Carnegie Mellon University
HeinzCollege
INFORMATION SYSTEMS • PUBLIC POLICY • MANAGEMENT

Capstone Project Proposal Template

Title of the Project:
Immediate Tsunami and Storm Surge Population Impact Modeling

Timing:
Spring 2026

Partner Name:
American Red Cross – National Headquarters

The American Red Cross is a non-profit organization with a congressional charter to provide disaster relief within the United States. Along with the U.S. FEMA, the American Red Cross is the Primary Agency under the United States National Response Plan Emergency Support Function (ESF) #6 – Mass Care, Emergency Assistance, Temporary Housing, and Human Services. Altogether, the American Red Cross has around 35,000 employees and over 265,000 volunteers.

Problem Statement:
To provide mass care services efficiently and effectively, the Red Cross needs a means of determining a rapid estimate of impacts to the population of a disaster for use in the planning process. Ideally, this model would use demographic, historical impact, and immediately available physical impact data to provide an initial estimate of population impacts that would be used to initiate Red Cross and partner agency disaster response.

Goals:
The goal of this project is to develop a comprehensive and robust predictive model that integrates historical data, demographic data, and information about the disaster event that is available in the initial hours of a disaster. This predictive model must be able to be integrated into existing Red Cross disaster response workflows that are used to initiate mobilization of resources for the disaster response operation.

Expected Deliverable:
The expected deliverable would be (1) a predictive model for population/shelter impacts from a tsunami or storm surge event in a defined area. This model would need to be run by Red Cross staff with limited technical skills. (2) The model output needs to be integrated into existing Excel based workflows of models of a similar purpose for other types of disasters. (3) The model needs to be accompanied by a documented process that works with existing disaster impact modeling data sources such as HURREVAC and U.S. Tsunami warning systems by the U.S. NOAA/National Weather Service to generate the inputs to the model and an output in a format usable by existing Red Cross tools and processes.

Data:
The American Red Cross has access to historical data on the impacts of tsunamis and storm surges on residential housing (damage assessment). Historical tsunami impact data (population impacted) is available

through the Tsunami Warning System. Additionally, storm surge data can be accessed via HURREVAC, which provides comprehensive information on hurricane evacuation and storm surge impacts. U.S. Census data is also available at the Census block or tract level depending on the specific data element.

Confidential Information:
Is any confidential information expected to be necessary to perform this course project? **No**

All historical event data has been aggregated.
Analysis:
We anticipate that GIS analysis will be required to process event data, and predictive models will be used to combine historical impact data with immediate physical impact information available.

Skills Required:
We believe that this project will require machine learning with PythonExcel skills, and ArcGIS skills. A grounding of U.S. geography and federal and state agencies involved in public safety and disaster response