University of Utah Project Description

An evacuation is an immediate concern when a hazard or incident occurs in or proximal to a transportation network. Often, there will also be a recovery period over a longer time horizon when the transportation network is operating outside of normal parameters. Since most urban transportation networks operate at near-saturation levels, this can create large-scale, system-wide consequences that severely disrupt normal performance. Understanding vulnerability to network disruption can lead to better protection strategies through identifying particularly vulnerable components as well as the benefits and costs of reinforcing those components. It can also lead to improved strategies for recovery from disruptions by identifying their consequences and magnitudes, and effective strategies for their mitigation. Understanding network vulnerability can also support long-term design and planning of transportation networks and related land-use systems that are less vulnerable to disruption.

This project developed a GIS toolkit for evaluating the impact of link disruption on traffic flows within a street transportation network. The user can select a link or links that have reduced capacity due to some incident or incidences. A dynamic flow model estimates the through-flow and travel times on each link after the capacity disruption. The system compares throughput, travel times and origin-destination shortest paths to the same attributes for a baseline (no disruption) case. The system reports these differences in a user-friendly manner using cartographic and other visualization and query tools.

The Transportation Hazards Consequence (THC) toolkit consists of three major components: i) ArcInfo GIS; ii) a dynamic network flow model developed using customized C++ code; iii) user interfaces developed using Arc Macro Language (AML), a scripting language for ArcInfo software.

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