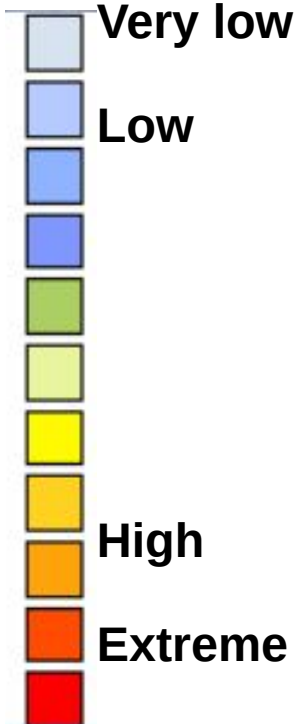
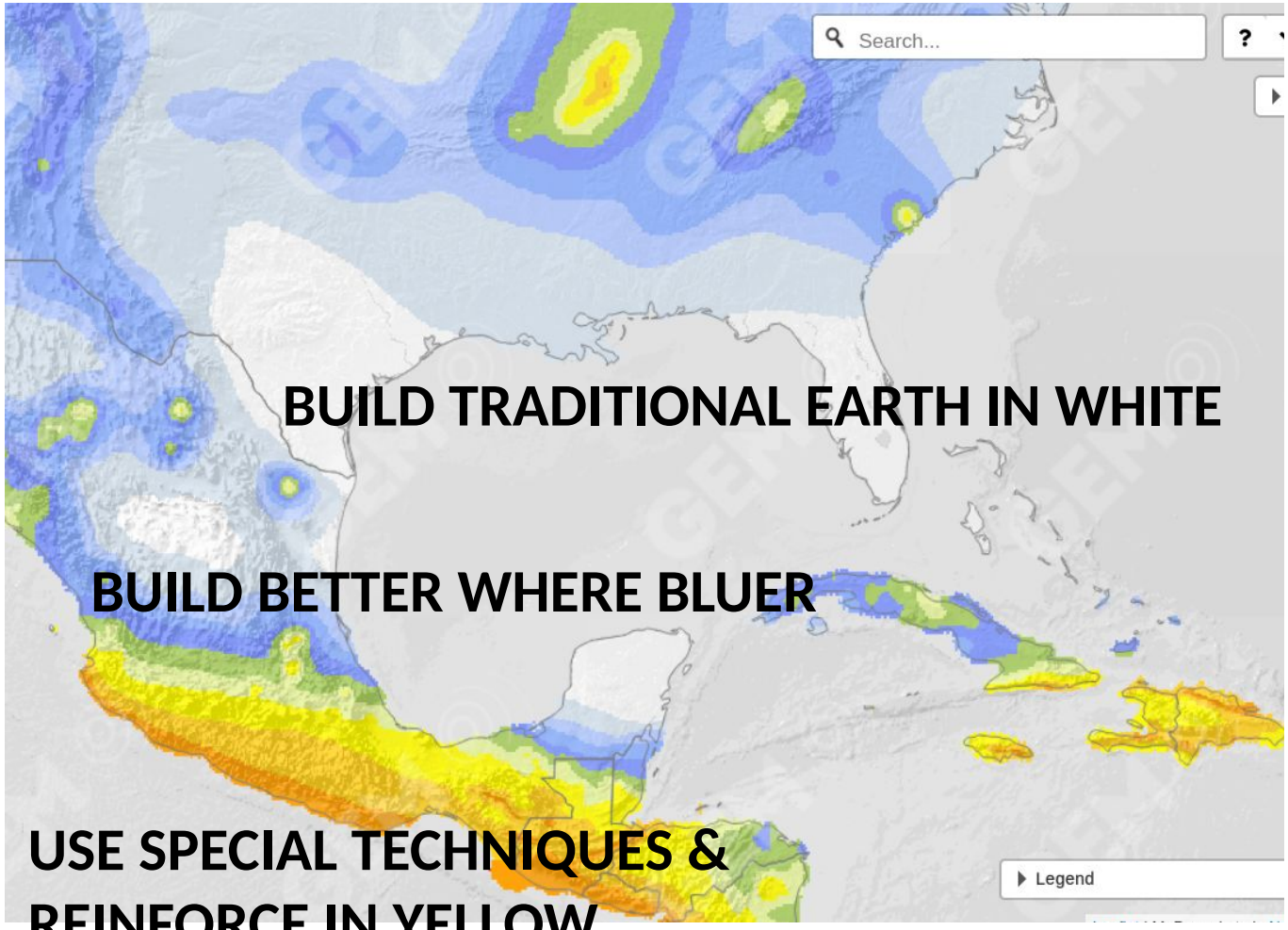
1- Use the GEM/ Global Earthquake hazard Map https://maps.openquake.org/map/global-seismic-hazard-map/

Risk Level:





2- Earthen buildings should be safe for the local level of risk:

https://maps.openquake.org/map/global-seismic-hazard-map/

Low seismic risk- traditional earthen buildings often safe

Improved earthen walls needed

Check plans: prove buildings strong enough (US code)

Guideline 4299 in New Zealand: how-to for unreinforced adobe on RC foundation

Guideline 4299 in NZ: how-to for reinforced adobe/ rammed earth without engineering

Have engineer design for your site, soil and building plan

Use more improvements as risk increases:

Strong building soil

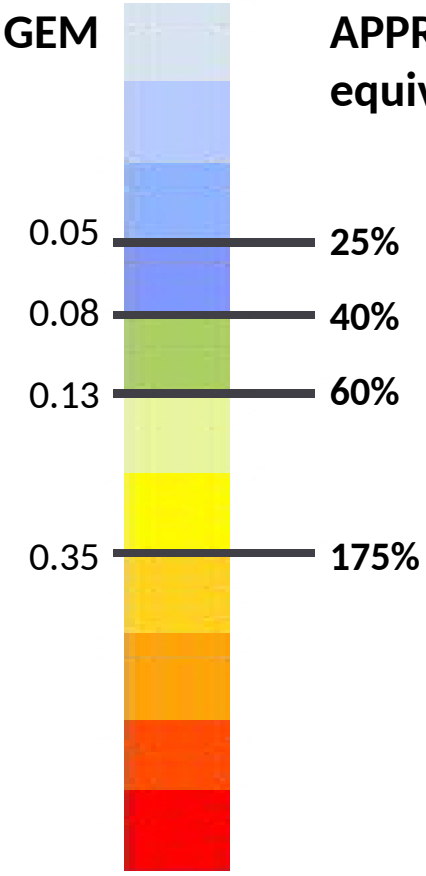
Enough bracing walls

Stronger bond beam

Meshed plaster

Better foundation with interconnected steel reinforcement

3- GEM/ Global Earthquake hazard Map estimates quake horizontal ground motion speed "Peak Ground Acceleration"/ PGA



Note: 1 g is equal to the force of gravity

4- Information needed to design safe earthen buildings

Check Peak Ground Acceleration (PGA) for your area first. Metric and Standard units sound different, but although governments choose which system of units to use, they have equivalents.

Engineers use PGA, the type of subsoil, and more to estimate forces on buildings, called SA or spectral acceleration. For low-rise earthen buildings use the 0.2 second SA (called Ss). Local governments, universities or engineers may have accurate Ss values for your area or site. Ask if there are government requirements for how well a building must resist what strength of quake.

Pin a location on the GEM online viewer map at https://maps.openquake.org/map/global-seismic-hazard-map/ for PGA data. BSI's black and white maps based on older data have Ss values and can be downloaded for free at: https://buildsimple.org/bsi-risk-map/

Guidelines developed in New Zealand for engineered (NZS 4297) and non-engineered (NZS 4298, 4299) earthen buildings provide a lot of details and allow designers to check that plans have enough bracing walls. BuildSimple is working to assemble test results that compare conventional earthbag and improved contained earth (CE) earthbag to the walls used in NZS 4299. The latest version of the NZ standards are updated for CEB. Other research has checked performance of materials like cob.