

# **Extension and Improvements of the STORMTOOLS Design Elevation Maps and Coastal Environmental Risk Index (CERI) Toolbox**

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One of the challenges facing coastal zone managers and municipal planners is the development of an objective, quantitative assessment of the risk to structures, infrastructure, and public safety that coastal communities face from storm surge in the presence of changing climatic conditions, particularly sea level rise and coastal erosion. To address this need, STORMTOOLS Design Elevation (SDE) maps and Coastal Environmental Risk Index (CERI) were introduced in 2014-2016 and have been applied to all coastal waters in the state of RI. They are integrated into the RI Coastal Resources Management Council (RI CRMC) permitting system via the Coastal Hazard App and are available via a mobile phone app. To date CERI has principally been applied to estimate flood induced damage to residential and commercial structures using US Army Corp of Engineers damage curves. Extension of SDE to inland waters, considering enhanced precipitation due to climate change, is currently in progress. In recent senior design studies, it has been extended to explore damage to Wastewater Treatment Facilities (WWTF), Above ground Storage Tanks (AST), power stations, and marinas and to include wind damage for residential structures. The goals of this joint 2024-2025 Ocean and Civil and Environmental Engineering senior capstone design class are to: 1. Extend CERI to assess flood and wind damage to structures and infrastructure in other locations in New England (NE) to broaden its geographic reach, 2. Compare CERI predictions of wind and flooding damage to existing fragility/loss models and commercially available estimates for several representative residential structures (e.g. First Street Foundation and Fathom), 3. Demonstrate the ability of CERI to estimate damage from real time and forecasted storm events for NE, 4. Extend STORMTOOLS Design Elevation Maps (SDE) to address 500 yr flooding, with sea level rise (SLR), for Narragansett Bay using a high-resolution application of STWAVE to estimate the wave climate, 5. Evaluate the feasibility of using reinforced dunes to mitigate flooding and erosion at selected sites in Rhode Island, 6. Extend CERI to include compound and urban flooding and add ability to perform cost benefit analyses (CBA) for flooding and wind damage and related mitigation strategies for residential and commercial structures in RI.

### **Selected References**

STORMTOOLS: <https://stormtools-mainpage-crc-uri.hub.arcgis.com/>, CERI:

<https://coastal-environmental-risk-index-ceri-crc-uri.hub.arcgis.com/>

STORMTOOLS CERI App: [http://www.crmc.ri.gov/samp\\_beach/CERI\\_App\\_Instructions.pdf](http://www.crmc.ri.gov/samp_beach/CERI_App_Instructions.pdf)

RI CRMC Coastal Hazard App: [RI CRMC Coastal Hazard Analysis Worksheet](#)

STORMTOOLS SDE: <https://stormtools-design-elevation-sde-maps-crc-uri.hub.arcgis.com/>.

First Street Foundation: <https://www.firststreet.org/>

Fathom: <https://www.fathom.global/>

Access to prior senior coastal resilience capstone design class presentations in Ocean

Engineering <https://storymaps.arcgis.com/stories/03880b4e67c740bba740f29730c5dc4c>