CIRCA’s Research Support for Phase III Projects

Phase III of Resilient Connecticut will develop location-specific projects on Ansonia, Branford, Danbury, Fair Haven, Fairfield, South Norwalk and Stratford. Consultant teams are developing scientifically informed adaptation strategies and scoping the engineering and infrastructure components to 30% conceptual design for the seven projects below. For each project, feasibility and implementation strategies will be evaluated, including historical and environmental permitting considerations, as well as cost estimates, funding pathways, and coordination and alignment with Federal and State climate resilience programs. CIRCA supports the Phase III projects with nearshore modeling work, and field measurements.

Nearshore Flood Modeling

Flood hazard planning requires accurate estimations of total water elevation due to predicted tide, surge, and wave runup to design flood protection structures and improve coastal risk planning for severe storms. CIRCA has performed a set of high-resolution nearshore modeling studies to assess and estimate flood risk in Branford, Norwalk, Fair Haven, and Fairfield, under historical and future scenarios.

Model Highlights

- The Long Island Sound model estimates the return intervals of the wave and surge water levels by simulating 22 historical severe storm events and performing extraneous analysis with these results. The nearshore model uses the boundary conditions from the Long Island Sound model. A total of 6 scenarios of current floods (10-, 50- and 100-year) and future floods (10-, 50- and 100-year +20 inches sea level rise) are considered.

FAIR HAVEN

- ADCIRC-SWAN model supported with RTK GPS measurements.
- All the flood scenarios include total flood depth which includes storm surge and waves considering mean high water level above ground level and NAVD88.

NORWALK

- FUNWAVE/TVD model supported with RTK GPS measurements.
- The elevations of unique install sites are not indicated in the DEM data and are surveyed onsite with RTK GPS.

BRANFORD

- ADCIRC-SWAN model supported with RTK GPS measurements.
- The elevations of unique install sites are not indicated in the DEM data and are surveyed onsite with RTK GPS.

FAIRFIELD

- ADCIRC-SWAN model supported with RTK GPS measurements.
- The elevations of unique install sites are not indicated in the DEM data and are surveyed onsite with RTK GPS.

Neighborhod Scale Heat Index Variability

Most of the temperature estimates are based on numerical weather predictions using ground radar, weather balloons, aircraft, satellites, and ocean buoys. These instruments are not installed to measure how environmental conditions relevant to human heat stress vary across and within urban neighborhoods or with equity in mind. CIRCA deployed heat sensors in various locations in towns to map and identify vulnerable areas to heat and identify the contribution of the changes in heat to vulnerability.

Process

- CIRCA deploys the sensors on poles or trees and maintains the sensors. The sensors are deployed 8-10 ft above ground level.
- Collaboration between City and private partners to ensure permissions and appropriateness of sites.
- Mapped unique install sites based on surrounding landscape topography, social-economic factors, heat CCV and town interest.
- Why the urban heat island effect occurs.
- Continuous feedback about street-level climate on temperature, humidity and dew point temperature.
- Local Climate Zones
- Local Climate zones are classified using World Urban Database and Access Portal Tools, which is a machine learning approach that uses Google Earth Pro and SAGA GIS to develop LCZ classification based on aerial images (Google and LANDSAT 8).
- Socio-economic characteristics of the community are examined using social vulnerability index and Census Data.
- Climate Change Vulnerability Index is examined to determine most vulnerable locations.

There is a significant variation in the datasets for temperature and humidity within these locations that can reach the differences of 5-10 F. These differences should be considered when developing adaptation solutions to extreme heat.