

Seismic Cities

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CIGIDEN

Centro Nacional de Investigación
para la Gestión Integrada
de Desastres Naturales



UDD

Universidad del Desarrollo
Universidad de Excelencia



The all important equation

Seismic
risk

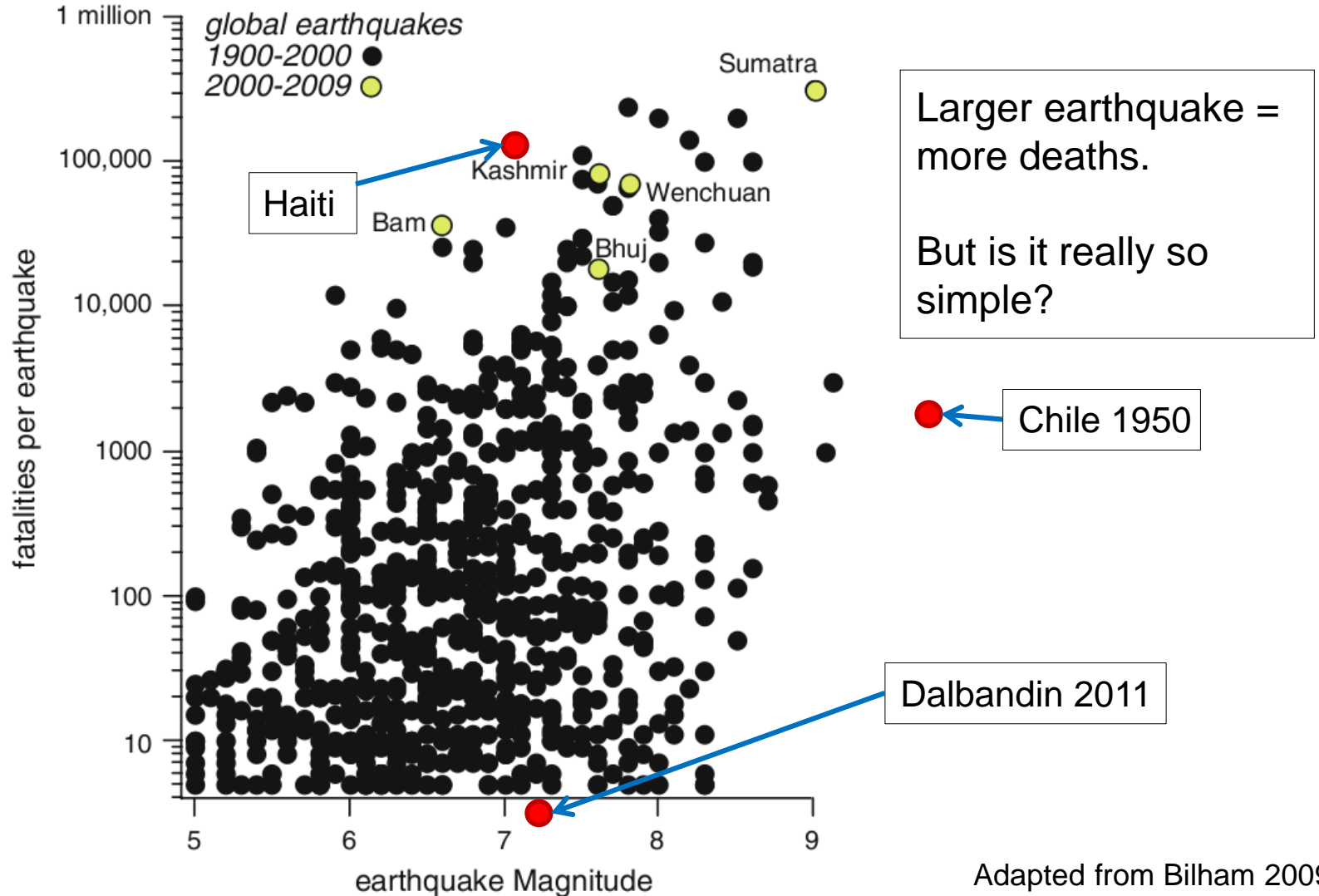
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Exposure

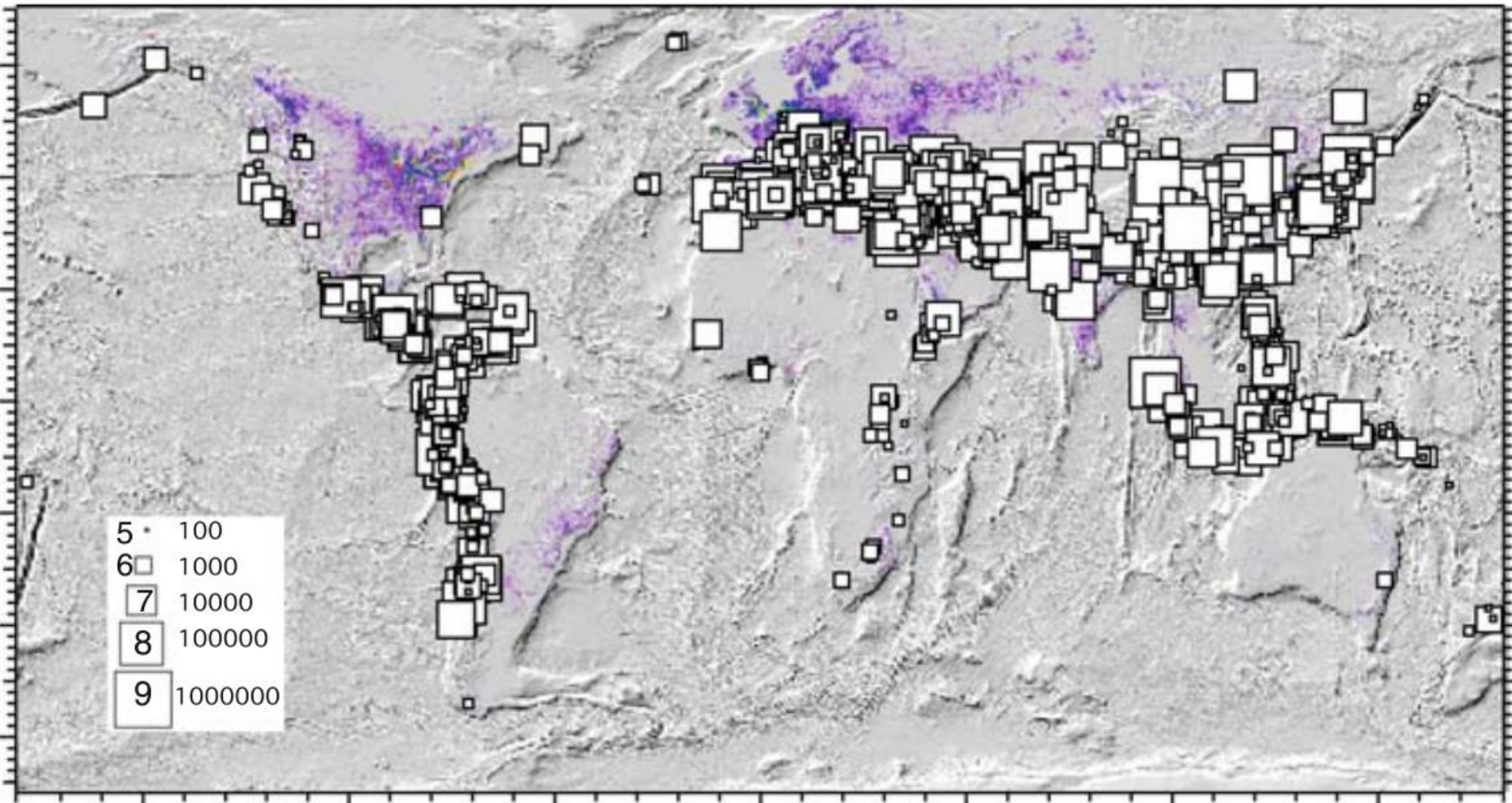
x

vulnerability

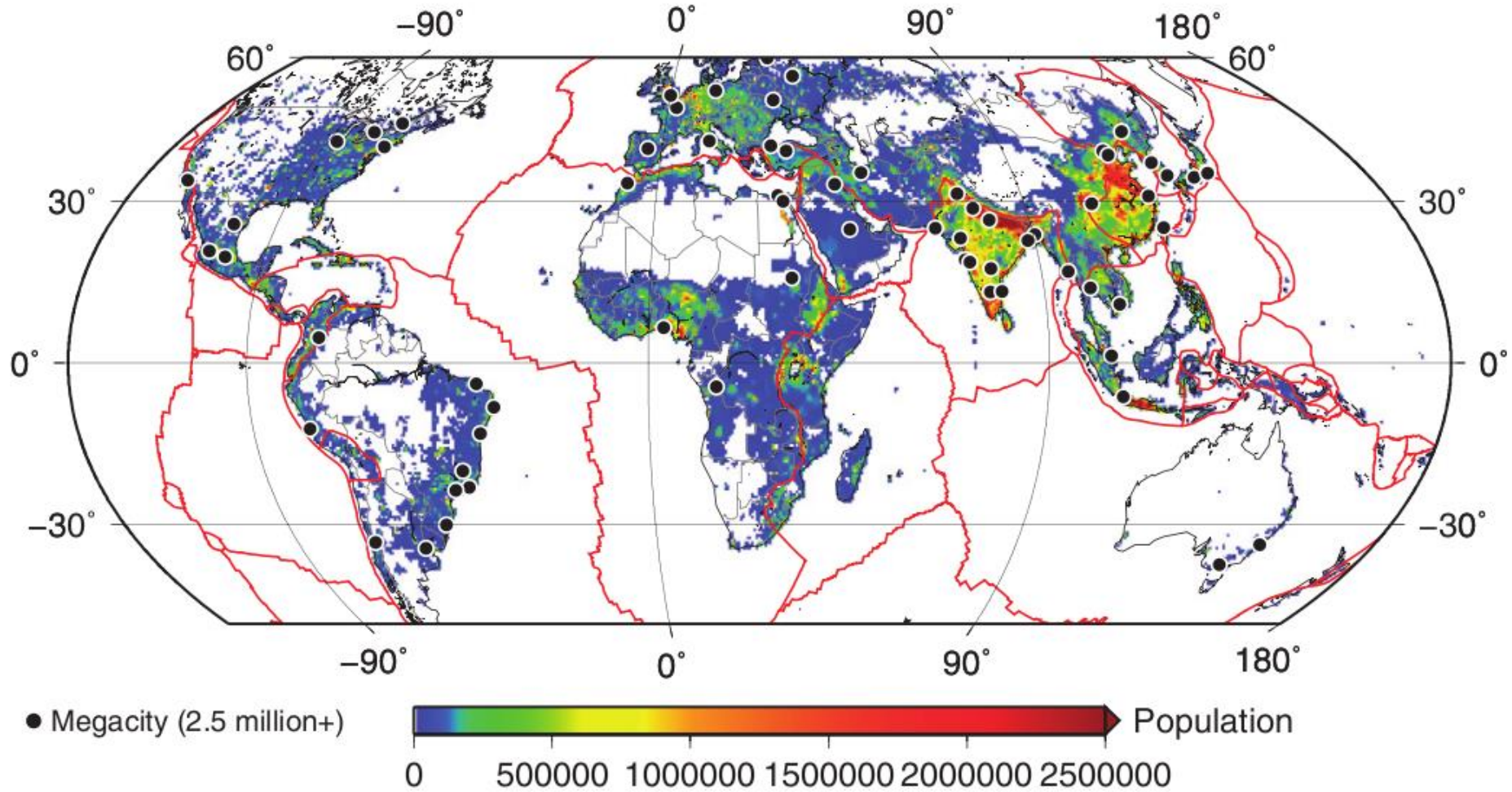
Deaths vs Magnitude

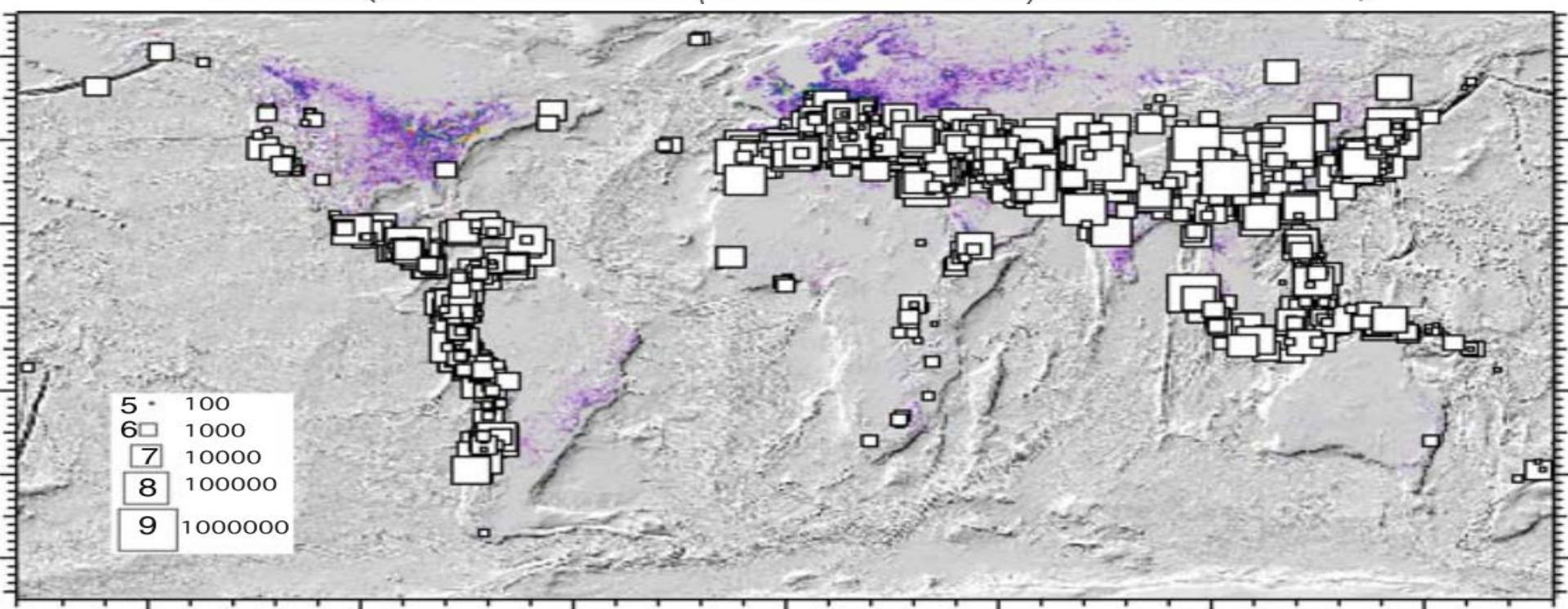
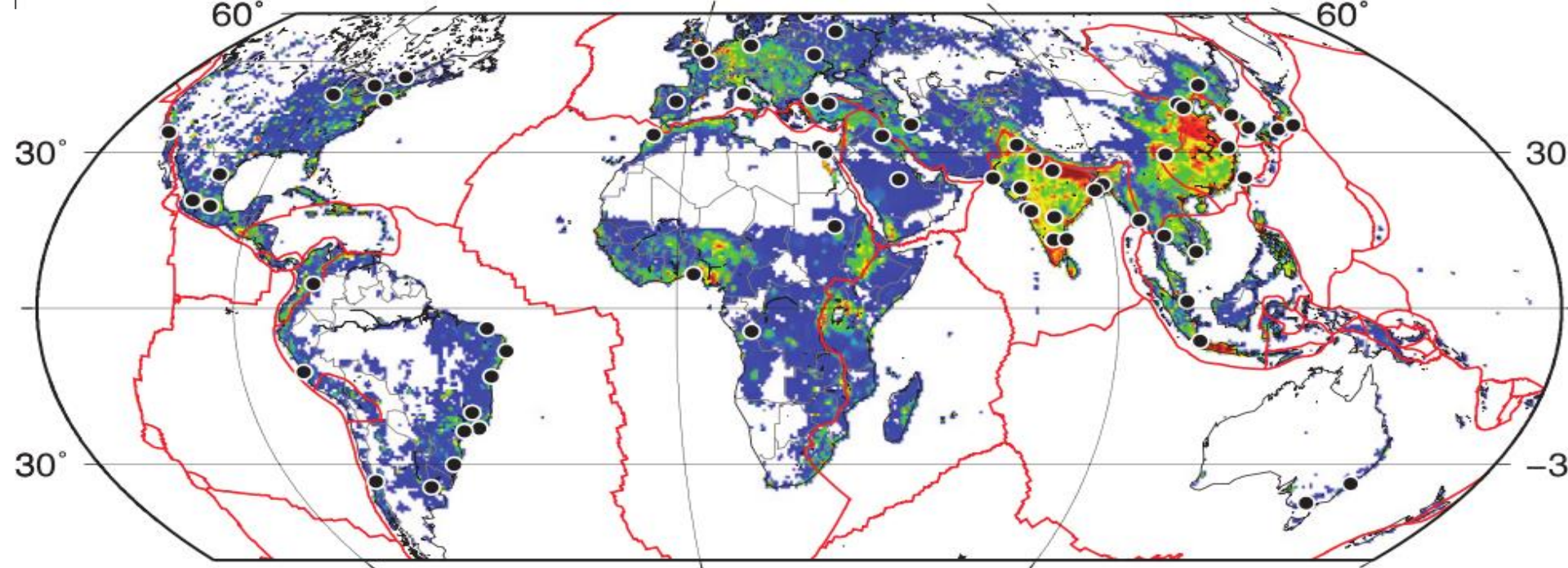


A 1000 years of earthquake deaths



Global population distribution





More to the story?

Port au Prince, Haiti 2010



Christchurch, New Zealand 2010



1,000,000

230,000

7.1

Population exposed

Killed

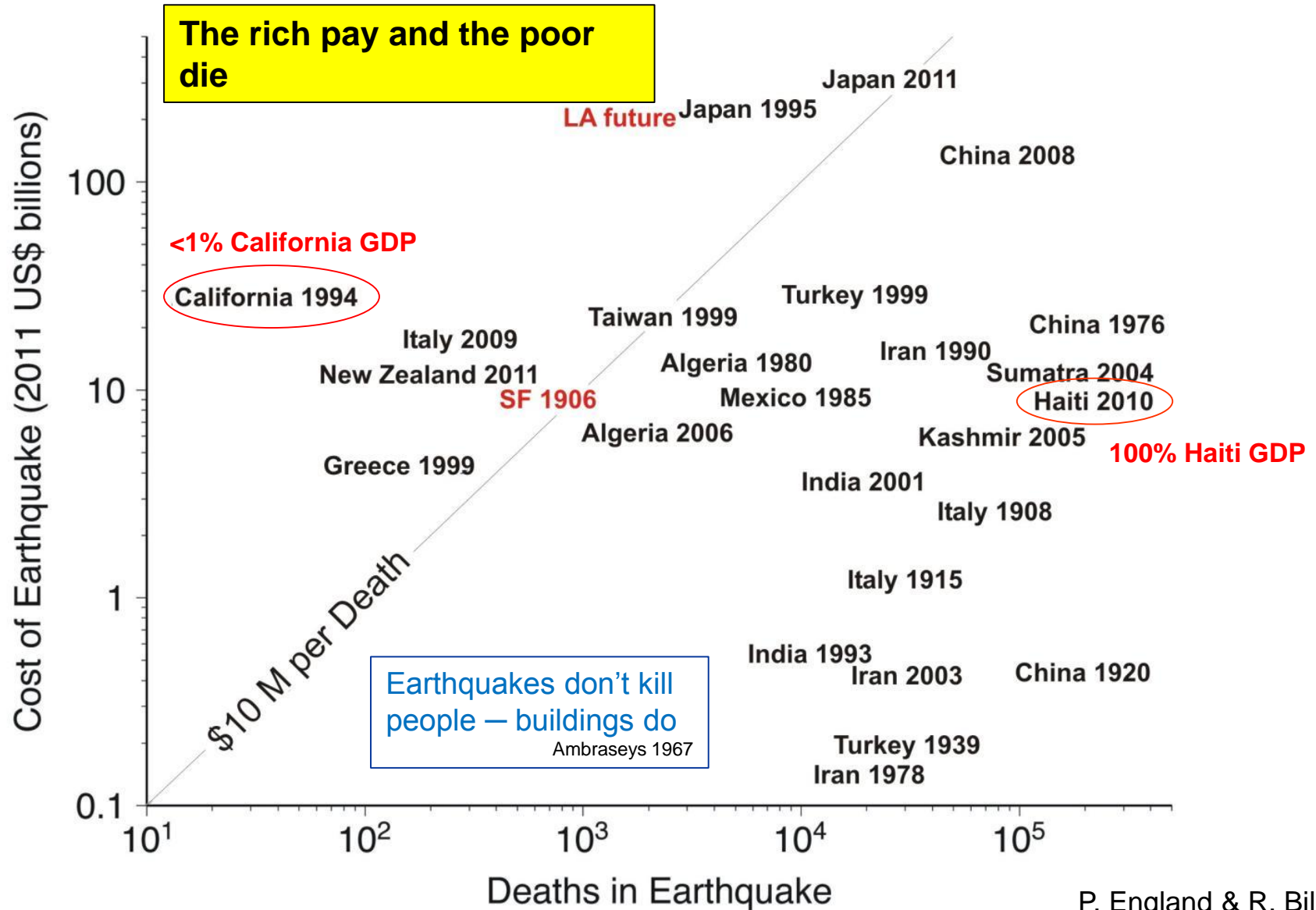
Magnitude

350,000

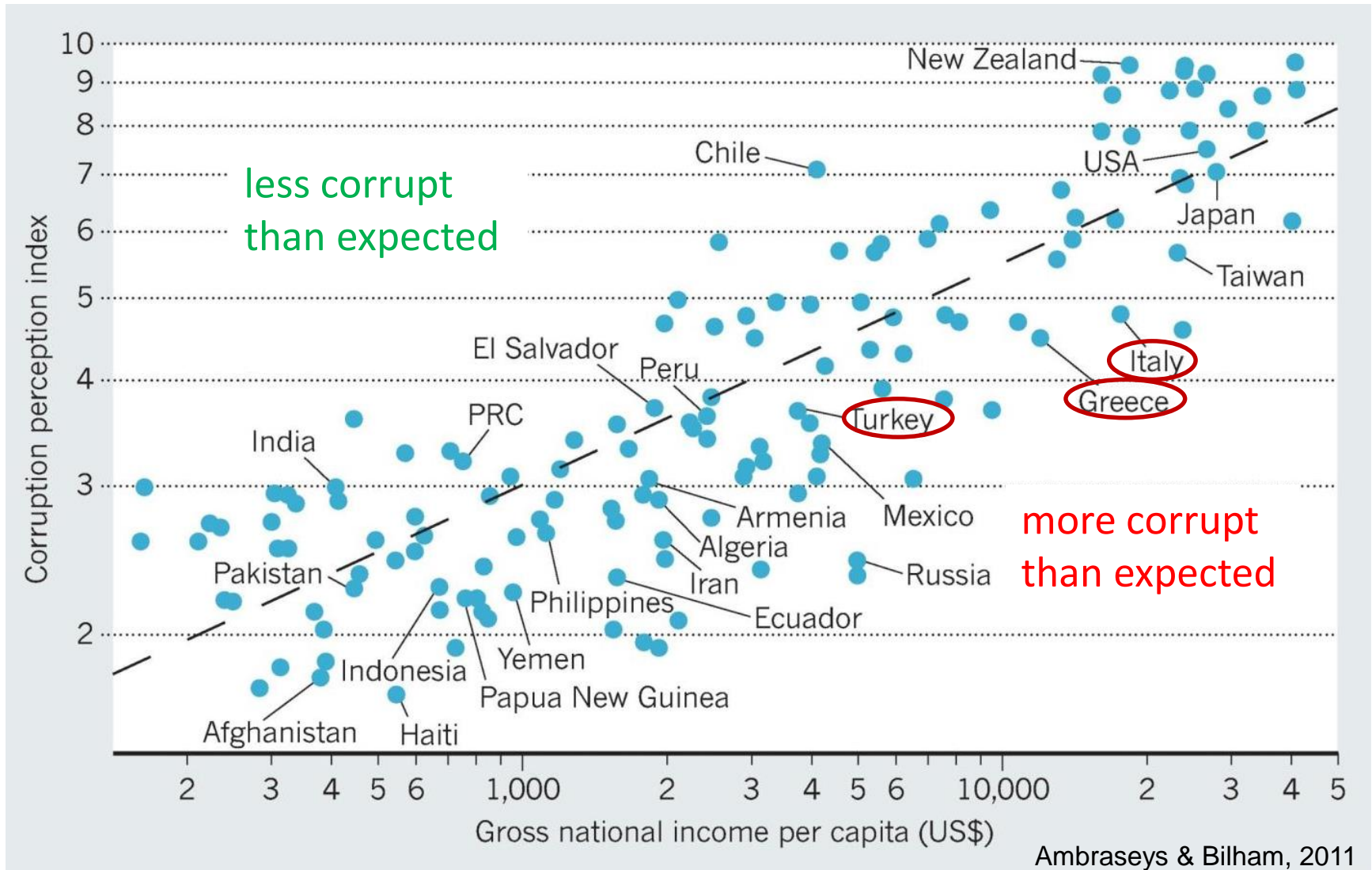
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7.1

The poverty curse



The corruption curse

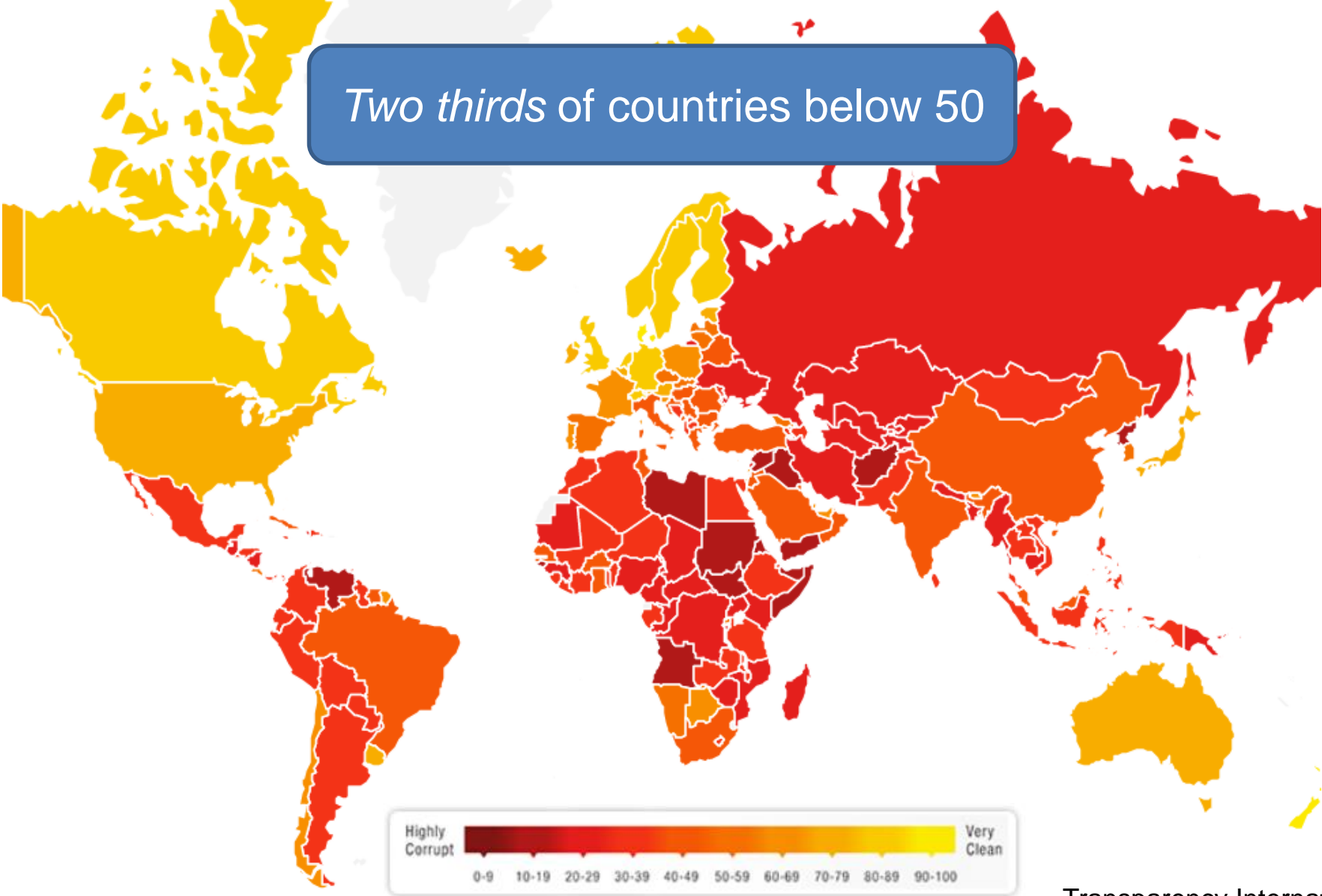


"The \$3.5* trillion construction industry is the most corrupt sector of the world economy"

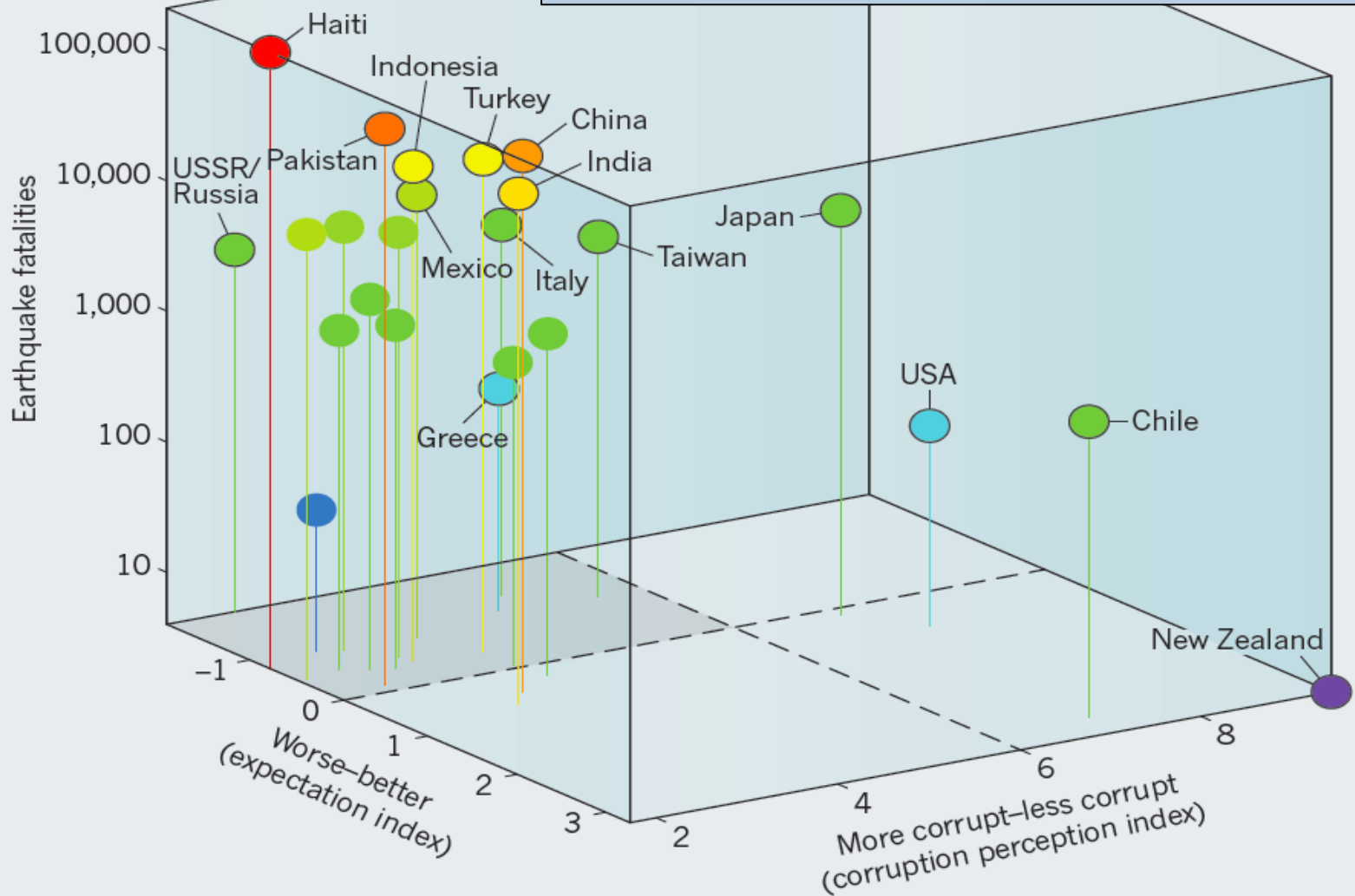
Transparency International 2005

Corruption Perception Index 2016

Two thirds of countries below 50

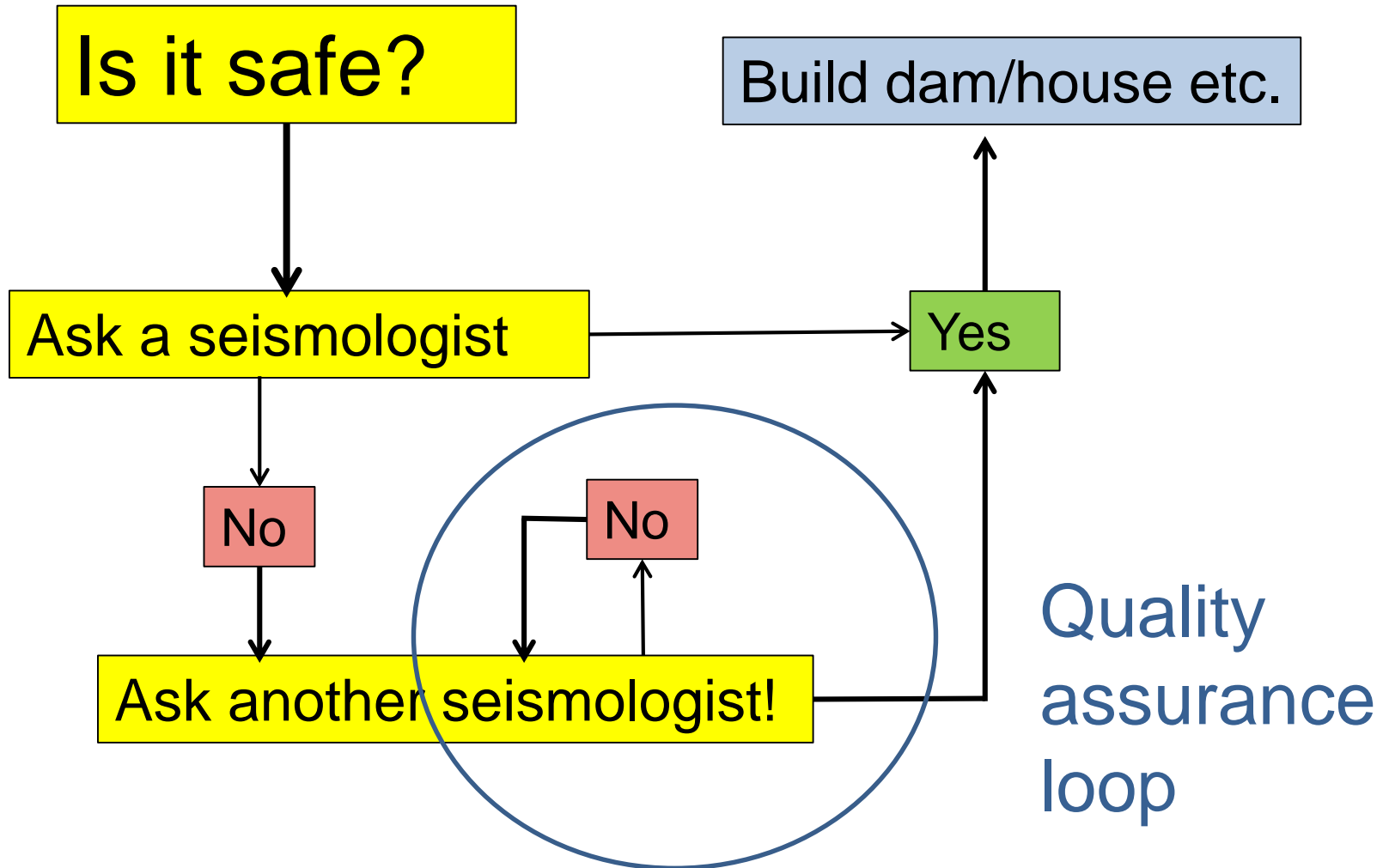


83% of all deaths from earthquakes in the past 30 years were in low income corrupt nations



Ambraseys & Bilham, *Nature*, 2011

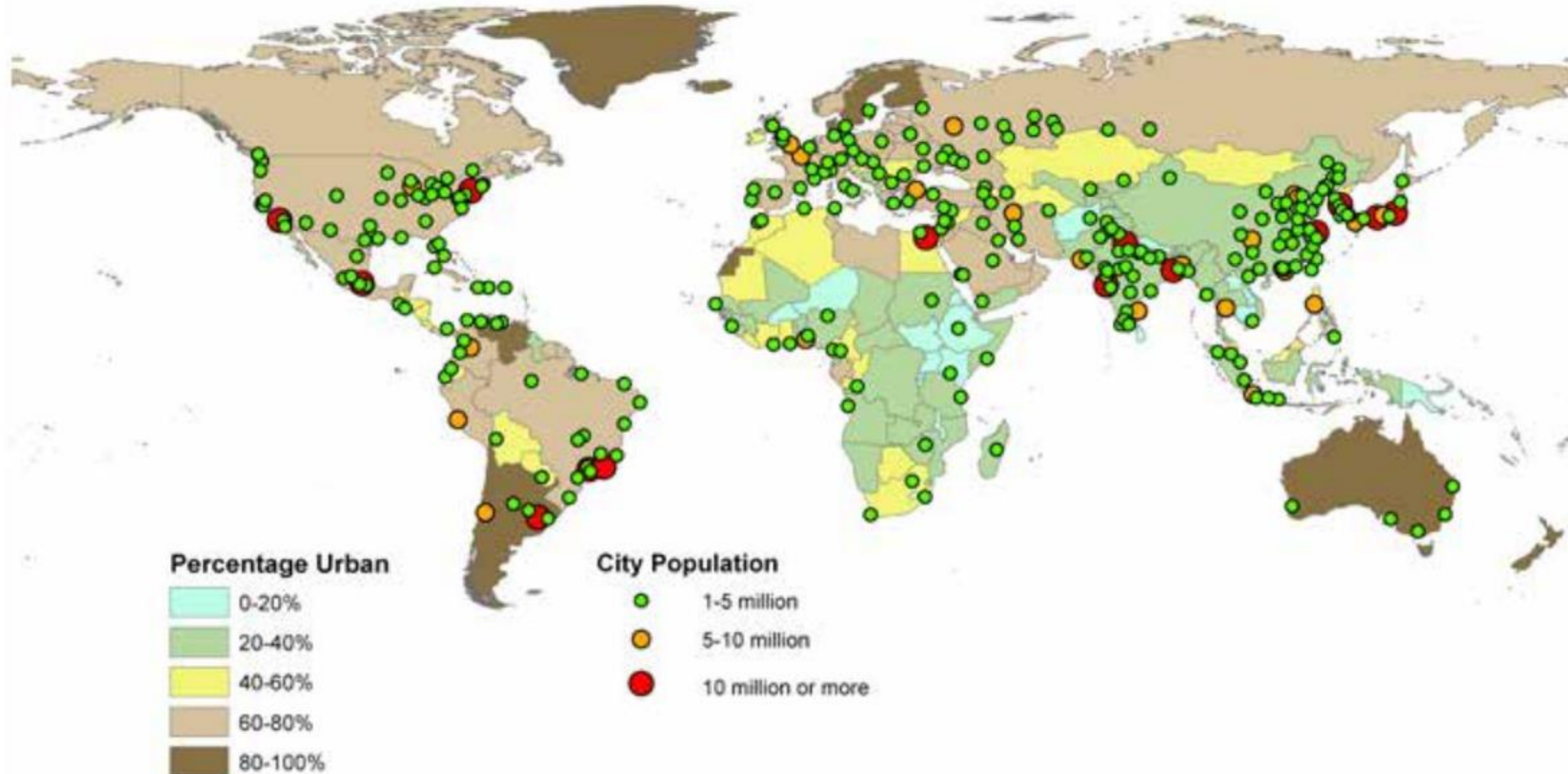
How to consult a corrupt seismologist



The city concentration effect

Figure 1.2: Global patterns of urbanization, 1995

Source: Based on United Nations, 2014b.



The city concentration effect

Figure 1.3: Global patterns of urbanization, 2015

Source: Based on United Nations, 2014b.

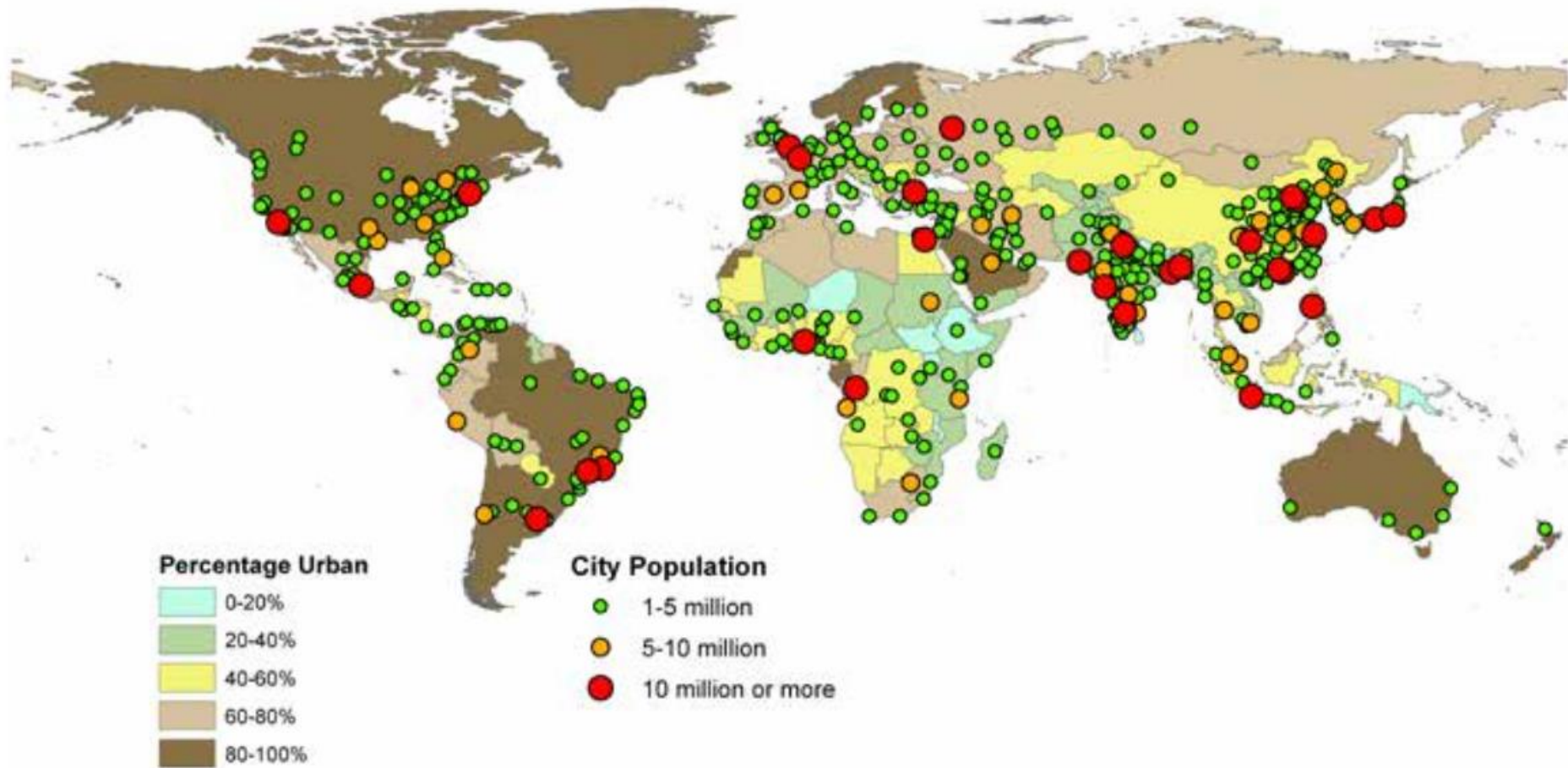
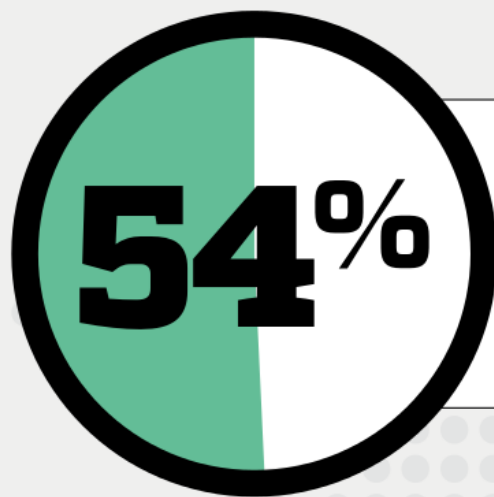


Figure 1.3: Global p

Source: Based on United Nati



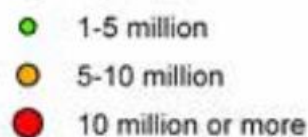
HALF THE WORLD'S
POPULATION RESIDES
IN URBAN AREAS.

Cities create **wealth**, **generate employment**
and **drive human progress** by harnessing the
forces of agglomeration and industrialization.

Percentage Urban



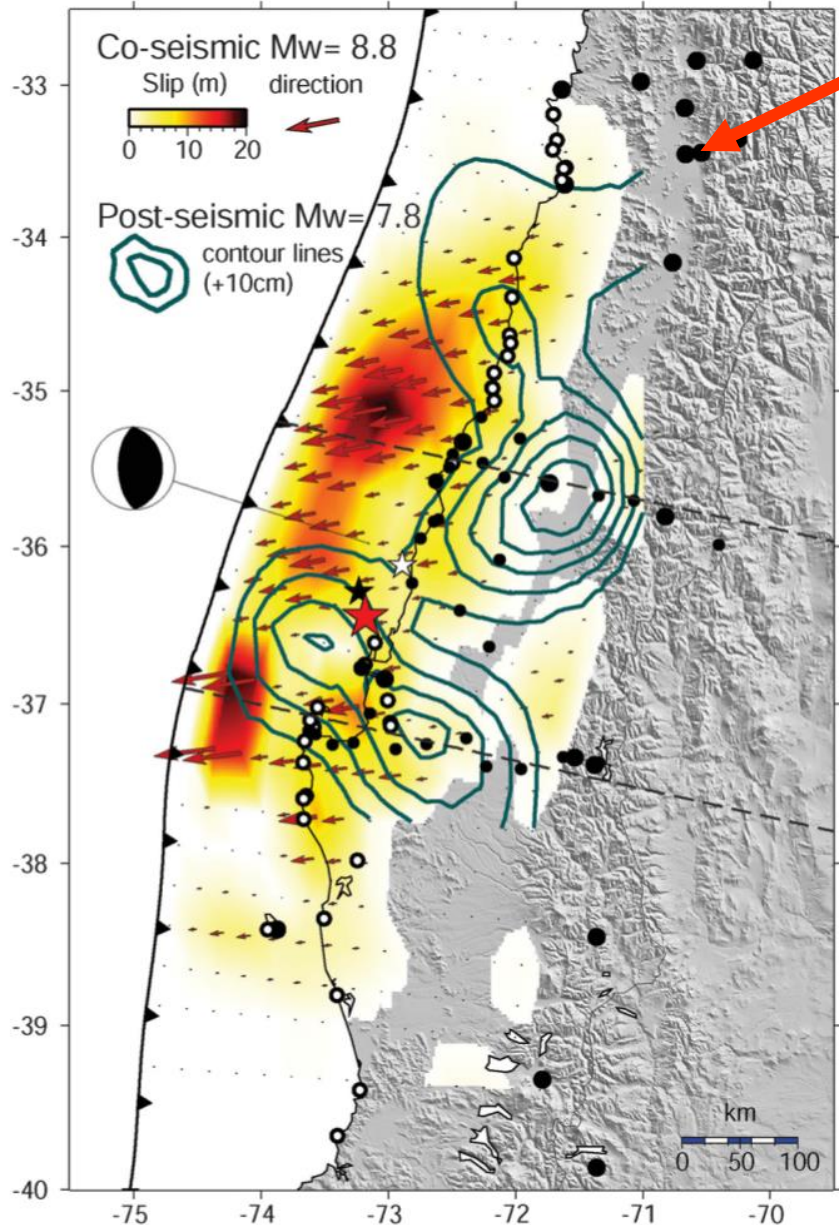
City Population



Seismic Cities Project Mission

To promote multi-disciplinary applied research in order to understand the full spectrum of seismic resilience in vulnerable cities around the world, and to promote the exchange of ideas and experiences with city officials, urban planners and the people living and working in 'Seismic Cities'.

Case study area: Santiago



Santiago

Recently affected by large earthquake in 2010

Fairly resilient city to offshore events

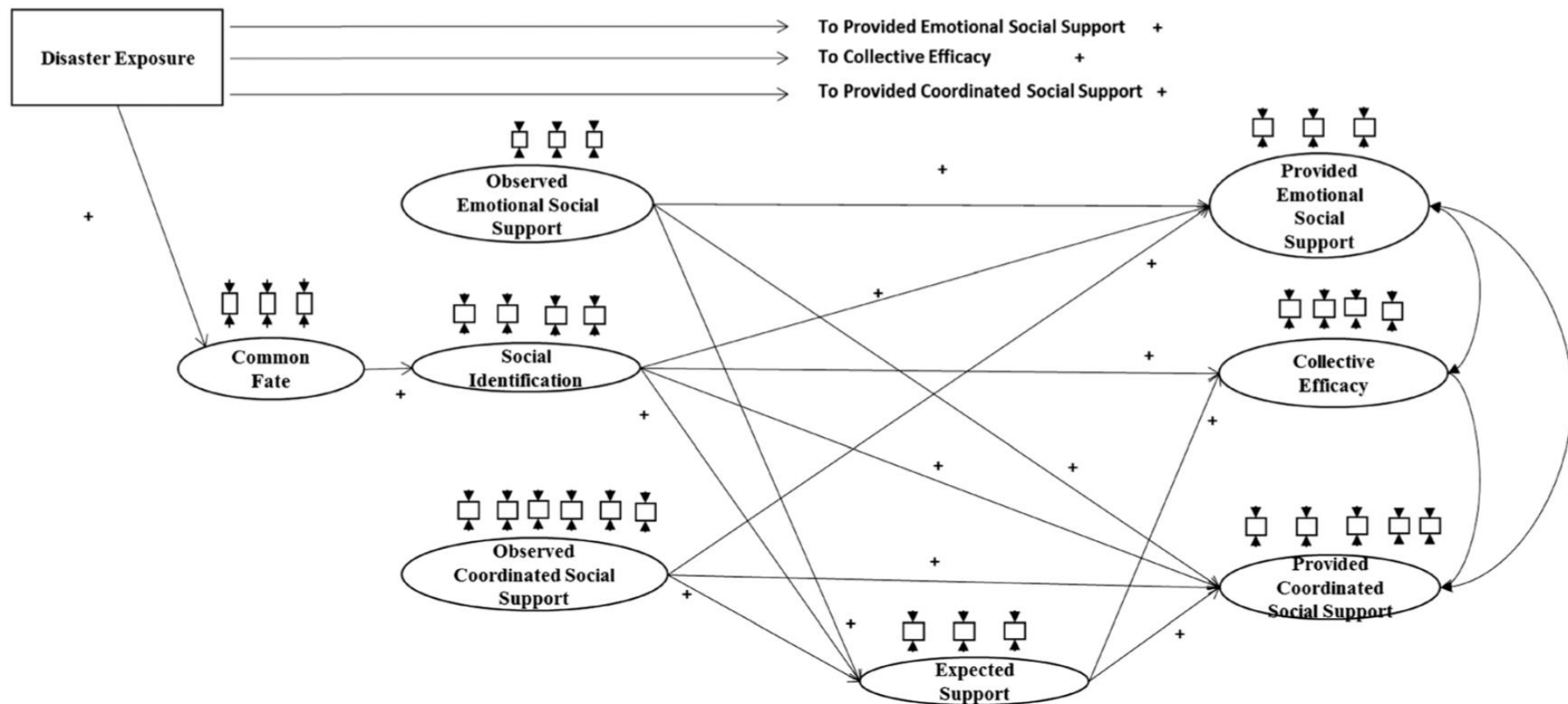
Newly recognised active fault next to the city: the San Ramon Fault

Ideal place to study the perceptions of risk

Transferable lessons?

The “common fate” effect

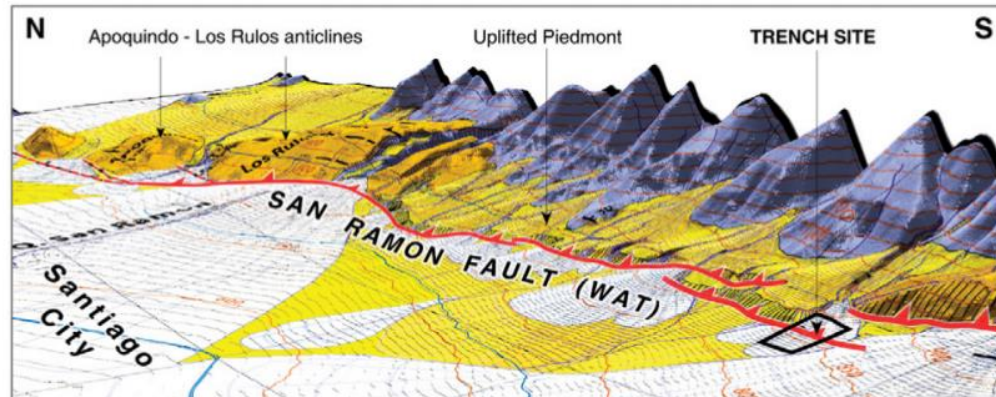
How do psychological and social groupings affect response during a disaster?



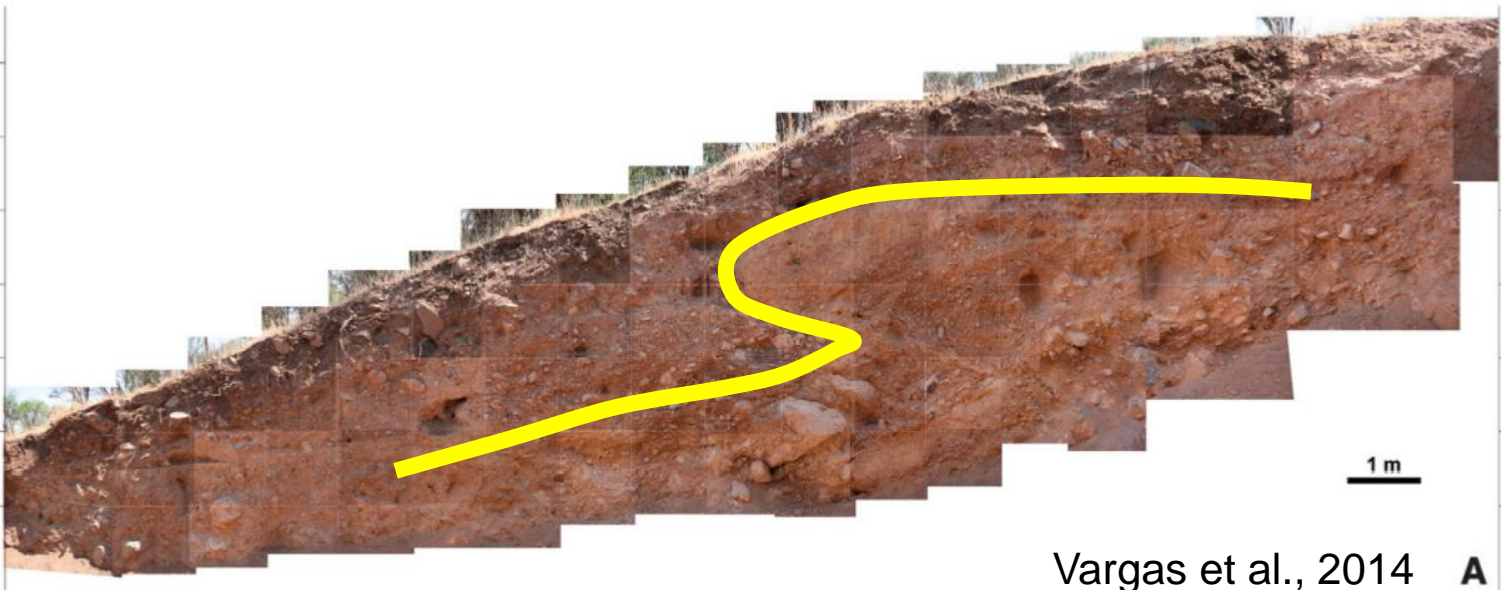
C: The San Ramon Fault



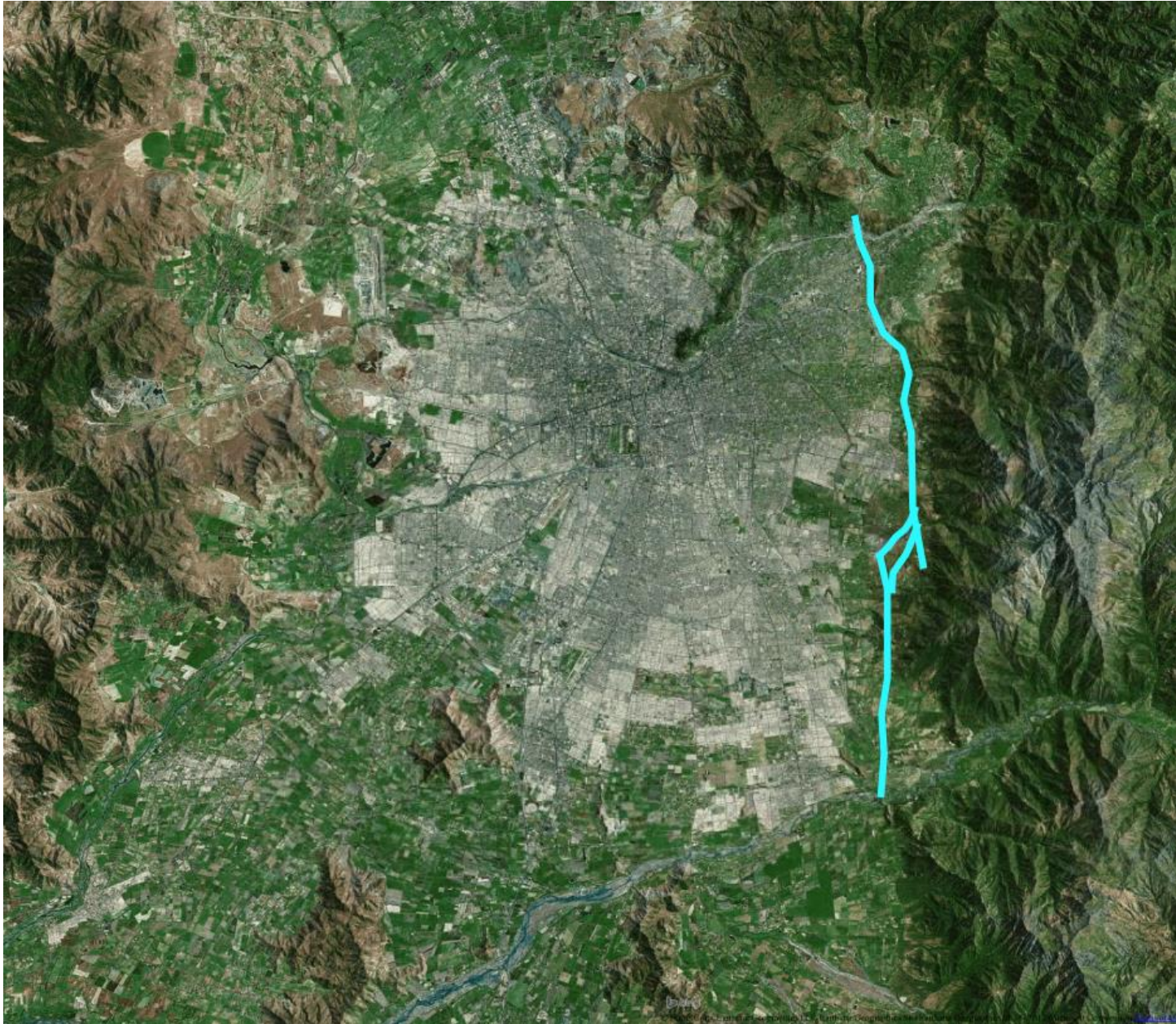
Seismic risk scenarios



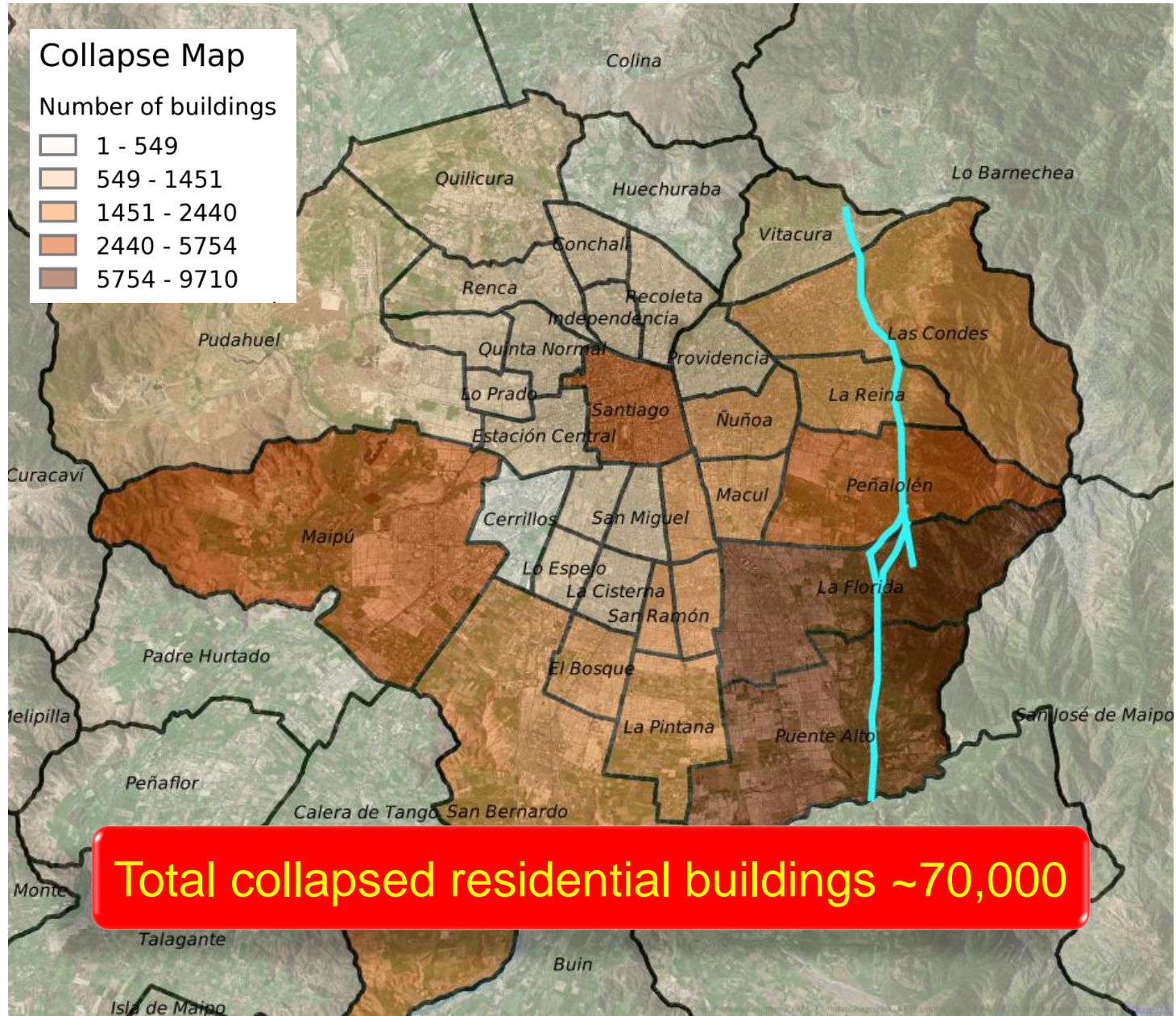
Two historical earthquakes: ~16k and ~8k years ago
Both magnitude ~7.5



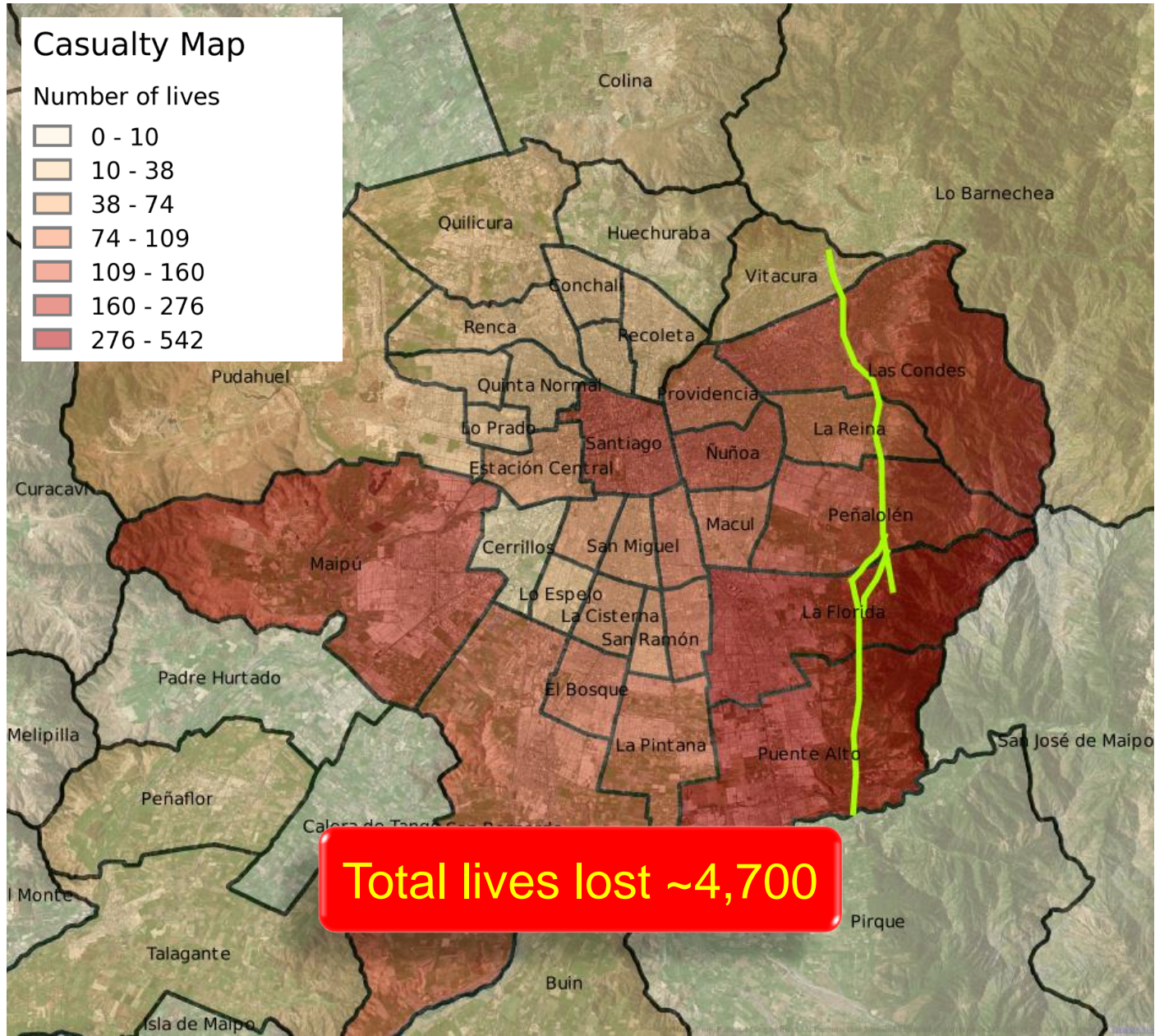
Seismic Risk Scenario



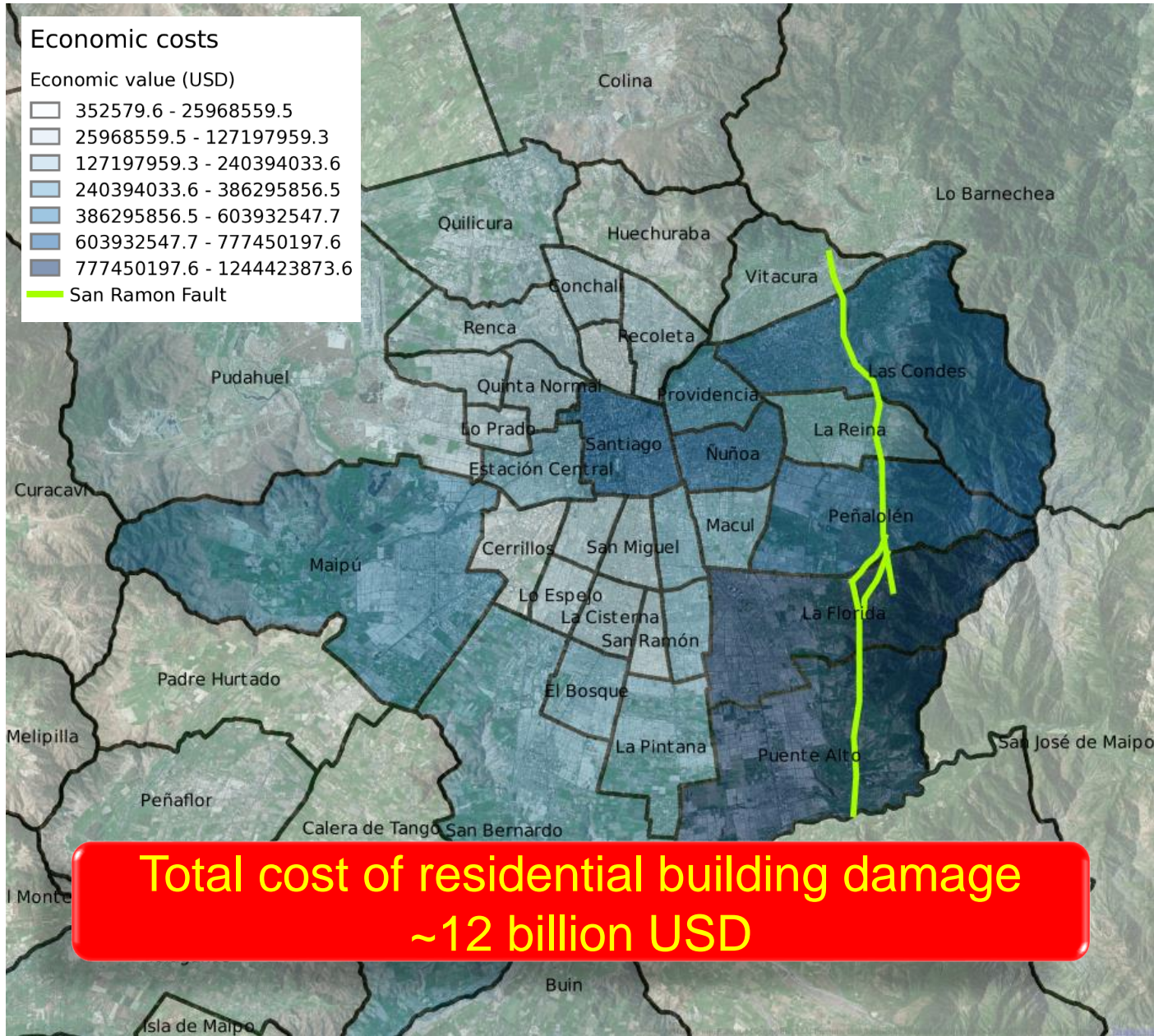
Seismic Risk Scenario



Seismic Risk Scenario



Seismic Risk Scenario



Summary

- Poverty, ignorance and corruption exacerbate the impacts of earthquakes on communities
- Seismic resilience is more than just better building design and construction.
- Psychological resilience stems from integrated communities
- Future work: How can we quantify the full spectrum of physical and social resilience?