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THE SAN FRANCISCO BAY REGIONAL · COASTAL HAZARDS ADAPTATION RESILIENCY GROUP

Steering Committee Meeting

May 18, 2015, 11:00am-1:00pm,
Federal Building 1301 Clay Street, Oakland, CA 5th Floor

Presentation: Howard Foster, Senior Research Associate, Center for Catastrophic Risk Management (CCRM)

Assessing the vulnerability of California's transmission pipeline infrastructure to future storm events: a project funded by the California Energy Commission to better understand the challenges of climate change for the future of California's energy infrastructure.

Study participants: John Radke, Greg Biging, Emery Roe, Martine Schmidt-Poolman, Howard Foster, Yang Ju, Will Fourt, William Maier, Wei Chen Hsu, Rosanna Neuhausler, Amna Alruheili, and Tessa Beach.

One of the greatest concerns related to global climate change is the potential for impacts to infrastructure from sea level rise (SLR) associated with extreme storm events. A critical infrastructure system particularly at risk is the natural gas and hazardous liquid transmission pipeline system, a complex of pipelines, storage facilities and control facilities, linked to the distribution infrastructure; much of the transmission infrastructure is located along the nation's coasts making it vulnerable to potential increased ocean flooding. To better understand the risks from climate change to the transmission infrastructure, it is necessary to map the spatial extent and depth of future storm inundation to understand where and under what conditions impacts are likely to occur. Such maps and the flood scenarios upon which they are based lead to questions of institutional and corporate risk assessment procedures and organizational preparedness.

For our California Energy Commission funded study, we integrate GIS and a hydrodynamic model, 3DI, to simulate inundation in California's San Francisco Bay and Sacramento-San Joaquin River Delta regions and assess the potential risk to gas and hazardous liquid pipeline infrastructure from SLR. We build a high resolution digital surface model (DSM) representing features which control the flow of water including buildings, trees, dikes, drainage facilities from Light Detection and Ranging (LiDAR) point cloud data. Using this surface, we employ the hydrodynamic model to simulate 15-minute interval water level data for a 72-hour, near 100-year, storm event, coupled with 0.5 meter, 1.0 meter, and 1.41 meter SLR, respectively. The output of each inundation scenario is a series of inundated-area grids with 1-hour interval time

steps which allow us to analyze both spatial inundation extent and water depth in every hour. We compare the simulated location and depth of inundation to existing gas pipeline infrastructure to characterize the risks from SLR. Our results demonstrate that under projected SLR greater than 1-meter there are major impacts to critical components of this infrastructure system. The results of this analysis provide regional governments and infrastructure managers with important spatial information to aid in SLR mitigation planning for their communities and natural gas pipeline systems. More broadly, this work provides a rich spatial database for better climate change and SLR planning, management, and governance across the region through spatial analysis of future impact and mitigation scenarios.

Presenter:

Howard Foster (h_foster@berkeley.edu), Howard Foster has developed architectures for describing, searching, manipulating, and visualizing geographic information for 20+ years. He developed geographic information systems for UC Berkeley's Geographic Information Science Center (GISC) and the UC Berkeley Computer Science Division's Digital Library Project, including the Calmap software for Web users to create and edit spatial data. At the Digital Library Project he collaborated with Microsoft Research in their development of the Terraserver, and developed software for the NOW [parallel-processing] Cluster for geodata processing. He developed ground water pollution potential models and databases for the California Regional Water Quality Control Board. His latest publication is the chapter, “Coping with Delta floods, sharing information in a regional flood management system”, in Water Sustainability Reader: Lessons from California for the 21st Century, Allison Lassiter editor, UC Press (in press).