

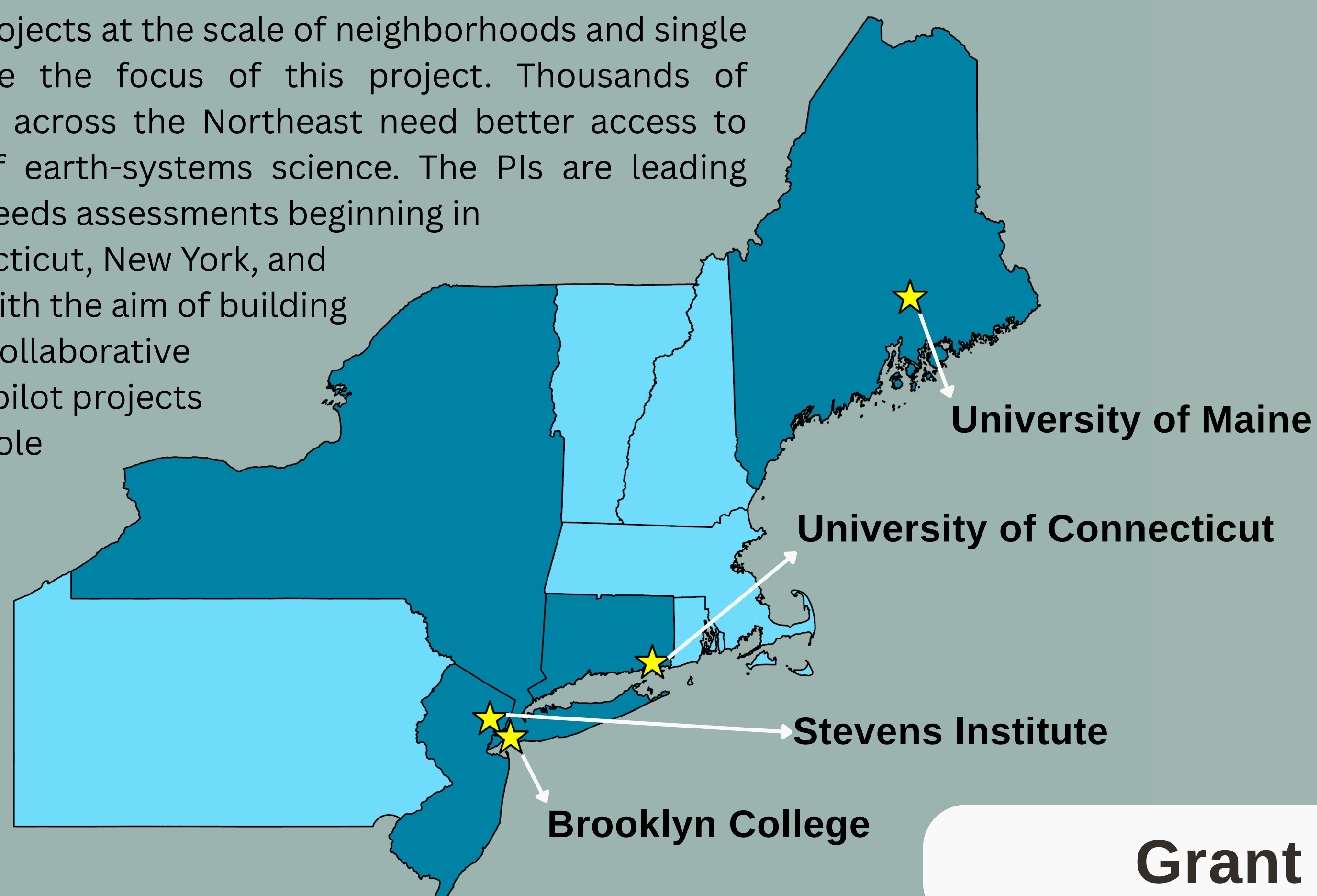
NSF R2I2: Identifying Community Need Based Adaptation and Resilience Priorities in the US Northeast

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Abstract

Rising sea levels, intensifying storms, and increasing flood risks are creating unprecedented challenges for coastal communities across the northeastern United States, where projected sea level rise is among the highest in the world, threatening millions of Americans and billions in infrastructure. Small municipalities and neighborhoods often lack the expertise and tools to translate cutting-edge Earth system science into practical protection strategies. This project will build a collaborative network of scientists, engineers, policy experts, and community leaders to accelerate the development and implementation of adaptation solutions at the scale where they matter most—individual properties and neighborhoods—aiming to reduce flood risks that cause over \$32 billion in annual damages, protect vulnerable populations from extreme heat-related illness, and preserve coastal infrastructure supporting regional economies. Driven by community needs, the project establishes a regionally coordinated adaptation network spanning Connecticut, Maine, New York, and surrounding northeastern states, using a systematic 10-step coordination plan to engage academia, private sector, and government partners and promote knowledge sharing between Technical and Policy (TAP) and Municipal, Agency, and Private sector (MAP) teams.

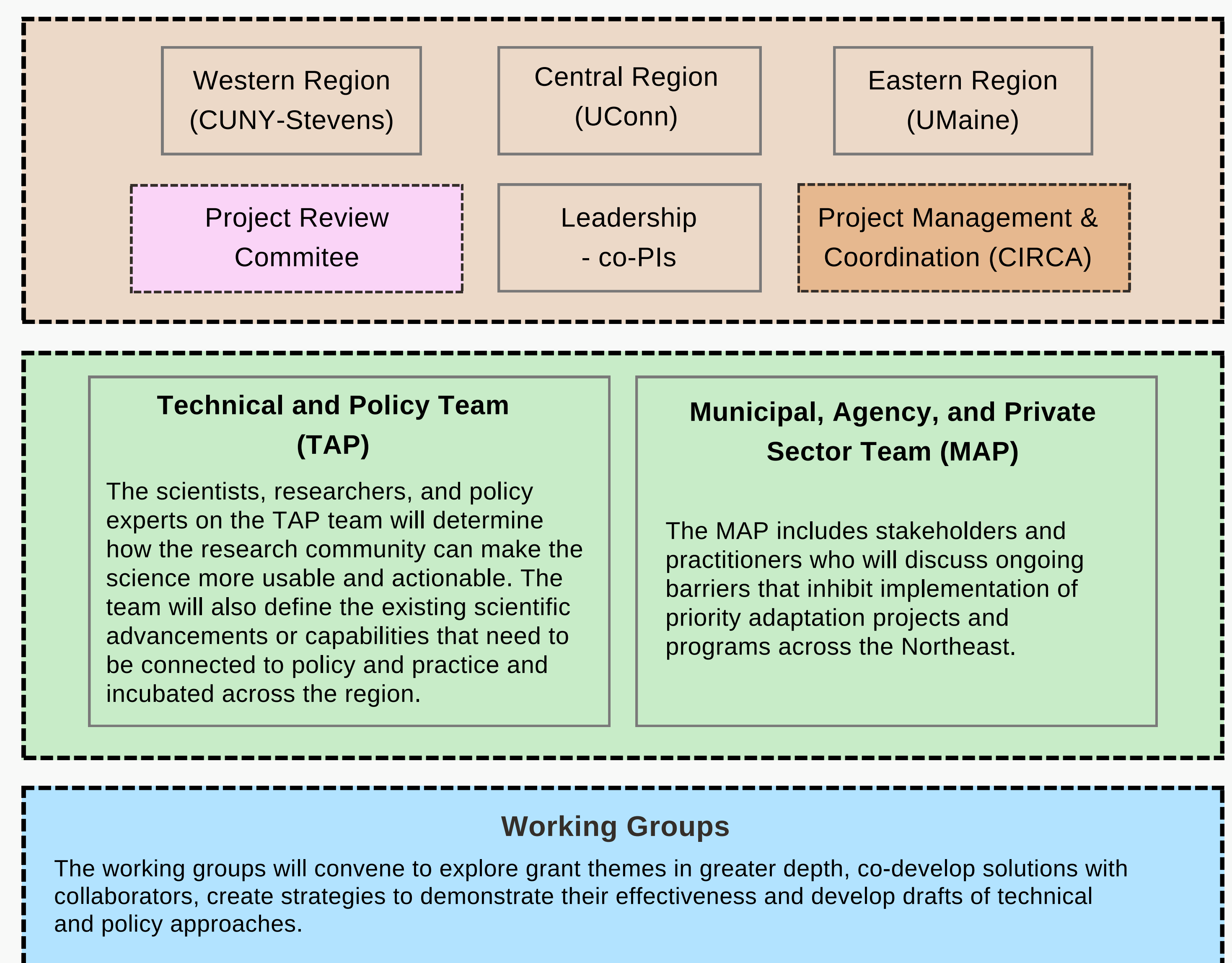
Adaptation projects at the scale of neighborhoods and single properties are the focus of this project. Thousands of municipalities across the Northeast need better access to the results of earth-systems science. The PIs are leading stakeholder needs assessments beginning in Maine, Connecticut, New York, and New Jersey, with the aim of building a network of collaborative research and pilot projects across the whole Northeast.



Grant Objectives

- Create a prioritized list of climate challenges facing Northeast municipalities.
- Develop a strategy to demonstrate the effectiveness of resilience solutions.
- Assess regional needs for education and workforce training.
- Develop a plan to sustain the collaboration and meet regional adaptation needs.
- Develop a final report with recommendations for Phase II of R2I2.

Organizational Structure



Grant Themes

Green/Hybrid Coastal Erosion Protection Design & Permitting: Develop design guidelines and performance assessments for living shorelines and hybrid systems through lab and field testing, modeling, demonstration sites, sensor deployment, and ongoing monitoring.

Localized Heat Risk Assessment & Adaptation: Create hyper-local mapping of temperature, humidity, and vulnerability using dense sensor networks, linked to built environment and socio-economic data.

Tools for Flood Adaptation Strategy Evaluation: Design simplified workflows and model templates to help small firms evaluate adaptation strategies.

Compound Flooding Risk: Assess combined rainfall, surge, river, and tidal flooding using integrated models and sensor data.

Regulatory Innovation Adoption Protocol: Develop a multi-state playbook through legal pathways analysis, identifying policy entry points and scaling strategies.

High-Resolution Wind Risk Assessment: Model building and grid wind hazards using hybrid ML and mechanistic methods with high-resolution atmospheric simulations.

High-Resolution Precipitation Risk: Improve downscaled precipitation projections, integrating with WRF and flood modeling.

Precise Coastal Wave Predictions: Improve wave prediction accuracy using WRF, WaveWatch III and CMS-WAVE, and sensor campaigns with buoys, nearshore arrays, and drones.

ML-Enabled Hyper-Local Short-Term Flood Alerts: Use sensors and machine learning for real-time flood alerts by integrating models with meteorological, tide, rainfall, and water-level data.

Flood Adaptation & High-Resolution Flood Modeling: Develop ~2 m flood models incorporating SLR, rainfall, drainage, and subsidence, with demonstration sites, sensor deployment, and workforce training.

