COASTAL RESILIENCE CENTER
A U.S. Department of Homeland Security Center of Excellence

Coastal Hazards Analysis, Modeling, and Prediction System for Emergency Management and Response

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SHORT DESCRIPTION

The Year 7 project will deliver a real-time Rhode Island Coastal Hazards Analysis Modeling and Prediction system (www.RICHAMP.org) for hurricanes and nor'easters in Rhode Island (RI) that incorporates end-user concerns and can be used by emergency managers in an Emergency Operations Center (EOC) during a storm event. By the end of Year 7, the system will be ready for transition to operations.

ABSTRACT

Emergency managers need relevant, local-scale information about potential consequences of extreme events in advance of a storm's landfall. Our approach allows critical facility managers' expertise about impacts to be integrated in model outputs in the same way that "damage functions" are traditionally utilized to model potential structural or economic damages. By identifying wind/surge/wave/flooding thresholds for critical infrastructure failure, the identified concerns may be directly linked to the storm prediction models in near real-time or for planning purposes. The concerns collected directly from end-users of the model make outputs directly relevant to emergency managers as they allocate resources and anticipate the challenges of an imminent storm at the EOC. A video overview of the system may be watched HERE and the prototype dashboard can be viewed HERE.

In Year 1-6, in partnership with the Ginis project, we developed, tested, and refined a novel approach to collecting such storm consequence data (Witkop et al. 2019) and coupling it with ADCIRC high- resolution storm model outputs (Stempel et al. 2018). We piloted our approach in Westerly, RI (Witkop et al. 2019), where we collected 102 "conse-

quence thresholds" from 11 critical facilities. A "consequence threshold" includes six primary components, an asset, its location, the hazard of concern (flood, wind, or wave), a threshold for damage, consequences if the threshold is exceeded, and an estimated recovery period. We next expanded and refined our approach in RI's capital city (Providence) in close collaboration with a steering committee consisting of local, state, and federal level end users. The steering committee provided invaluable feedback throughout the project regarding data collection protocols, recommended facilities, and have helped with engaging and encouraging facility managers to participate. In Providence, our research team identified 306 "consequence thresholds" (for wind, surge, flooding) collected from managers of 45 critical infrastructure facilities located along the city's 500-year floodplain (Becker et al. In Review). Through several focus groups conducted in partnership with end-user agencies, including RI Emergency Management Agency (RIEMA), the RI Department of Health (RIDOH) and Providence Emergency Management Agency (PEMA), we vetted the methodology for collecting local and regional consequences of infrastructure damage, at the site-specific scale, and for integrating these data with the type of near real-time predictive storm models already in use at EOCs around the country (e.g., ArcGIS Enterprise and WebEOC). We then used the methodology developed during the steering committee focus groups to create semi-structured scripts and meeting agendas to follow during Consequence Thresholds Data Collection focus group meetings held with critical infrastructure facility managers.

In Year 6, we scaled data collection to two infrastructure systems statewide: Wastewater Treatment Facilities and Maritime Transportation Systems. We created a prototype real-time hazard and impact prediction online dashboard for major storm events in RI that can be used in EOCs (See prototype dashboard with selected examples at https://edc.maps.arcgis.com/apps/dashboards/df600b99bba34635b2b03b5e33d5ed8d). We also developed a web-based geospatial reporting tool using Survey123 (an ESRI web and mobile survey application), to collect "consequence threshold" data from statewide facility managers, along with training materials for accessing, using, and managing collected data with Survey123. Survey123 allows us to streamline data collection through real time geolocation and recording of assets through a user-friendly online survey form. Data collected through Survey123 is automatically uploaded to an online feature service used to create maps and dashboards.

In a significant Y6 development, we also formalized a partnership with RI Department of Transportation (RIDOT) to integrate our Rhode Island Coastal Hazards, Analysis, Modeling & Prediction (RI-CHAMP) system to be hosted and managed using the newly adopted State Enterprise GIS System, making the information more easily accessible to all state agency and municipal emergency managers. The system will be workshopped through a series of exercises with RIEMA in the summer of 2021,

as part of the Year 6 plan. Workshops will include introductions and explanations of the RI-CHAMP system followed by hands-on exercises with the RI-CHAMP dashboard using storm scenarios to replicate how it might be used in an EOC. The goal of the workshop is to train end-users on the tool as well as to receive feedback from end-users to ensure the tool meets their needs. The audience for the initial workshops is RIEMA and PEMA staff responsible for EOC operations, in addition to CI sector leads.

In order to prepare the RI-CHAMP system to be operationalized for the Statewide EOC at the end of Year 7, we propose to develop a plan and associated guidance to support institutionalization with RIEMA. In collaboration with the Ginis real time storm modeling effort, RI-CHAMP will be tested and vetted for real time readiness. Additional critical infrastructure sectors and data will be incorporated into the consequence threshold database. Templates for consequence prediction reports will be developed as for use by emergency managers, sector leads, and/or facility managers.
Improvements to the dashboard system will be made, based on end user feedback. These activities are outlined in Section 6 of this workplan.