

Community Supply Resiliency (COMSURE)

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End User Engagement

The project team has initiated end user interactions on several fronts:

Commercial Service Providers (requests for information on the impacts of Hurricane Matthew)

Grocery Chains – Food Lion, Lowes Food, Harris Teeter

Drug Chains – Walgreens, CVS, Rite Aid

Banks – Wells Fargo, Bank of America, Sun Trust

Convenience Stores – Circle K (Kangaroo Express)

North Carolina Emergency Management (requests for information on the impacts of Hurricane Matthew; possible demonstrations to potential users of the technology)

Cumberland County – Randy Beeman

Johnson County - Kim Robertson

Nash County – Brent Fisher

Pitt County - Allen Everette

Robeson County - Stephanie Chavis

Scotland County - Roylin Hammond

Wayne County - Mel Powers

End User Engagement

Model Development/Application

- ❖ Proposal submitted to the DHS Critical Infrastructure Resilience Institute, University of Illinois, Dr. Mark Petri, director, requesting funds to upgrade the MUNICIPAL database to include the HSIP Gold data set and conduct an assessment workshop in New Hanover County, NC. A second phase was proposed that would fully integrate the geospatial data management, disruption simulator, and restoration optimizer into a single, comprehensive tool.
- ❖ A draft Request for Input was developed to be submitted to education partners of the CRC to identify what capabilities and characteristics an educational version of MUNICIPAL for students in university-level EM programs should possess for user interactions, functionality, and display. This effort was coordinated with Tom Richardson and Robert Whalin of Jackson State University.
- ❖ Contact will be maintained with informational contacts for continued input and potential demonstrations of the model.
- ❖ The project team will continue to explore funding sources for model refinement and deployment as both a training tool for practitioners and an educational tool for students.

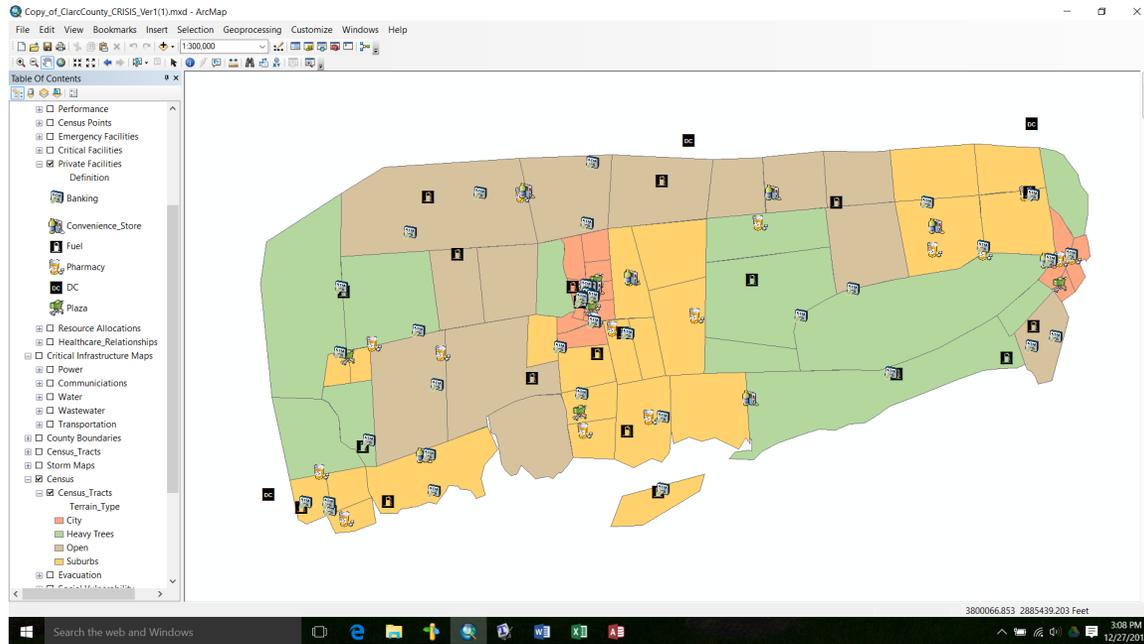
Research Work and Accomplishments

Activities, findings and outcomes to date

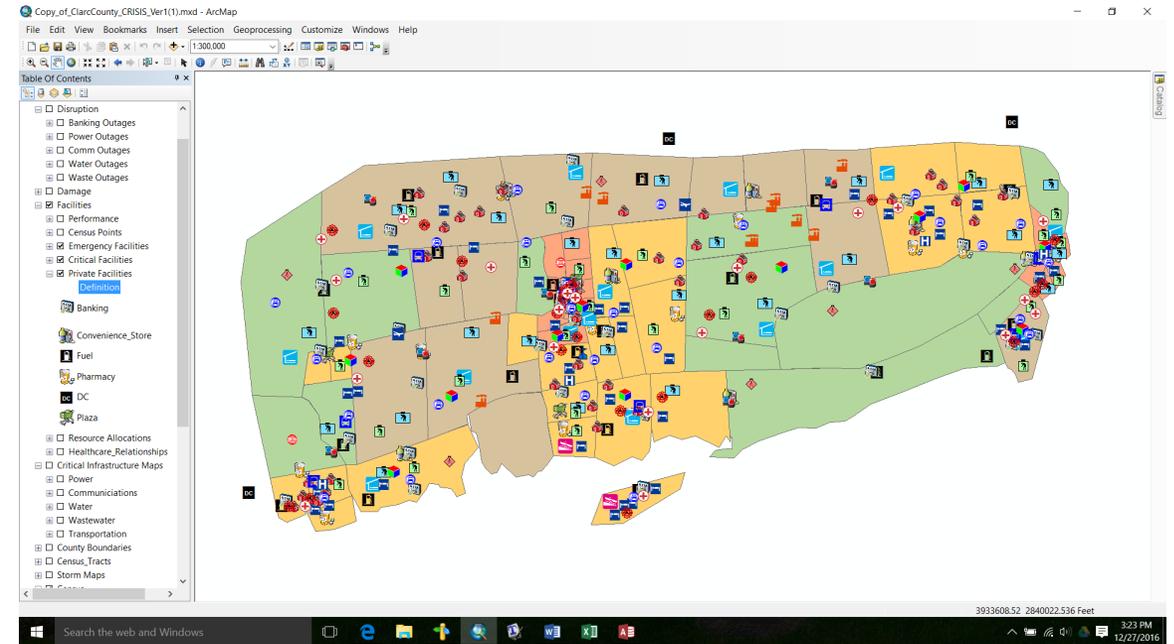
- ❖ Collected data on Critical Commercial Services (food, fuel, pharmaceuticals, cash) in New Hanover County and their interdependencies with civil infrastructures
- ❖ Developed a CCS dataset for CLARC, the artificial test community for MUNICIPAL
- ❖ Performed model runs to simulate interruptions to the delivery of CCS in CLARC based on expected infrastructure outages from a hypothetical storm event
- ❖ Overall, the work completed to date validates the previously developed algorithms and their applicability to CCS as well as civil infrastructures. It also affirms the important role of the Emergency Manager as the sole owner of the “Big Picture” of how the various systems interact and the importance of restoration priorities in designing the most effective of response and recovery program for these interdependent systems.

These activities, coupled with models of damage and disruption of services, databases and a GIS interface will form the basis for continued refinement of the COMSURE decision technology for the remainder of the project.

Civil and Social Infrastructures in CLARC

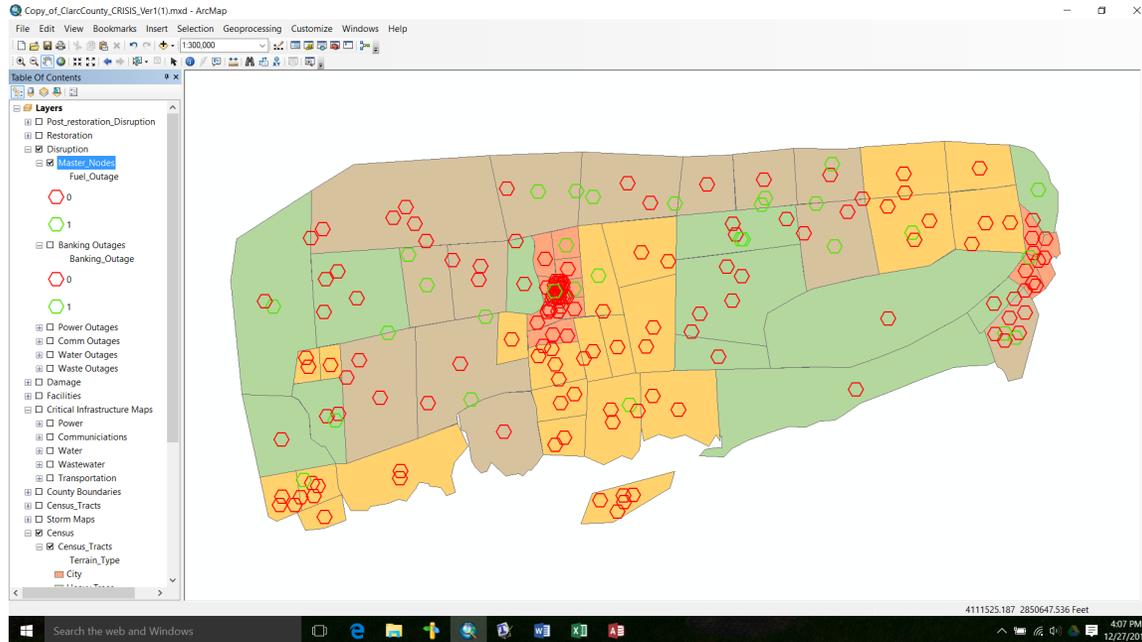


Critical Commercial Services

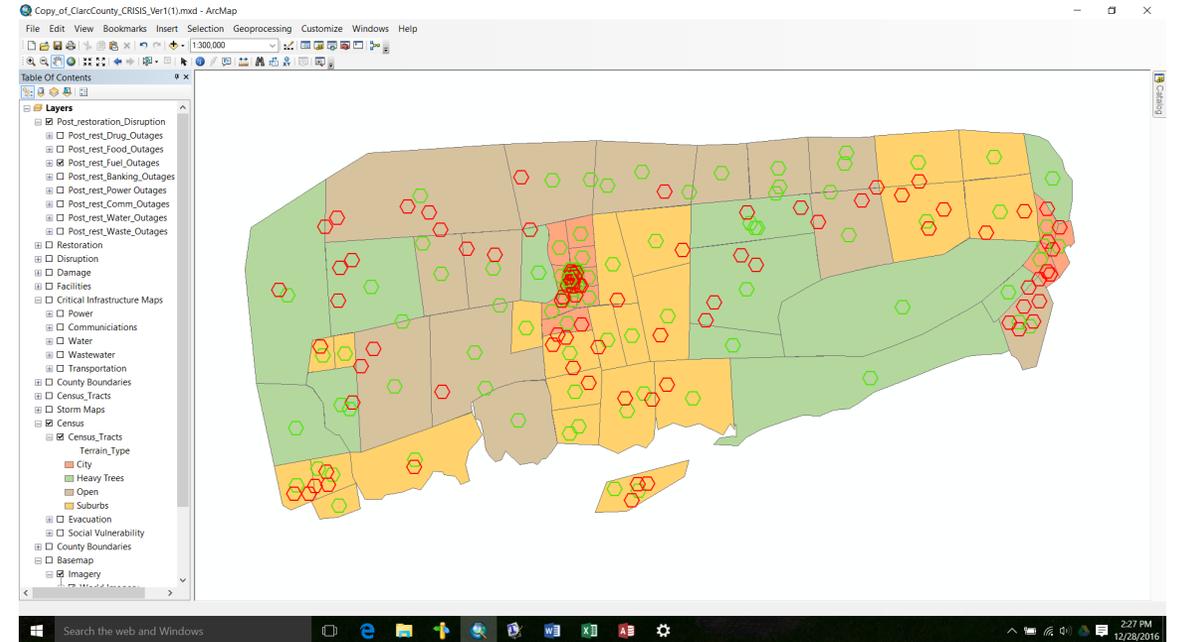


All Civil and Social Infrastructures

COMSURE Simulations of Fuel Supply Outages

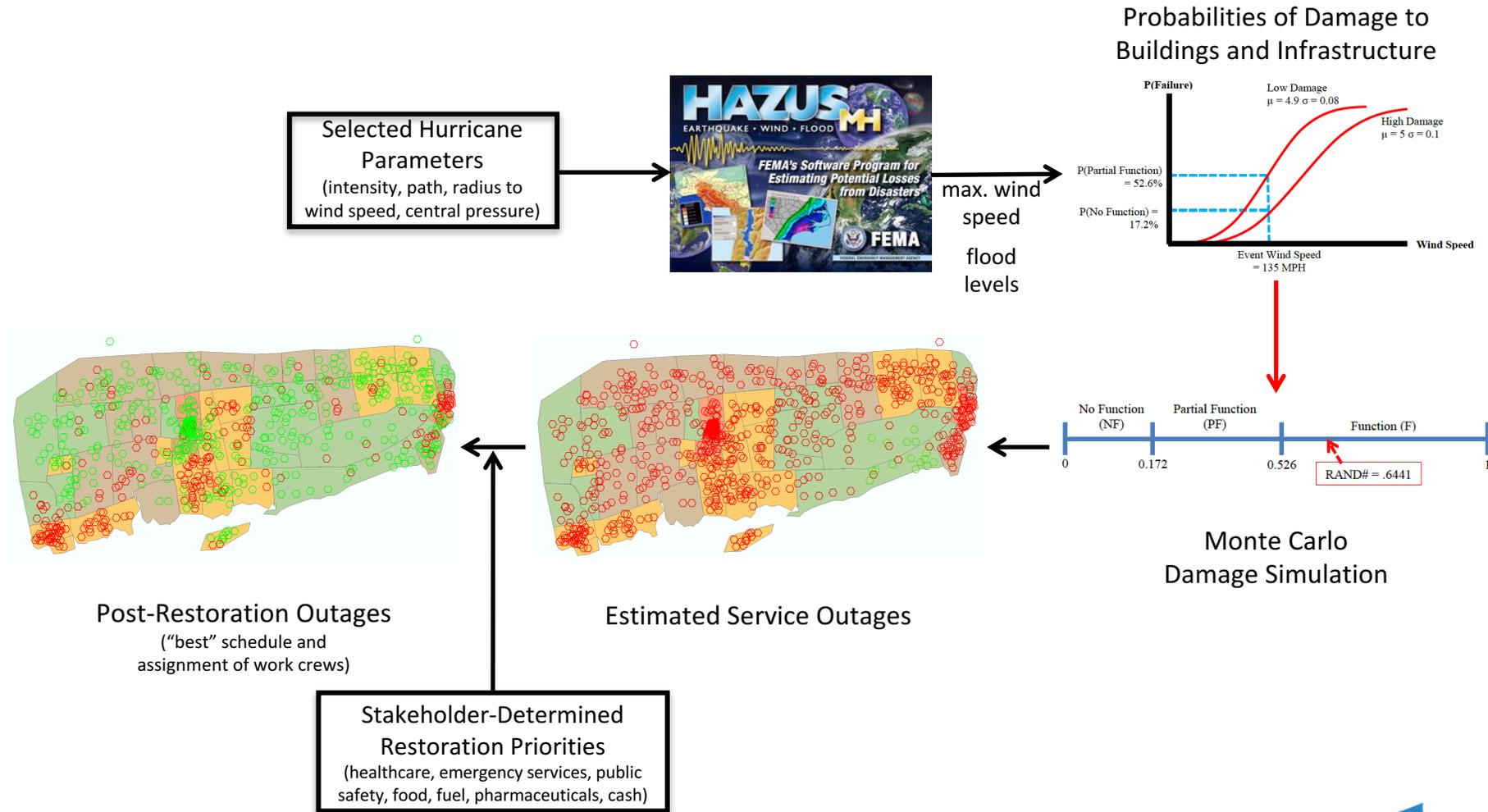


Simulated Fuel Supply Outages in CLARC



Simulated Fuel Supply Outages Remaining After X Time Periods of Restoration

COMSURE in CLARC



Lessons from Hurricane Matthew Impacts on the fuel supply chain



“We’re struggling to figure out what roads are open so that we can get gasoline to the stations,” “Obviously, gasoline and diesel are an extremely important part of all these communities.”

The company’s trucking center in Kinston, which serves as a hub for gasoline, diesel and propane shipments, was essentially cut off from all major roads when the Neuse River overflowed its banks. With U.S. 70 closed and flooding on the Tar River, access to Morehead City “is going to be a challenge for the truckers.”

Anticipated Project Impact

The MUNICIPAL/COMSURE technology has 3 potential levels of application that could be utilized by different cohorts of the EM community.

- ❖ An educational application designed for university-level curricula in emergency management that would make use of the CLARC community dataset
- ❖ A training application designed for working professionals in emergency management that would make use of the existing technology coupled with the HSIP Gold dataset specific to the location in question
- ❖ A field application to be used as a real-time decision-support tool in an actual emergency; it would also utilize the HSIP Gold dataset

All of these applications would produce usable tools for the education and practitioner communities to better understand the complex interactions that occur between interdependent civil and social infrastructures. The educational tool would make students more familiar with the complex interactions that occur between interdependent systems; the training tool would supplement or replace costly “boots on the ground” field exercises; and the decision-support tool would increase understanding of the important role of service restoration priorities in designing effective response and restoration activities.

Proposed Follow-on Work (1)

- ❖ Although the research necessary to develop and deploy MUNICIPAL/COMSURE has essentially been completed, this technology is not readily usable by the practitioner community. If funding were provided for an additional 2 years, this research could be translated into a readily deployable education and training tool for practitioners that will make the nation and its critical infrastructures more resilient in the face of multiple hazards.
- ❖ A first phase would demonstrate a deployable, cloud-based, data-centric application based on the MUNICIPAL technology enhanced by its coupling to HSIP Gold data that will allow users to
 - (1) extract critical infrastructure assets in a selected geographic region
 - (2) identify interdependencies among those assets
 - (3) summarize and map the infrastructure assets and interdependencies
 - (4) simulate disruptions caused by various types of disasters, and
 - (5) create an optimal restoration schedule to recover from the disruptions.

Proposed Follow-on Work (2)

- ❖ In a second phase, we would construct a world-class decision support tool that any emergency management agency could use to simulate and prepare for critical infrastructure disruptions in their locale. More specifically, this decision support tool would fully integrate the geospatial data management, disruption simulator, and restoration optimizer into a single, comprehensive tool.
- ❖ This web-based tool would be developed and deployed in the cloud, using an open source software stack, so that any agency could access it any time, anywhere. Through “what if” analysis, the decision support tool would allow users to configure, run, save, and compare runs for various disaster types and restoration plans. The tool would provide both a summary of key performance indicators and a suite of supporting visualizations including tables, graphs, and maps.

Proposed Follow-on Work (3)

- ❖ As an ancillary activity, the development team would also pursue the option of making the technology available as an educational tool for university students in degree or certificate programs in emergency response and management as recommended during the 2016 program review. This would be a generic application of the technology that utilizes the dataset developed for CLARC, the artificial community created out of a need for a robust and sharable dataset for infrastructure and emergency management research.
- ❖ All of these applications would produce usable tools for the education and practitioner communities to better understand the complex interactions that occur between interdependent civil and social infrastructures and the important role of service restoration priorities in designing effective alternative response and restoration activities.
- ❖ The full impact of this research is in its application; without the funding to build workable tools based on the research, its full potential for education, training, and real-time decision support will never be realized.