

Radke - Topic 1:

Title:

Modeling the impact of climate change and extreme storm events at the nexus of the natural and built environments.

Abstract:

Global climate change will bring about sea-level rise (SLR), greater flooding and higher storm surges in coastal regions. Analyzing impacts of catastrophic environmental events is crucial to identifying vulnerabilities and facilitating sustainable infrastructure at the nexus of the natural and built environments. We model the risk of critical infrastructure failure due to impacts from sea-level rise and extreme storms in the San Francisco Bay and Sacramento - San Joaquin Delta (Bay-Delta) regions.

Using LiDAR data for California's Bay-Delta region, we build a data-rich surface model combining bathymetry, land surface elevations and significant surface feature elevations that influence water flows, such as building footprints, levees, roadways, etc. We add to this model historic tidal and river water surface elevation data, and simulate in a 3D hydrodynamic model hourly water surface elevations, over a 72 hour period during a 100-year storm event at projected future SLR (increments of 0, 0.5, 1.0, 1.41m).

Our methods and findings are timely and relevant to the planning for and retrofit of critical infrastructure systems in what can now be characterized as extreme landscapes. Our findings facilitate proactive designs that insure sustained infrastructure through better understanding of potential vulnerabilities posed by catastrophic environmental events.