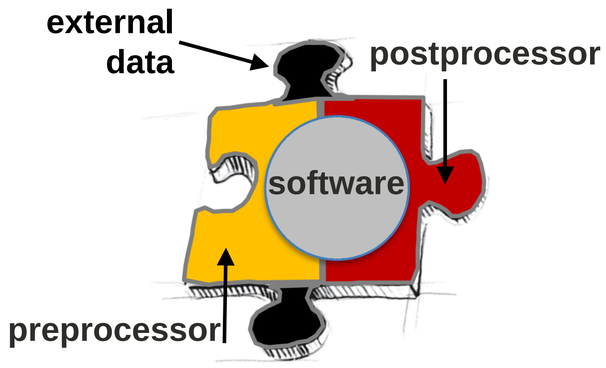
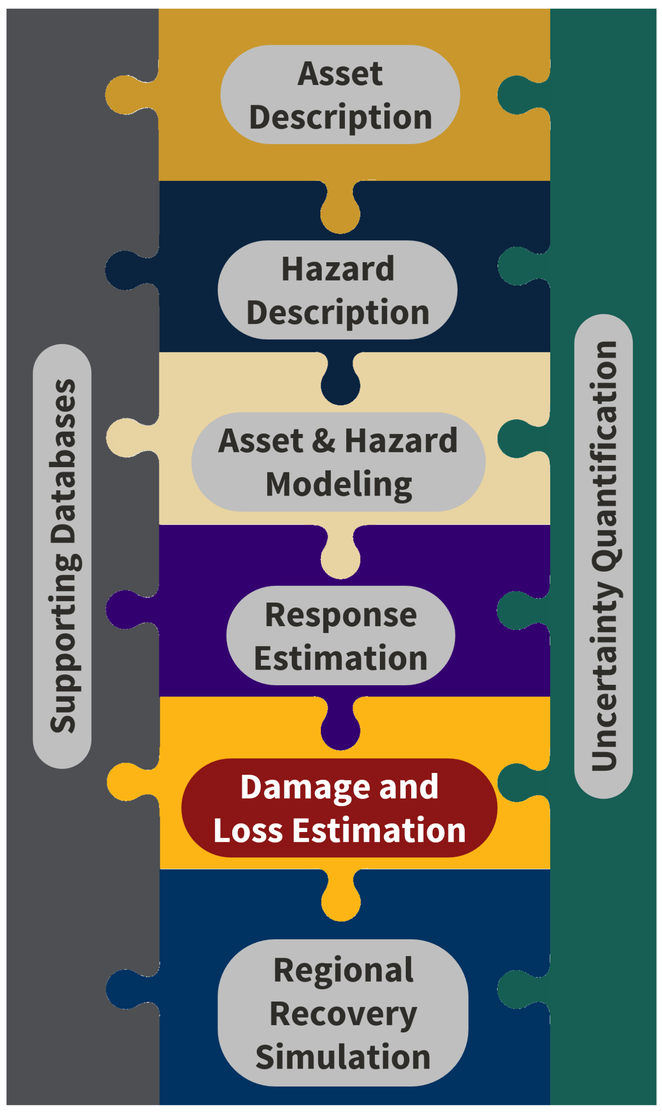
NHERI SimCenter
REGIONAL HAZARD WORKFLOW

Application Framework and Flexible Workflows



We use our Application Framework (AF) to assemble a **hazard-agnostic regional workflow** and streamline regional risk assessment. State-of-the-art software is available for each task allowing researchers to tailor the assessments to their needs. **New software can be added** simply by preparing pre- and post- processors that embed it in the AF. These workflows can run at DesignSafe-CI and use HPC resources at TACC.



describe the region
specify characteristics of buildings and infrastructure in the region

describe the hazard
specify the regional distribution of ground shaking, wind, or water

for each random region-hazard sample:
propagate uncertain characteristics of the regional assets and the hazard

for each asset in the region:

describe the asset
create stochastic models for response, damage, and loss estimation

describe the event at the site
specify hazard-consistent loads for response estimation

for each random asset-event sample:
propagate uncertainties in asset models and event description

estimate asset response to the event
describe the response with engineering demand parameters

estimate asset damage and its consequences
prepare a stochastic description of damage and loss for the asset

describe regional damage and direct losses
aggregate damages and losses in the region considering dependencies

estimate indirect regional consequences
describe regional consequences of infrastructure- and social disruption

simulate regional recovery
estimate the temporal and spatial variation in the recovery of communities

Research Tools

EE-UQ

uq-FEM

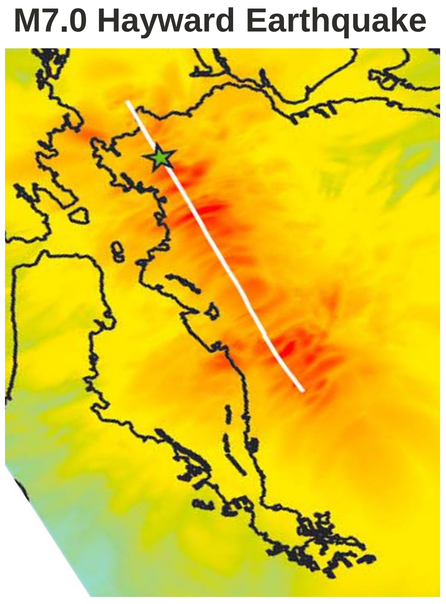
PBE

DESIGN SAFE-CI

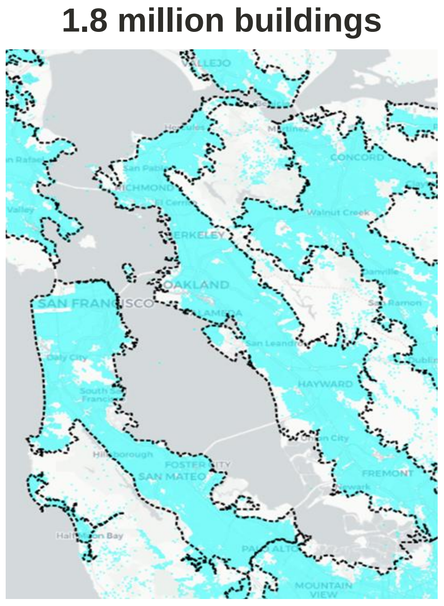
TACC
TEXAS ADVANCED COMPUTING CENTER

Regional Testbed: Seismic Risk in the SF Bay Area

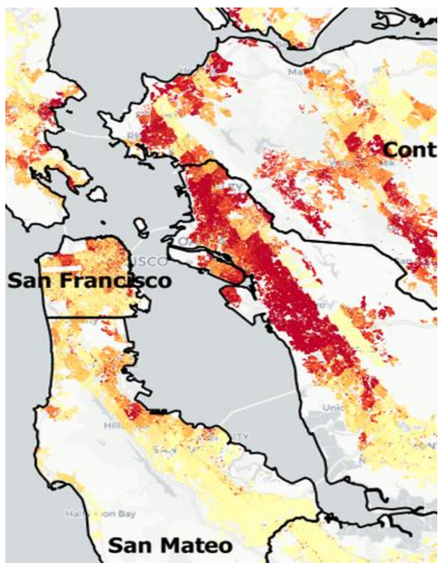
HAZARD [1]
M7.0 Hayward Earthquake



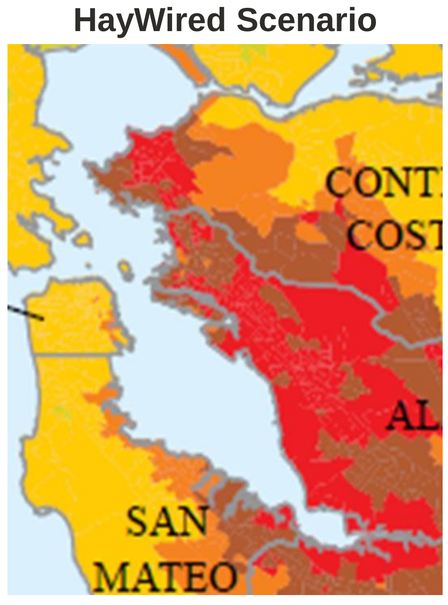
EXPOSURE [2]
1.8 million buildings



RISK [3]
FEMA P-58 loss assessment

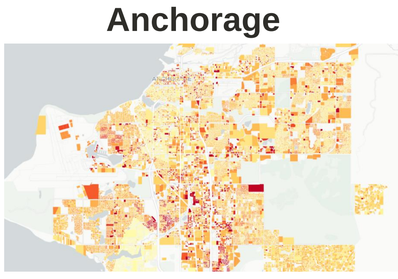


VERIFICATION [4]
HayWired Scenario

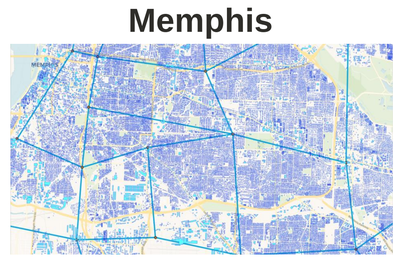


+ others in preparation

Anchorage



Memphis



[1] Rodgers, A.J., Pitarka, A., Petersson, N.A., Sjögreen, B., McCallen, D.B., (2018), Broadband (0–4 Hz) ground motions for a magnitude 7.0 Hayward fault earthquake with three-dimensional structure and topography, *Geophysical Research Letters*, 45,

[2] Waddell P., (2002), UrbanSim: Modeling Urban Development for Land Use, Transportation and Environmental Planning, *Journal of the American Planning Association*, 68:3, pp. 297-314

[3] Zeng X., Lu X., Yang T.Y., Xu Z., (2016), Application of the FEMA-P58 methodology for regional earthquake loss prediction, *Natural Hazards*, 83:1, pp. 177-192

[4] Detweiler, S.T., Wein, A.M., eds., (2018), The HayWired earthquake scenario—Engineering implications, *U.S. Geological Survey Scientific Investiga-tions Report 2017–5013–I–Q*, 429 p.

NHERI

SimCenter
Center for Computational Modeling and Simulation

NSF
CMMI 1612843