



The Multi-Network Interdependent Critical Infrastructure Program for the Analysis of Lifelines (MUNICIPAL)

A DHS Science and Technology Center of Excellence Solution

Decision Support for Community Preparedness and Recovery

The **Multi-Network Interdependent Critical Infrastructure Program for the Analysis of Lifelines (MUNICIPAL)**, developed by the **Coastal Resilience Center of Excellence (CRC)** partner Rensselaer Polytechnic Institute (RPI), is a decision support tool for emergency managers and managers of critical civil and social infrastructure (CCSI) systems. Users can view CCSI systems and their interdependencies; visually assess damage to these systems; and make preparedness, restoration, and recovery decisions.

MUNICIPAL can also provide a training environment for infrastructure protection specialists and others involved in hazard and emergency management. Refined over several years and tested in a large coastal county, MUNICIPAL is a unique decision support tool that simulates the various moving parts of infrastructure in a coastal region to define optimal 'rules of engagement' before, during and after hazards.

How It Works

MUNICIPAL uses a combination of GIS data, weather data, Hazus-MH data and user inputs to calculate:

1. Vulnerability and disruptions of CCSI by converting weather information into hazards such as wind gust, flood and storm surge during hurricane scenarios;
2. Restoration optimization by finding the best solution for preparedness, restoration and recovery decision making; and
3. GIS visualization of CCSI systems, the interdependencies among them, and the results found by the optimization and vulnerability modules.

Building Local Capacity for Collaboration

MUNICIPAL enables a more accurate description and portrayal of the supply chains that provide critical goods and services to a disaster-impacted area, resulting in a deeper understanding of how local networks may be affected by extreme events.

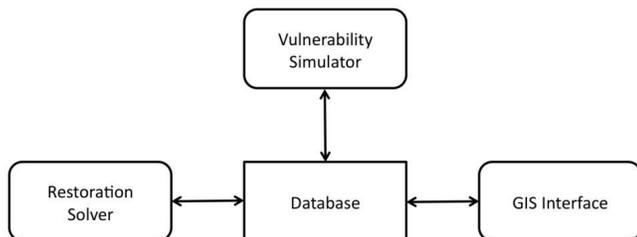
MUNICIPAL is designed to help answer questions like, "Where are all the fuel centers?" With the right data inputs, MUNICIPAL could quickly identify, for example, which power grids need to be restored first to enable enough gas stations to work.

This knowledge can be used to help emergency managers develop emergency response plans and training programs, as well as facilitate greater coordination between emergency management personnel and service providers when responding to interruptions in critical services, ultimately increasing community resilience to the impacts of natural and human-caused hazards.

To reach full operational potential, MUNICIPAL requires data inputs on current infrastructure, a reliable stream of post-disaster damage reports, and additional test/evaluation.

Next Steps

The research team has completed data collection efforts for critical infrastructure, human services facilities, and commercial services in a large coastal county. On-going activities in this pilot community include geo-coding of additional data into a MUNICIPAL-compatible format, inclusion of U.S. Census Bureau and state population and socio-economic datasets, and assignment of Hazus-MH fragility measures for typical commercial structures. Inclusion of this information will allow a more expansive assessment of interdependent service outages that considers social infrastructure systems.



MUNICIPAL Component Diagram