

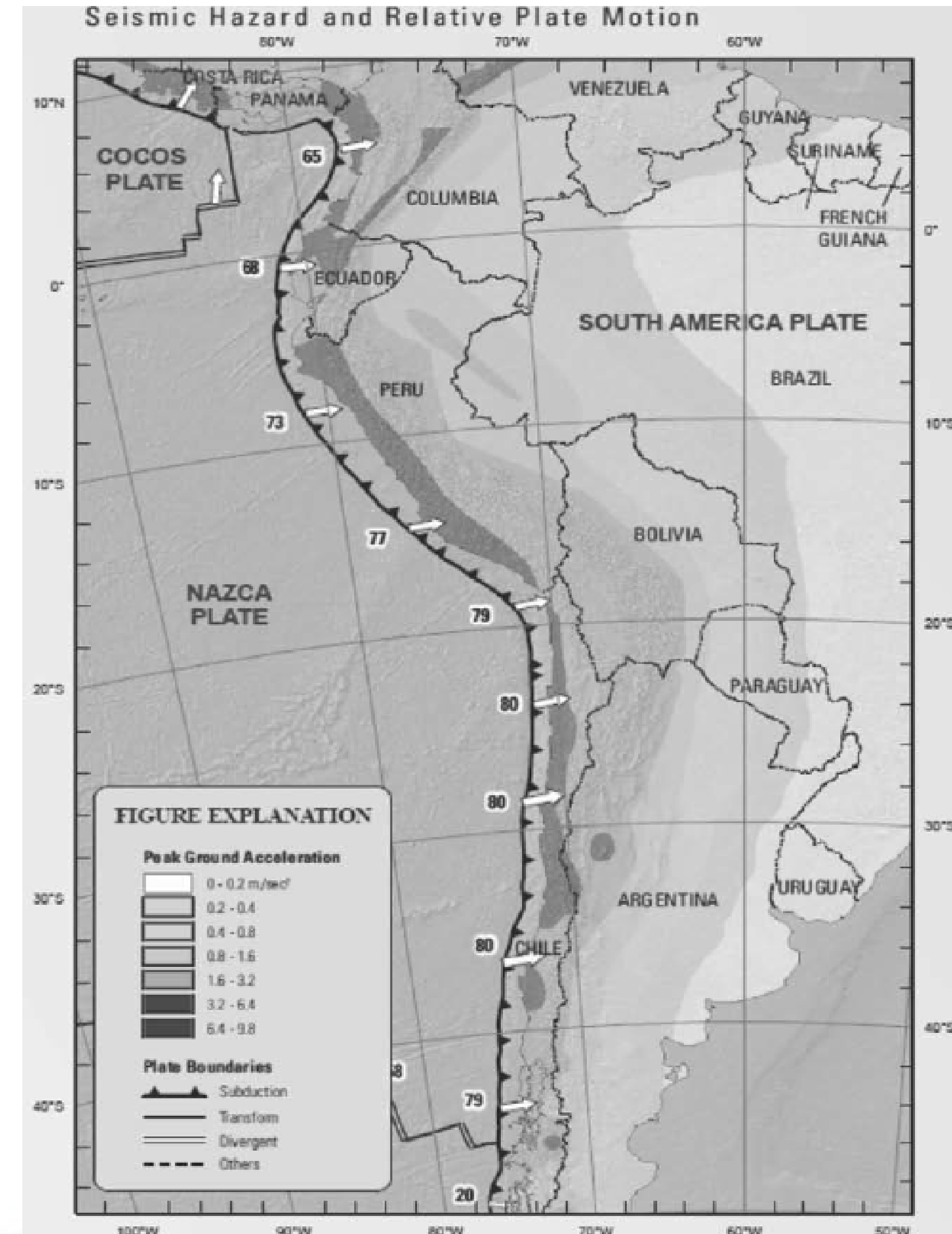


Disaster Preparedness and Operational Recovery Jorge Chavez International Airport

June 2023

Introduction

- ✓ The Pacific coast of South America is particularly vulnerable to earthquakes, due to the convergence of the Nazca and South American tectonic plates.
- ✓ The Lima-Callao megapolis is the largest urban area along the coastline, with a population of over 11 million living in under seismic zone III conditions.
- ✓ This area has been hit by earthquakes throughout history, one of the worst occurring in 1868, when a 9.0 M_w earthquake and tsunami claimed several thousand lives.

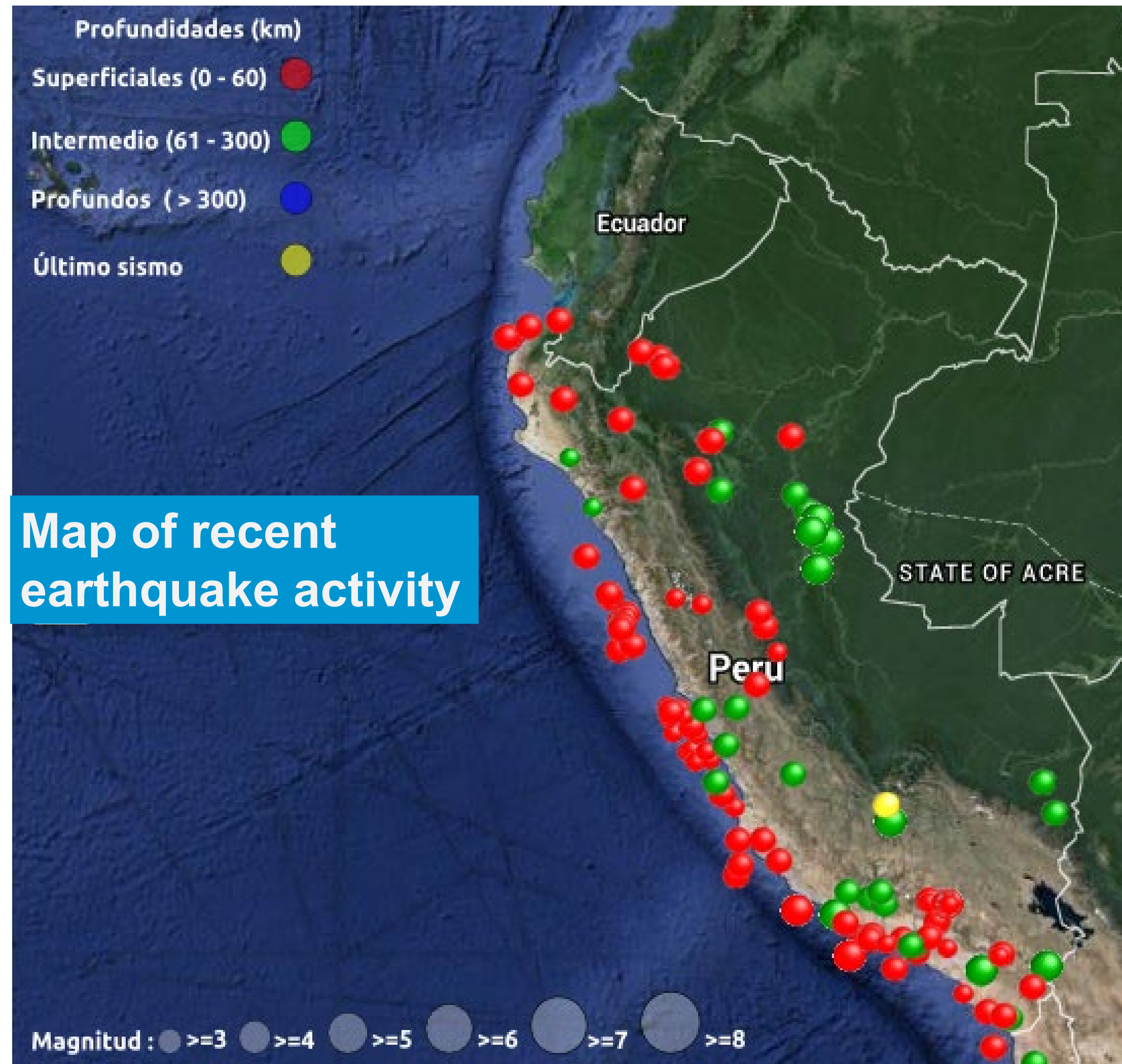


Introduction

- ✓ International airports are a critical part of a country's transportation infrastructure and are key to humanitarian relief operations in the aftermath of natural disasters.
- ✓ The design of the new LIM expansion has taken into account these lessons learned from the past, working together with the Government to ensure a safer Peru for all.



Recent Seismic Activity: Peru, Ecuador and Chile



Ecuador: 7.8 M_w ,
16 May 2016.
Manta ATC Tower



Santiago: 8.8 M_w ,
27 Feb 2010.
Airport pedestrian
bridge

2007 Pisco Earthquake

- ✓ The 2007 Pisco earthquake ($8.0 M_w$) devastated the city of Pisco, approximately 230 km to the south of Lima on the coast).
- ✓ The social and economic impact of the earthquake was significant—519 people died and more than 1,300 were injured.
- ✓ Tens of thousands of homes, churches, schools, and hospitals collapsed or were damaged.
- ✓ The estimated economic losses, including to lifeline infrastructure, were about US\$300 million.
- ✓ The hardest hit cities were Pisco, Chincha Alta, Cañete, and Ica.
- ✓ Even though many kilometers away from the epicenter, the earthquake damaged buildings in Lima, including the international airport, concessioned to Lima Airport Partners.

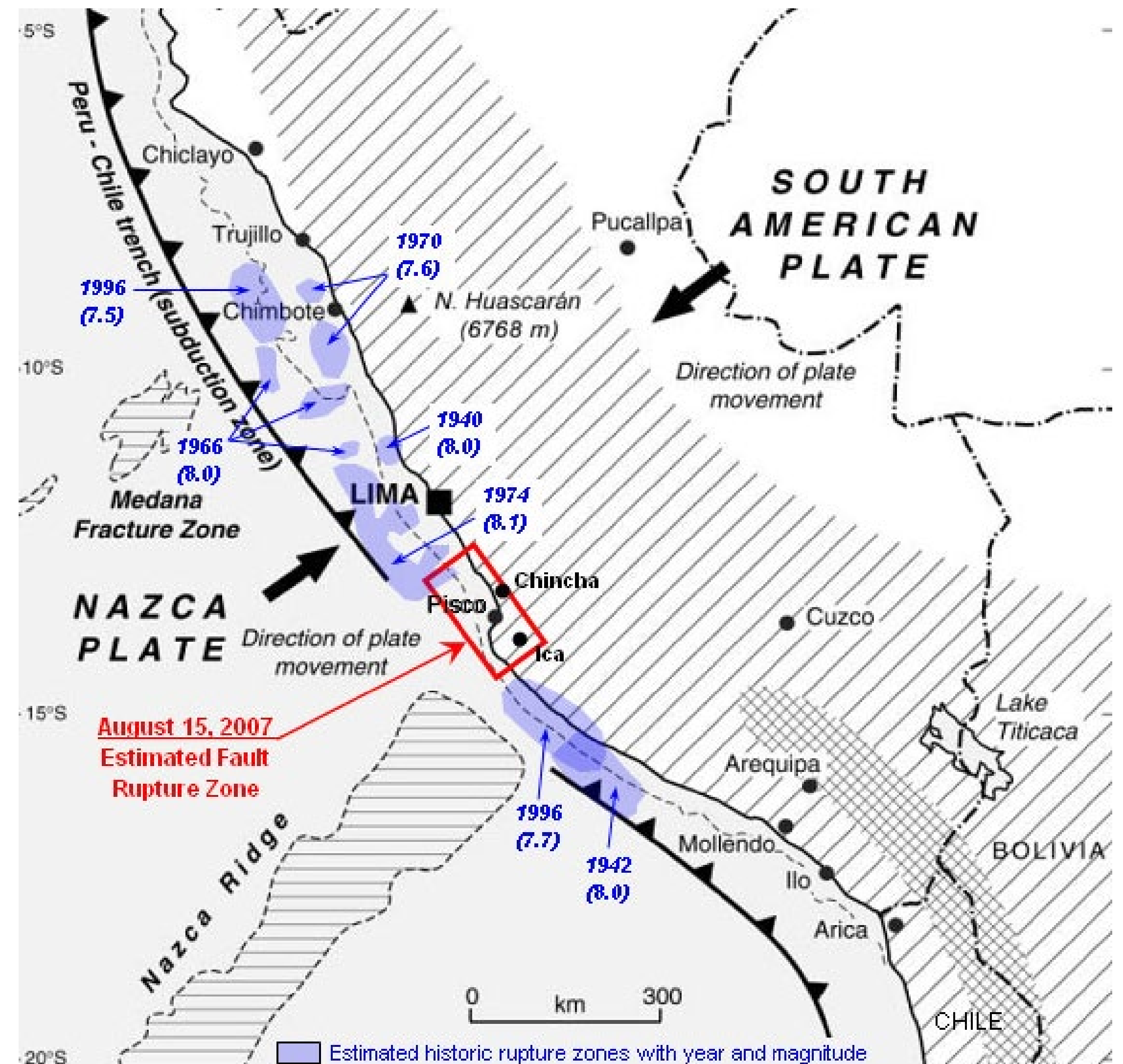


Figure: The tectonic setting of Peru and estimated fault rupture zones from August 2007 and historical earthquakes (modified from Degg and Chester [2004]⁴ with August 2007 rupture zone from Ji and Zeng [2007]⁵ and historical rupture zones from IGP [2007]⁶)

2007 Pisco Earthquake

- ✓ Violent shaking and swaying prompted the evacuation of the airport.
- ✓ The evacuation was very orderly, as a result of excellent planning and preparation for just such an event.
- ✓ Most of the damage was cosmetic, as the oldest structures at the airport had been recently reinforced.
- ✓ The airport was not closed, however flights were disrupted for several days.
- ✓ This picture and the next two were taken from the airport's CCTV.

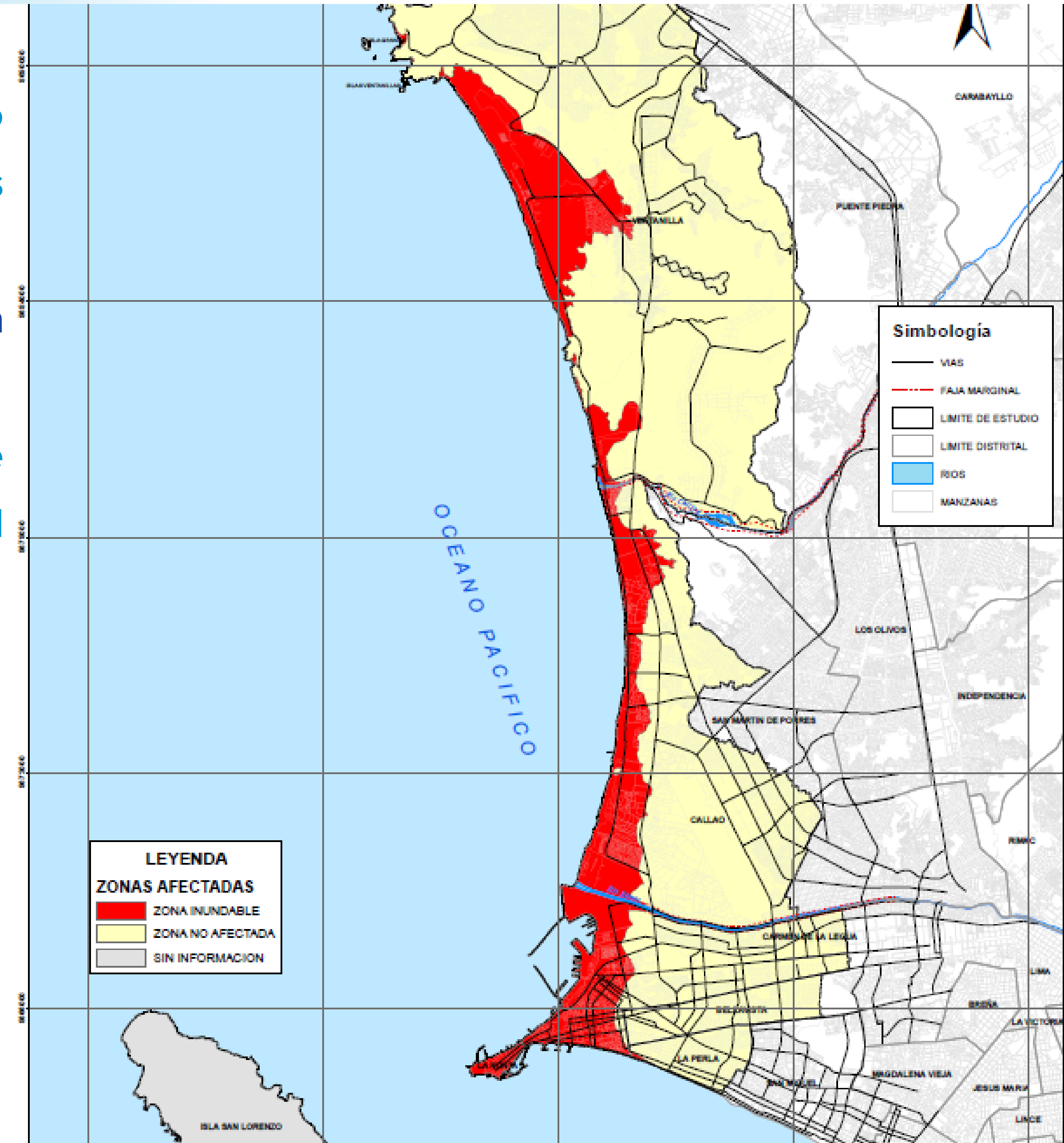






What if the epicenter had hit Lima-Callao?

- ✓ The airport is in Callao, directly to the north of the Rimac River.
- ✓ This area has a population of over one million and is home to Peru's principal seaport, international airport and some of its largest petroleum refineries.
- ✓ Rapid urban development has led to informal construction in many areas, which are particularly vulnerable to earthquakes.
- ✓ In the event of a tsunami, probabilistic models show that the waters will reach the site of the new second runway and could trap fleeing residents against the perimeter fence.



New Jorge Chavez International Airport



Seismic Design

- ✓ Over 1,000 seismic isolators in the new terminal building.
- ✓ Effectively isolate the ground movement of an earthquake of up to 9.0 M_w .
- ✓ Absorbing the shaking and lateral movement so that the above ground floors of the building are not damaged.
- ✓ Secondary supports for large equipment also have an enhanced seismic design to avoid displacement and damage due to heavy falling objects.



Evacuation Route

- ✓ Use in the event of a **tsunami warning** was provided to the community located between the expanded airside and the sea.
- ✓ Seismic alarms installed at strategic airside points.
- ✓ Emergency exercises have been completed with members of the community and staff of Lima Airport Partners, to enhance awareness of the actions to take in case of a tsunami.



Airfield Drainage

- ✓ Lima is a desert and annual precipitation is negligible. However, the second runway could be flooded in the event of a tsunami, according to probabilistic models.
- ✓ The airfield has a drainage system specifically designed to rapidly drain a tsunami flooding at 700lts per second flow, allowing the runways to be put back into use in a matter of hours.



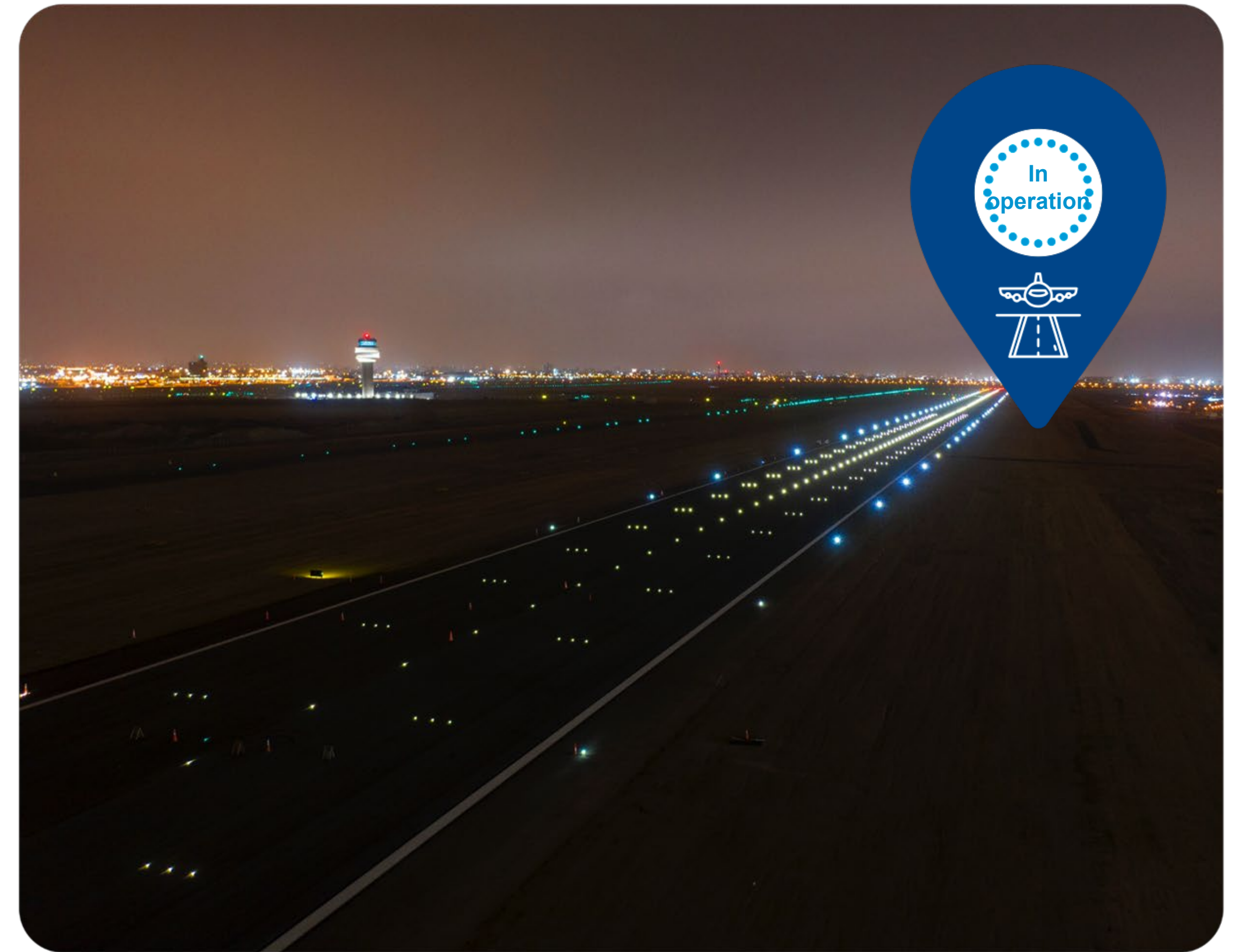
ATC Tower

- ✓ The 65m-tall ATC Tower is built on 33 friction piles, each 30 meters in depth. This will provide stability even during major earthquakes.
- ✓ The Tower has redundant systems and an autonomous fuel and water supply, to allow for continuity of operations in these situations.



Runways

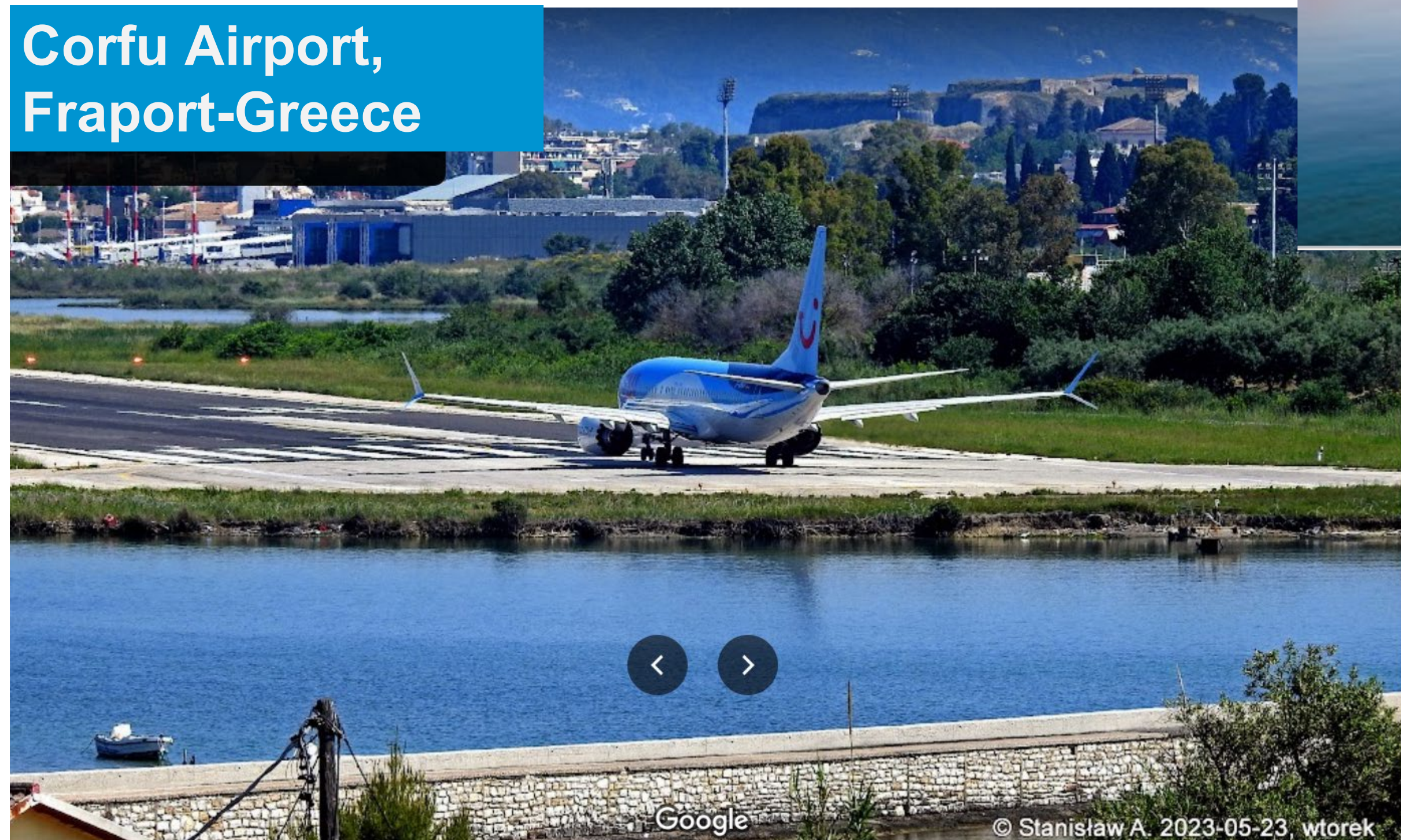
- ✓ LAP has recently commissioned a second, fully independent runway for the Lima Airport.
- ✓ This dramatically increases capacity so that humanitarian relief supplies can flow unimpeded after an earthquake to quickly reach distress areas.
- ✓ The airport also now has ample areas for the marshalling of relief flights and distribution of supplies to ground based transportation, as well as to and from the nearby port.



How about earthquakes AND high water...

- ✓ The Aegean and Ionian islands of Greece lie in one of the world's most active seismic regions.
- ✓ Fraport operates the 14 regional airports of Greece, on island locations such as Santorini, Mykonos, Crete, Rhodes and Corfu, among others.

Corfu Airport,
Fraport-Greece



Corfu Airport,
Fraport-Greece



- ✓ Several of the concessioned airports are located in low lying areas next to the sea, vulnerable to storm surge, sea level rise and runoff from neighboring highlands.

Some areas of CFU lie just 1m above sea level

- ✓ High water can easily render the runway inoperative.
- ✓ A more resilient airport is critical for this island community.

This is the usual water line



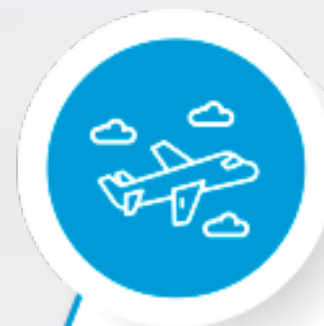
The new CFU runway will be elevated and more resilient

Through European Union funding, the runway will be raised, refurbished, recrowned and outfitted with a robust drainage system.

Many other improvements are under implementation to meet ICAO standards.

The new runway will be more resilient and ready to support humanitarian relief efforts in the event of an major earthquake on the island.





¡Thank You!

