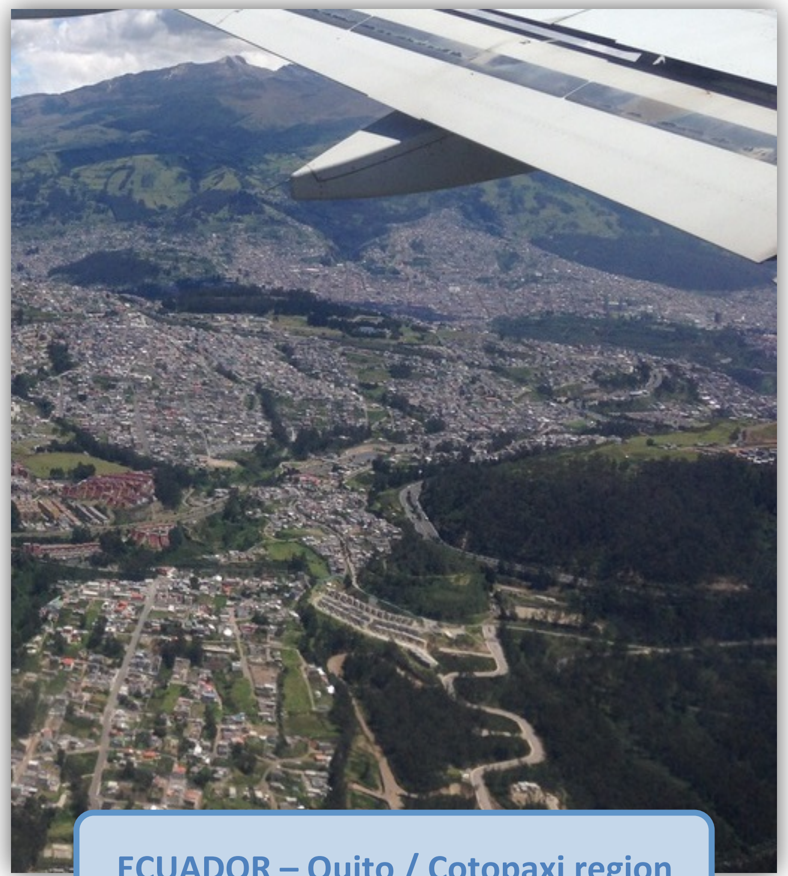
"Story": Volcanic activities, lahars, landslides, floods and critical infrastructure



RIESGOS – Pilot regions

PERU – Metropolitan Lima and Callao

CHILE – Valparaíso region



ECUADOR – Quito / Cotopaxi region

MOTIVATION

INTERDISCIPLINARITY

Multi-hazard applications require diverse competences, background and skills, that are rarely to be found in a single institution.

COLLABORATION

Multi-risk estimation requires strong collaboration among different scientific and operational partners, often geographically distributed.

SHARED COMMITMENT

Research-focused institutions need efficient solutions to make available mature & bleeding-edge methodologies to fellow researchers and end-users.

DISTRIBUTED VS MONOLITHIC

Monolithic solutions for multi-hazard and multi-risk are difficult to develop and maintain. Distributed architectures favour objective choices in an international, collaborative framework.

OPENNESS - TRANSPARENCY

The use of standard formats and open sharing of data and methodologies. are key!

To explore the complex interplay between different natural hazards a distributed framework for multi-risk assessment has been designed

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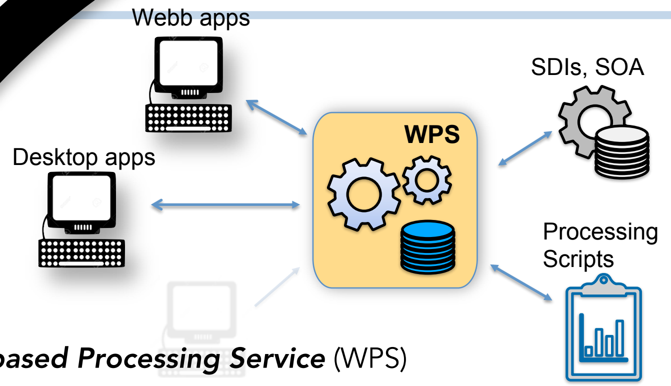
The distributed architecture is based on a set of WPSs, each implementing one or more steps of the risk assessment workflow. Each WPS can be hosted by different institutions, in different locations.

TECHNOLOGY

WEBSERVICES

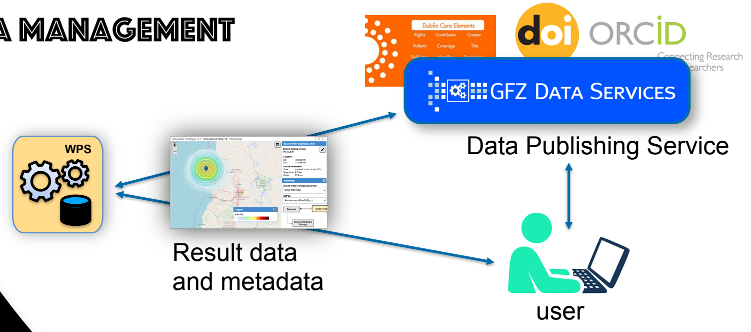


A ***Web-based Processing Service*** (WPS)

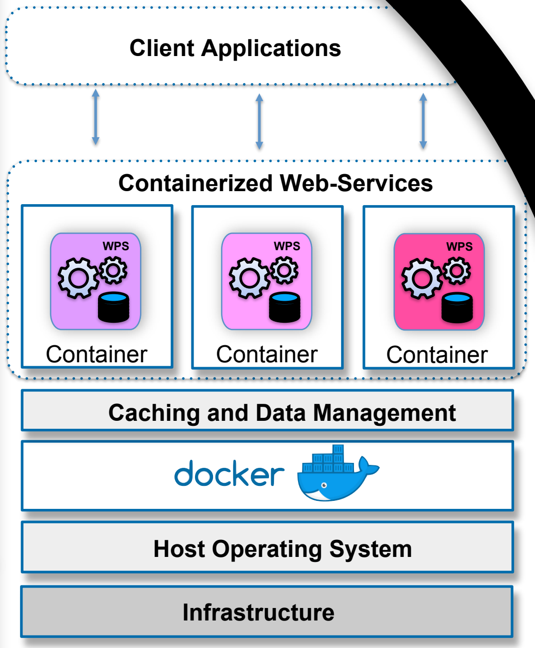
- logically represents an activity with a specified outcome
- is self-contained
- is a black box for its consumers
- may consist of other underlying services
- Open Geospatial Consortium (OGC) Standard

Read more

DATA MANAGEMENT



Each product can be directly indexed with a ***persistent identifier*** (e.g., a DOI) and published in a recognised public repository for referencing, dissemination and reuse.



A modular architecture has been designed to ensure and safe rapid implementation of OGC-compliant WPS. The use of docker containers allows for an efficient management of available resources and improve the scalability of the system.

ARCHITECTURE

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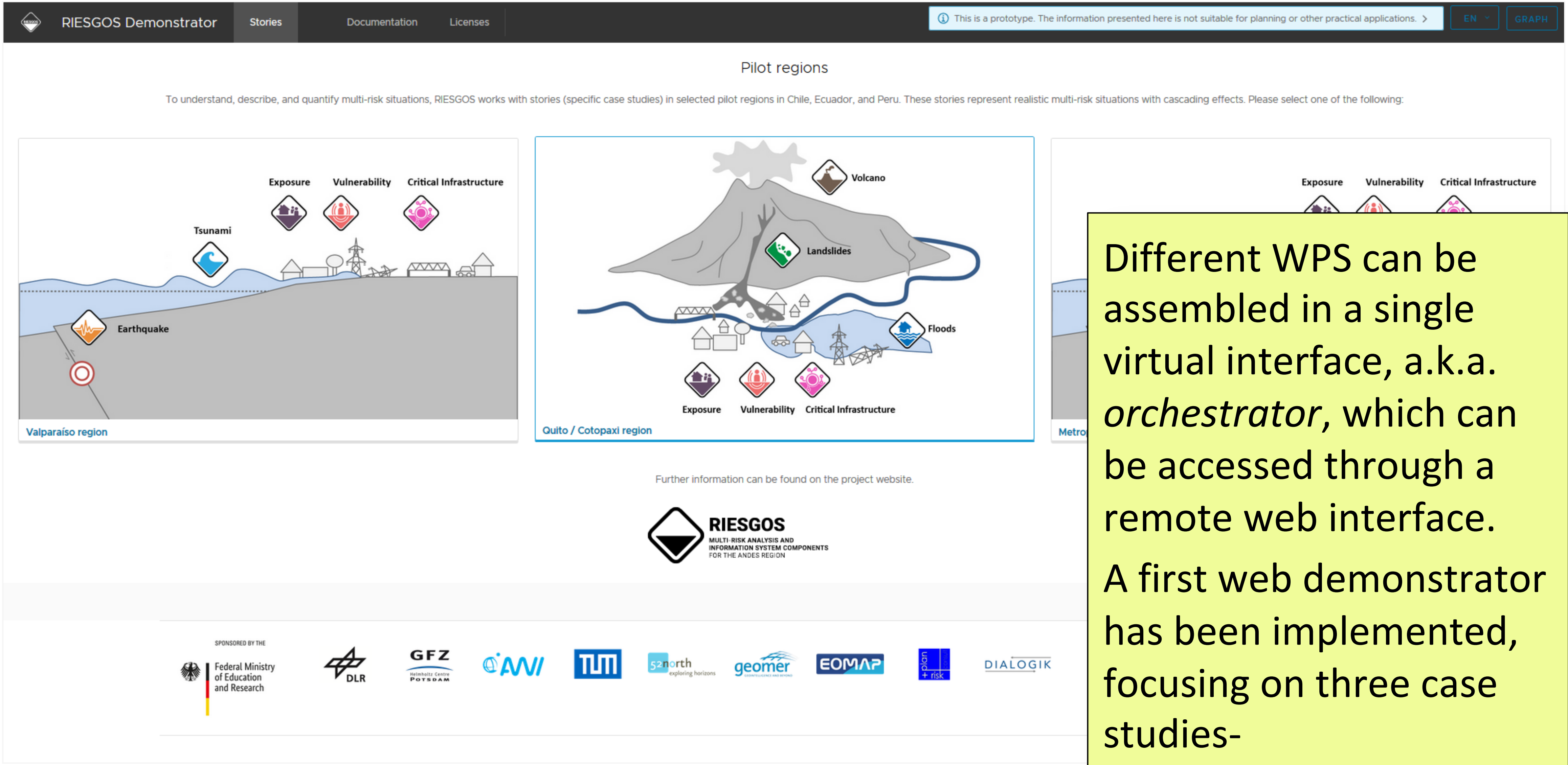
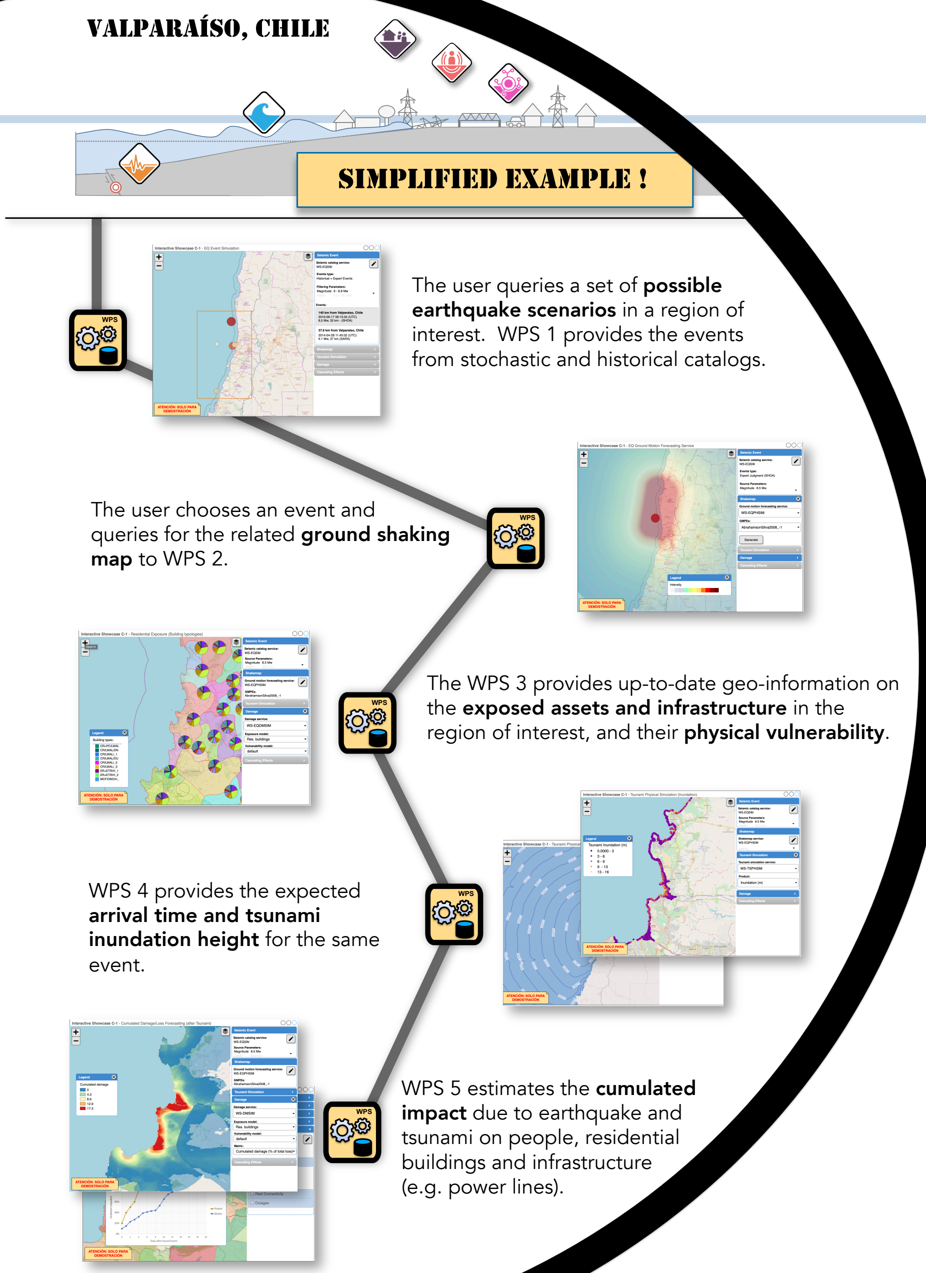
RIESGOS Demonstrator: landing page (as of May 2020)



Different WPS can be assembled in a single virtual interface, a.k.a. *orchestrator*, which can be accessed through a remote web interface.

A first web demonstrator has been implemented, focusing on three case studies-

APPLICATION



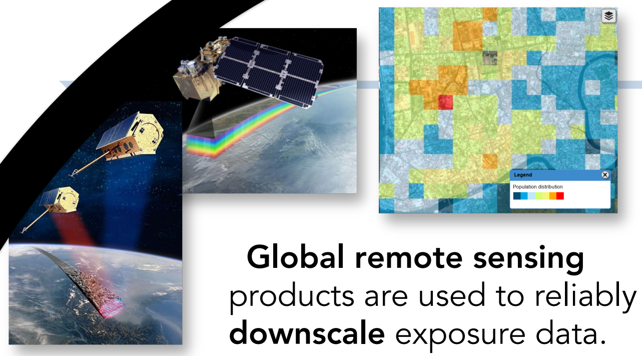
Each case study represents a specific multi-risk scenario. For instance, earthquake+tsunami in Valparaiso, Chile.

In this case 6 different WPS hosted in three different servers in Germany are employed. The details of the individual events can be chosen by the user, in order to better explore the range of possible consequences.

Across the two consecutive events the damage and loss is accumulated

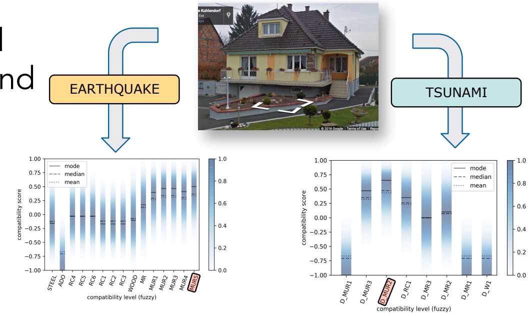
The use of a distributed and modular architecture allows to streamline the application and testing of advanced scientific applications. New approaches and methodologies (e.g. for exposure and vulnerability modeling, or event simulation) can be made readily available to the scientific community as well as practitioners and end-users.

EXPOSURE



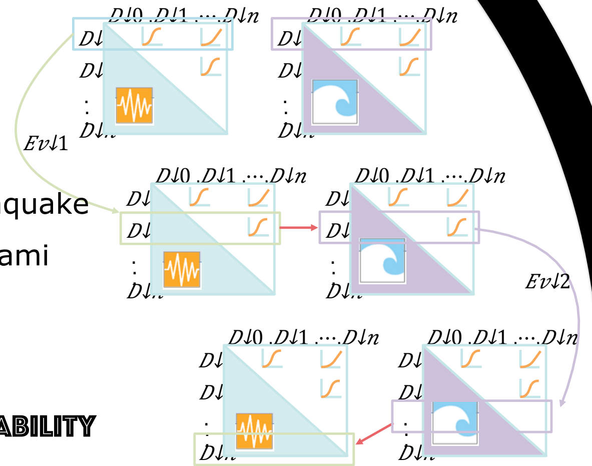
Global remote sensing products are used to reliably **downscale** exposure data.

Multi-hazard taxonomies and fuzzy mapping allow to create **dynamic exposure models.**



VULNERABILITY

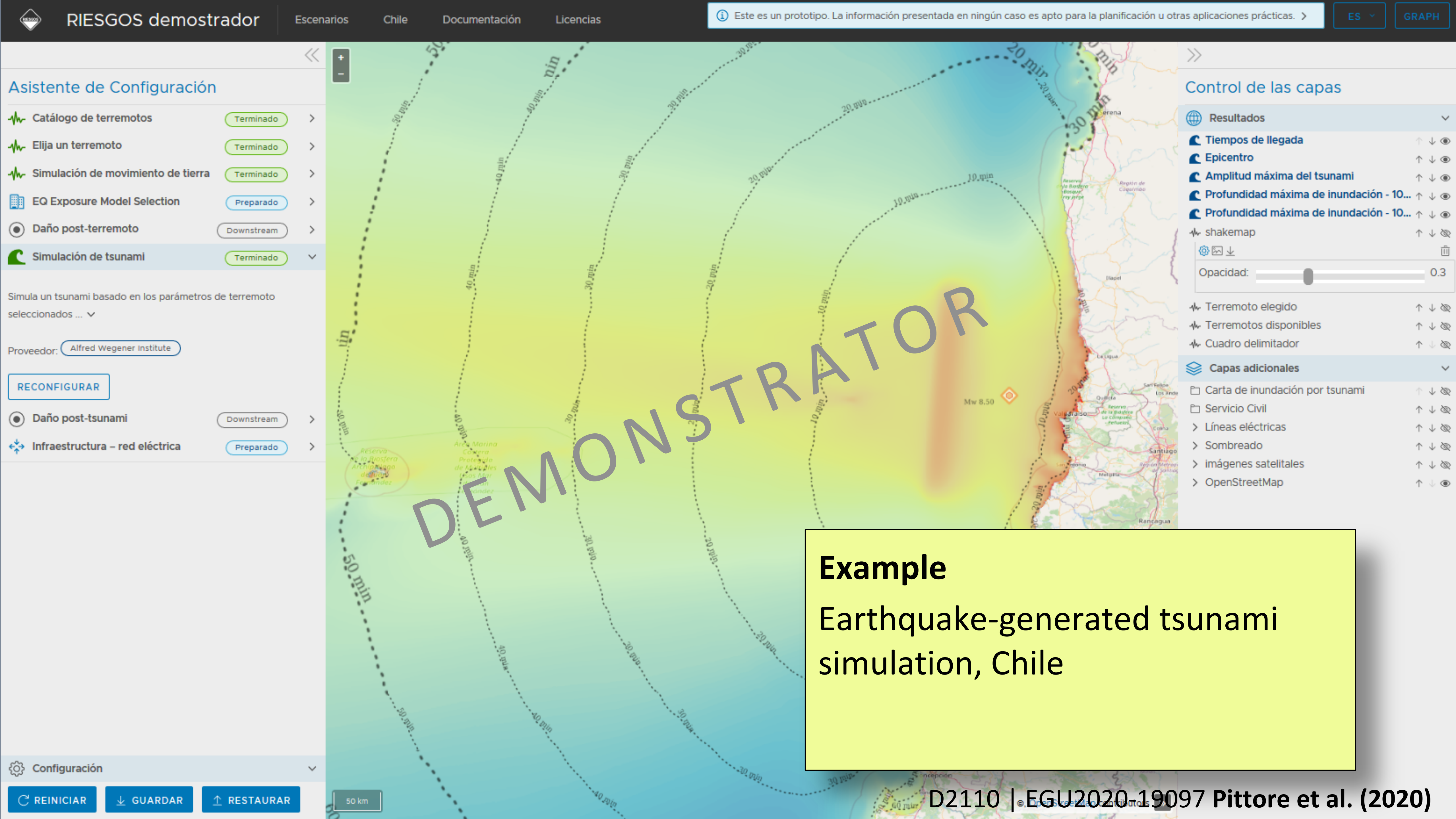
Multi-risk vulnerability models have to consider the state dependency in order to model the accumulation of physical damage across a sequence of (different) natural events.



IMPACT

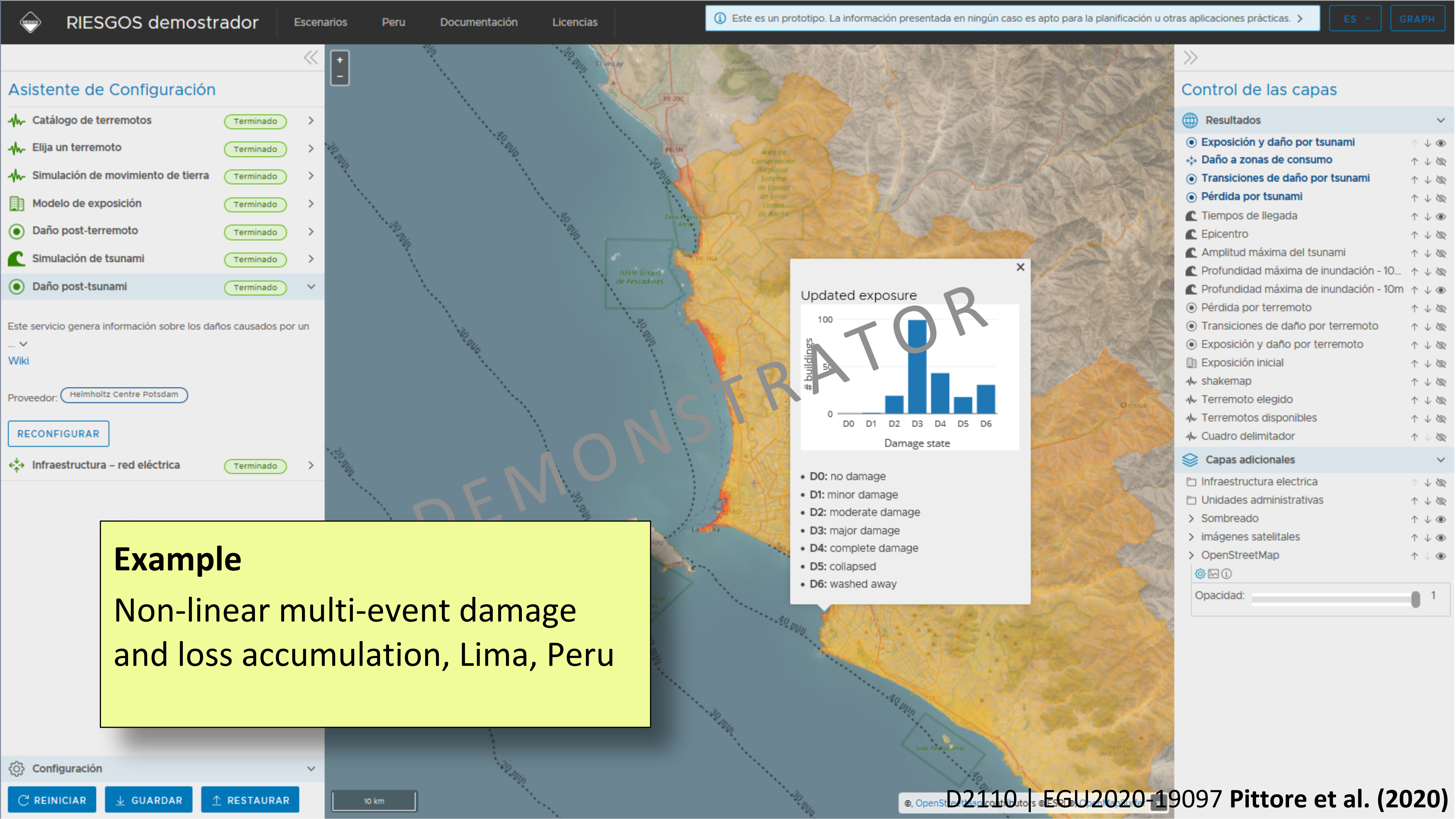
Impact of cascading events is considered from the physical and from the systemic perspective. Dynamic non-linear models of vulnerability and loss are employed to estimate possible consequences and also the estimated time required for the affected systems to recover their original performance.

SCIENC



Example

Earthquake-generated tsunami simulation, Chile

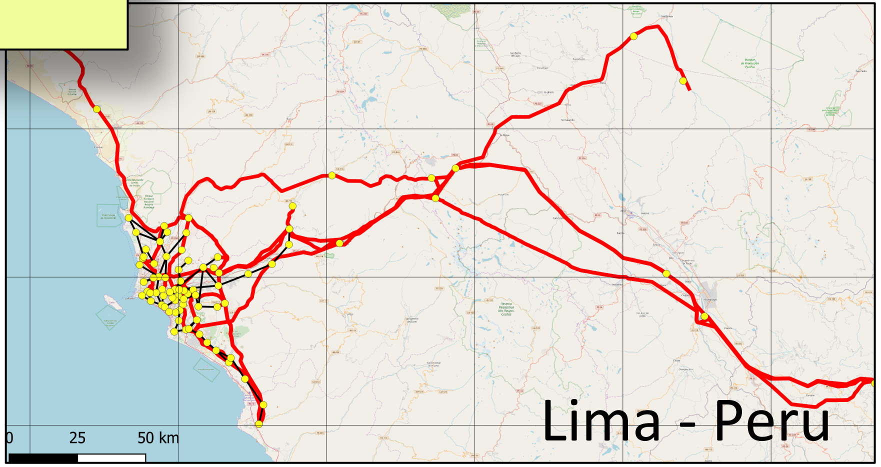


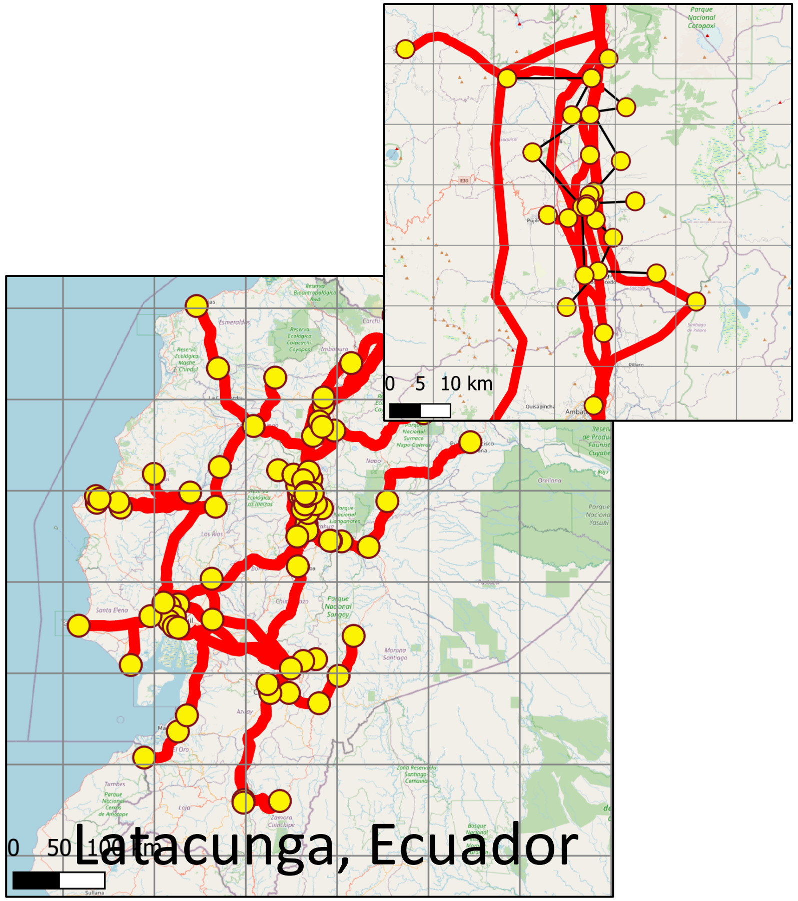
Example

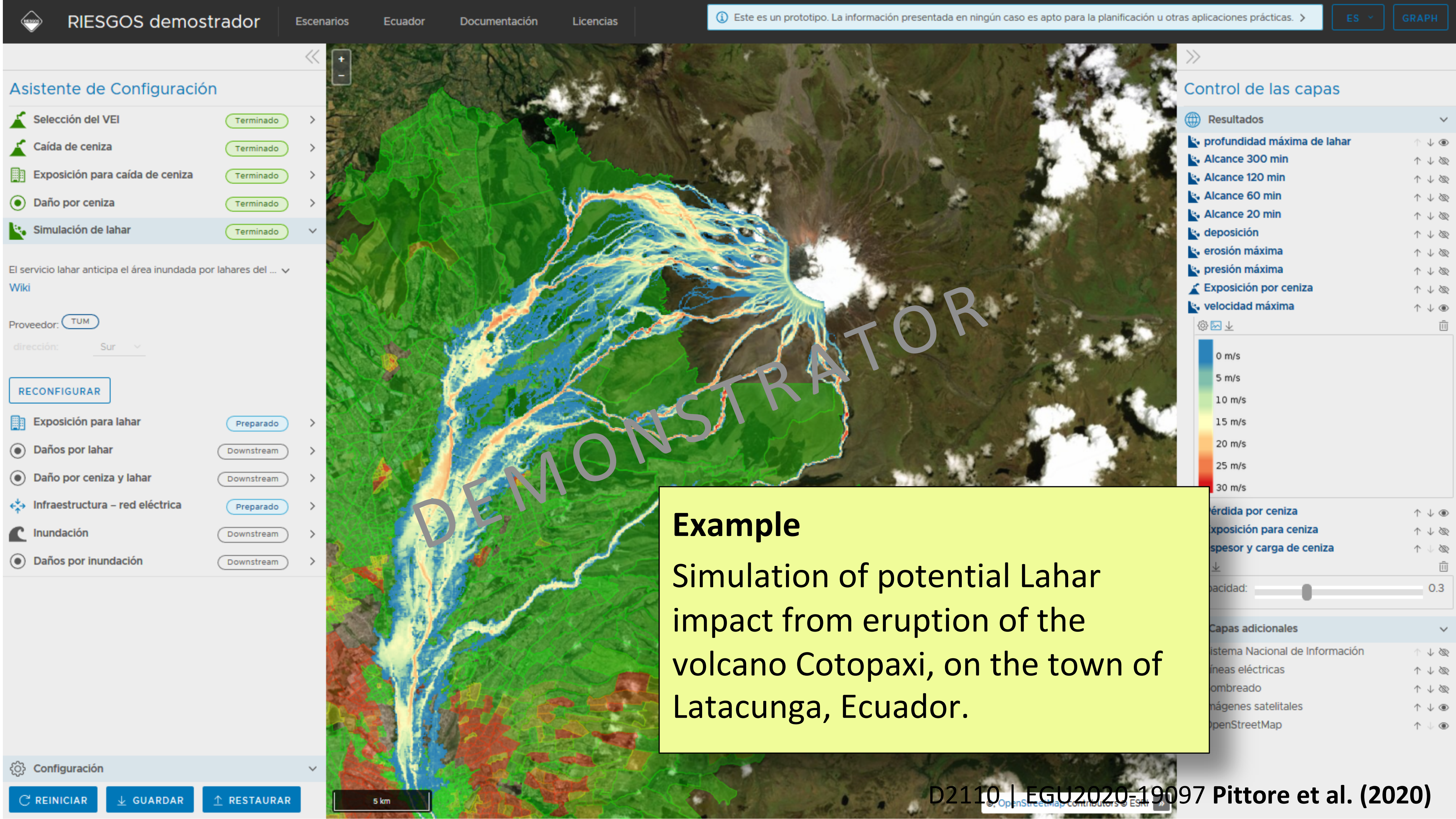
Non-linear multi-event damage and loss accumulation, Lima, Peru

RIESGOS Demonstrator: landing page (as of May 2020)

Complex infrastructure such as power networks are simplified. Advanced approaches are used to seek for optimal trade-off between complexity and realism of the models.







Example

Simulation of potential Lahar impact from eruption of the volcano Cotopaxi, on the town of Latacunga, Ecuador.

RIESGOS – Key facts

PARTNERS	▫ DLR ▫ GFZ ▫ AWI ▫ TUM ▫ 52°North ▫ geomer ▫ EOMAP ▫ plan + risk ▫ Dialogik
ASSOCIATED PARTNER	▫ GIZ ▫ Munich RE ▫ UNOOSA / UN-SPIDER ▫ UNESCO
REGION	Chile, Ecuador and Peru
TOPIC	Natural risks
FUNDING	BMBF – CLIENT II
DURATION	01/11/2017 – 30/10/2020 (3 years)

RIESGOS – Partners for Cooperation in South America

- Cooperation with **research partners** and **public authorities** in **Chile, Ecuador** and **Peru**
  - **Universities** and **research institutions**
  - **National authorities**
  - **Actors of the civil society**
  - Associated organizations

RIESGOS in EGU 2020 (Online)

Come and chat with us !

D2111 | EGU2020-18379 ★

Dynamic physical vulnerability: a Multi-risk Scenario approach from building- single- hazard fragility- models

Juan Camilo Gomez- Zapata, Massimiliano Pittore, Nils Brinckmann, and Simantini Shinde

D872 | EGU2020-8671 ★

Put your models in the web - less painful

Nils Brinckmann, Massimiliano Pittore, Matthias Rüster, Benjamin Proß, and Juan Camilo Gomez-Zapata

D2143 | EGU2020-19861 ★

Scenario- based multi- risk assessment on exposed buildings to volcanic cascading hazards

Michael Langbein, **Juan Camilo Gomez- Zapata**, Theresa Frimberger, Nils Brinckmann, Roberto Torres- Corredor, Daniel Andrade, Camilo Zapata- Tapia, Massimiliano Pittore, and Elisabeth Schoepfer

D1728 | EGU2020-11719 ★

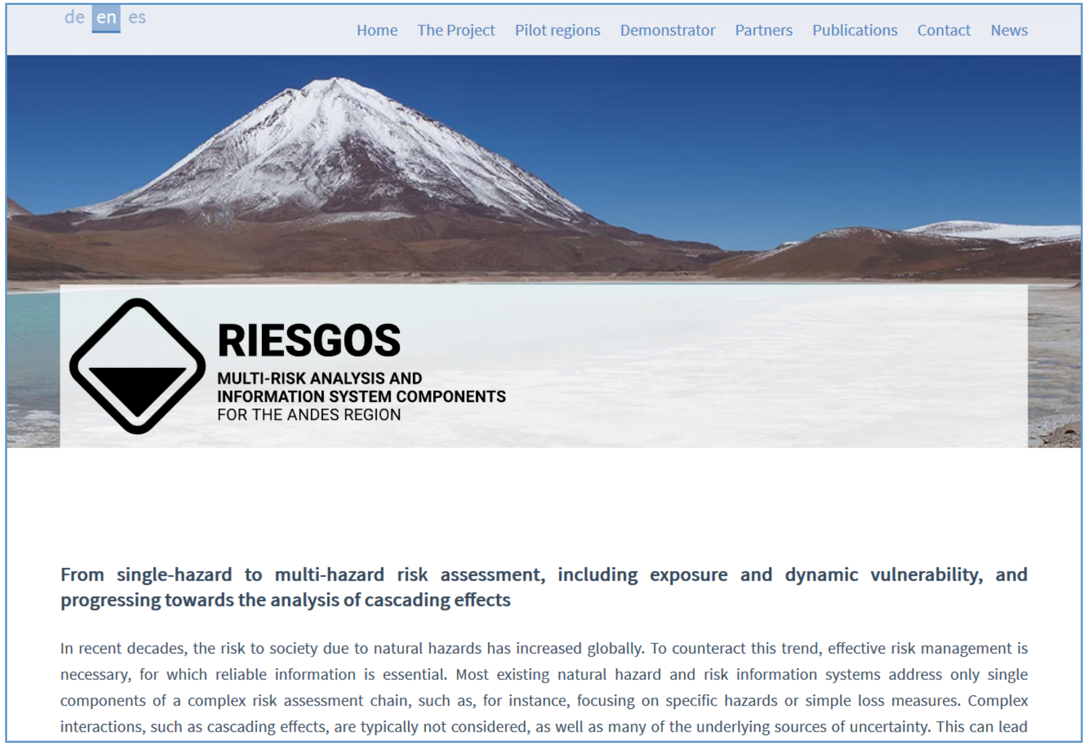
Development of multi-hazard exposure models from individual building observations for multi-risk assessment purposes

Simantini Shinde, **Juan Camilo Gomez- Zapata**, Massimiliano Pittore, Orlando Arroyo, Yvonne Merino- Peña, Paula Aguirre, and Hernán Santa María

RIESGOS – Further Information

www.riesgos.de

visit us !



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