

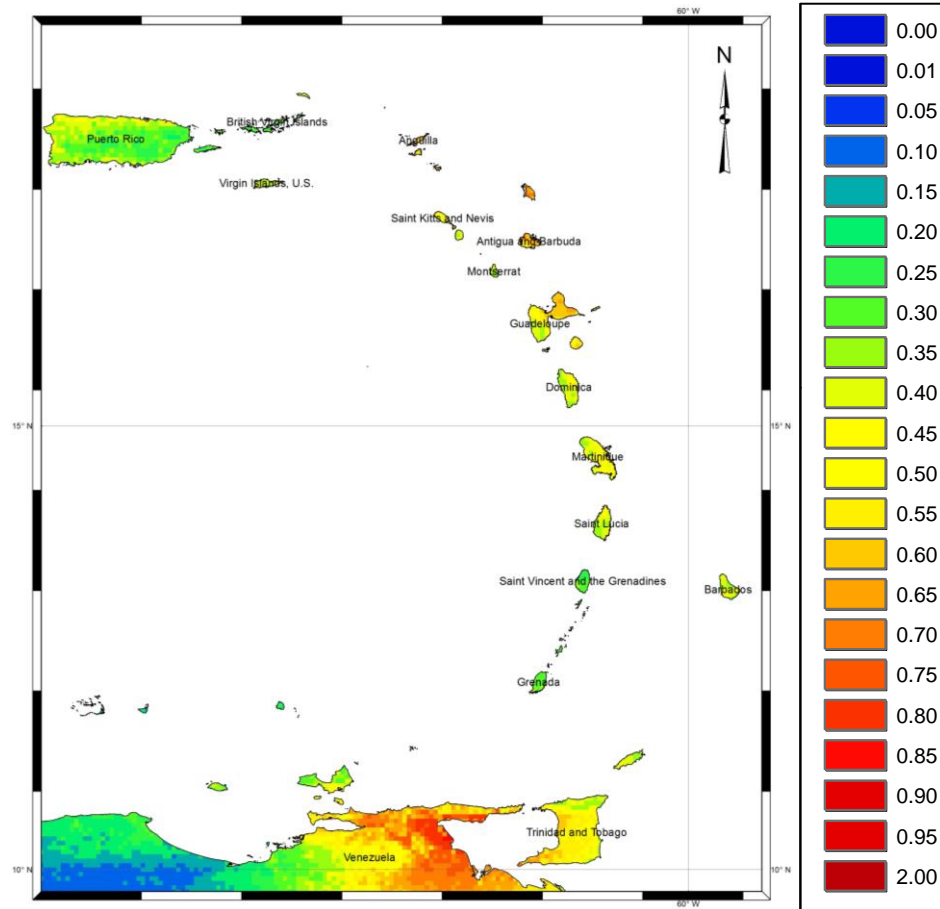
Introduction

- Caribbean and Central America TC and EQ model (SPHERA - System for Probabilistic Hazard Evaluation and Risk Assessment):
 - To be used by country-level institutions, e.g. governments
 - Provides payouts around two weeks after the event
 - Based on a physically-based hazard models
 - Extensive and detailed asset exposure database (including buildings, infrastructure and crops)
 - Calibrated against reported losses of historical tropical cyclone and earthquake events

- Summary
 - Classic PSHA approach to estimate long-term relations between **ground motion intensities** and **exceedance rates**
 - Seismic **zonation** and representation of the sources using different geometric models
 - **Review, homogenization** and **declustering** of the historical seismicity
 - Seismicity parameters estimated using Poissonian models
 - Selection and combination of **ground motion prediction equations** by tectonic environment
 - Generation of a **stochastic event-set** statistically consistent with the historical seismicity in the region
 - A recent update of the PSHA was carried out for Jamaica, Haiti and Cayman Islands to **explicitly account for fault data**

EQ hazard

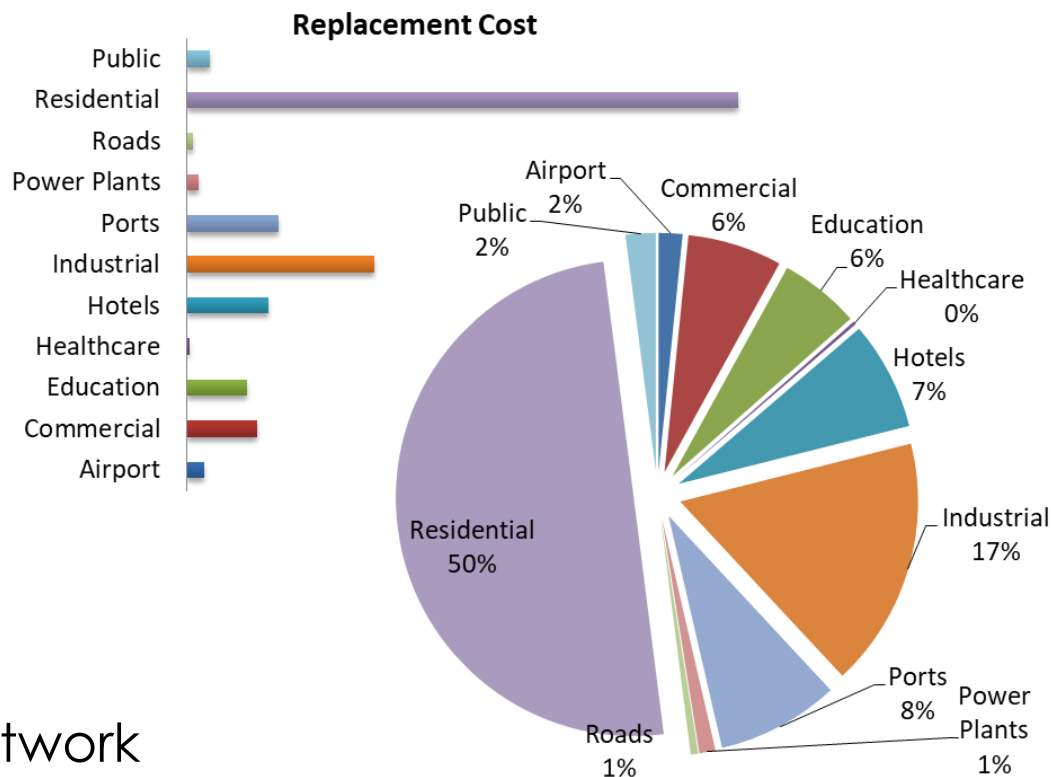
- Final hazard model (pga – 475 years on soil – g)



SPHERA exposure

- Categories included:
 - Residential buildings
 - Commercial buildings
 - Public Buildings
 - Industrial facilities
 - Hotels and restaurants
 - Healthcare infrastructure
 - Energy Facilities
 - Education infrastructure
 - Airports and ports
 - Transportation (roads) network
 - Crops

Example: St Kitts and Nevis



EQ vulnerability

Four classes to consider the relative vulnerability level

Vulnerability Code	Description
VG1	High building stock quality
VG2	Average building stock quality
VG3	Low building stock quality
VG4	Poor building stock quality

Vulnerability classes - examples



Anguilla buildings (VG1 – Good quality) examples



Haiti buildings (VG4 – Poor quality) examples

Real-time operation (EQ)

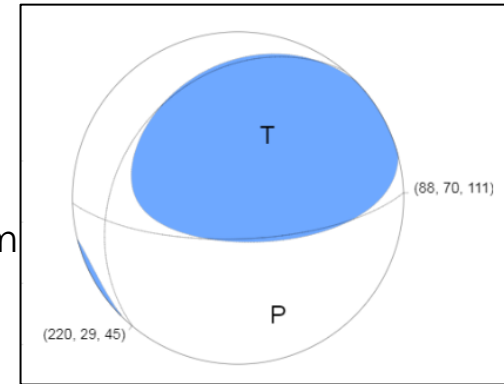
Post-event (or quasi real-time) operational workflow

1 - USGS reports an EQ

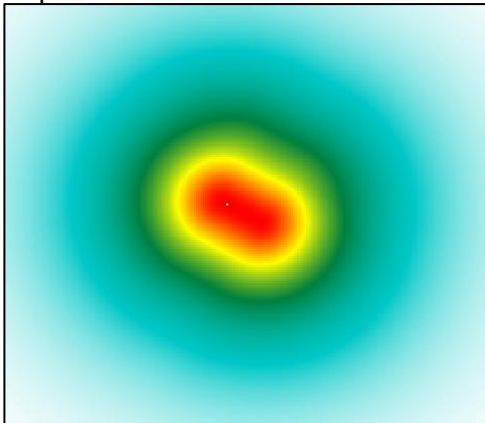


2 - USGS reports magnitude, depth and moment tensor solution

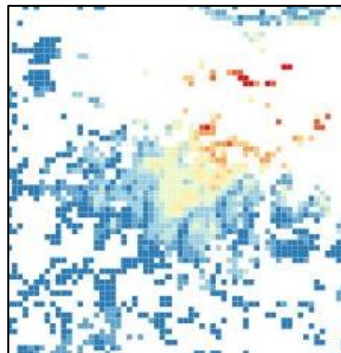
M=7.3
10.773° N
62.902° W
Depth=146.8km



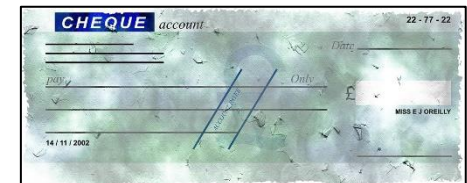
3 - CCRIF's calculation agent runs SPHERA using the USGS parameters as input



4 - SPHERA produces estimates of ground motion intensities and economic losses



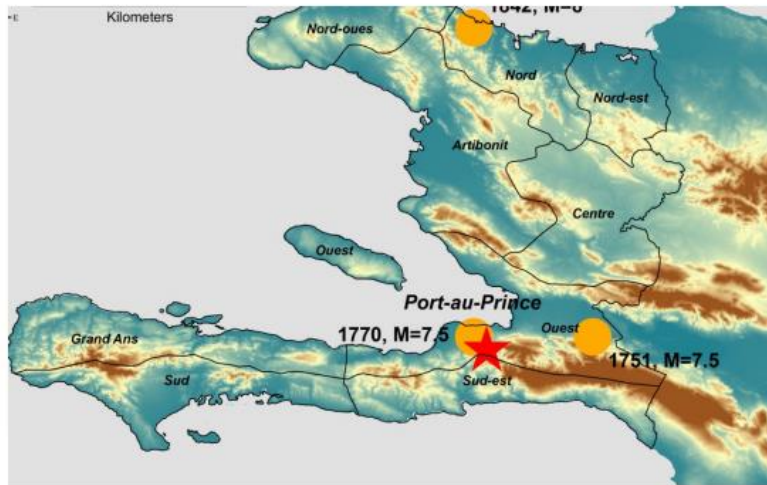
5 - Given the country's policy parameters, if the losses are above the attachment point, a payout is computed



The case of Haiti (EQ)

The Haiti Earthquakes of 2010 and 2021

A large earthquake struck close to the capital city of Port-au-Prince, Haiti late in the afternoon of January 12, 2010. The United States Geological Survey (USGS) estimated that the quake was a magnitude 7.0 event at a depth of 10 km just 15 km southwest of Port-au-Prince.



The red star shows the epicentre of the 2010 earthquake, which was 15 km southwest of Port-au-Prince. Note the two orange spots nearby that show the epicentres of two previous earthquakes in 1751 and 1770 with magnitudes close to 7.0.

The earthquake shaking was felt strongly in the Dominican Republic, Cuba, and Jamaica, although little to no damage happened outside of Haiti. The earthquake occurred along the Enriquillo Fault, which runs east-west along Haiti's southwest peninsula. Although smaller earthquakes are relatively common in Haiti, the last major earthquake to affect the country previously was in 1842 (devastating Cap Haïtien in the north).



Devastation caused by the 2010 Haiti Earthquake

On August 14th, 2021, another devastating earthquake of magnitude 7.2 struck Haiti, significantly impacting the city of Les Cayes. This earthquake was centred near Petit Troup de Nippes, approximately 78 miles to the west of Port-au-Prince and released approximately twice as much energy as the 7.0 earthquake that affected the country in 2010. Both quakes occurred on the same fault line, but the 2010 earthquake occurred nearer to the capital.

The case of Haiti (EQ)

CCRIF Parametric Insurance Coverage for Earthquakes

Following both earthquakes, CCRIF made payouts to the Government of Haiti as follows:

- US\$40 million following the 2021 event.
- US\$7.8 million following the 2010 event.

Following the 2010 earthquake, the Government of Haiti began to increase its parametric insurance coverage for earthquakes, recognizing not only the country's vulnerability but also the need for quick liquidity following an earthquake. Haiti's cumulative increase in earthquake parametric insurance coverage has been about 400 per cent since 2010. This increased coverage has been made possible through premium support provided initially by the Government of Canada and subsequently by the Caribbean Development Bank, which pays Haiti's insurance premiums for earthquakes, tropical cyclones, and excess rainfall either fully or in part.

At the local level, CCRIF supports several civil society organizations (non-governmental organizations and community-based organizations) in Haiti as they work in their communities to build forward stronger – to reduce vulnerability and build resilience within local communities. CCRIF has provided more than 14 grants under its Small Grants Programme totalling over US\$400,000 to these organizations in Haiti to implement projects in disaster risk reduction, climate change adaptation and environmental sustainability.