



# COORDINATED TRANSIT RESPONSE PLANNING AND OPERATIONS SUPPORT TOOLS FOR MITIGATING IMPACTS OF ALL-HAZARD EMERGENCY EVENTS

## Background

The Chicago metropolitan area is one of the largest and most dense concentrations of people, industry, and commerce in the U.S. As a transportation hub, the region must be prepared to quickly recover from natural and man-made hazards. At the same time, transportation networks are a critical resource in disaster management and recovery operations. Transit systems are needed for the evacuation of exposed populations, transport of injured persons, movement of emergency personnel and first responders, and delivery of needed supplies. As witnessed in recent natural disasters, the lack of evacuation planning and coordination among transit systems can be catastrophic.

## Objectives

The objective of this research was to investigate methods, techniques, technologies, and practices that can help emergency responders improve the efficiency of the decision-making process for detecting, analyzing, and responding to emergencies, service disruptions, and catastrophic failures associated with multimodal transportation systems and recovering system services in an effective manner using available transit assets.

## Findings and Conclusions

*Using existing open source POLARIS technology, this project developed a toolbox of emergency planning scenario evaluation models customized for public transportation that demonstrates the integration of real-time data feeds with transportation modeling software.*

The project assessed a variety of technologies and strategies, including those dedicated to locating persons and resources, improving communications, assessing the operability of transit systems, and re-deploying resources. Examples of these technologies and strategies include TODSS, automated vehicle location systems, improved sensor and detector networks, communication network technologies and protocols, variable messaging sign (VMS) networks, public alert broadcasts, e-mail or short message service (SMS) notifications, transit signal prioritization, and others. The project also assessed the value of pre-planning for emergency operations, including developing alternate transit routes/schedules, the use of bus, bus rapid transit (BRT), and train assets for transit vehicle bridging, and other strategies that can be developed with such a decision support tool.

An extensive survey was conducted on how individuals react to a variety of hazards. This information was used to develop computational models of how the Chicago area operates under a number of emergency conditions and behavioral data-driven assumptions. Computational models were developed that evaluate the most viable technologies and strategies in relation to various hazards to which they might respond. The models also were integrated as a new Emergency Planning Module in the existing open source Planning and Operations Language for Agent-Based Regional Integrated Simulations (POLARIS) modeling system in use for the Chicago area.

## Benefits

By developing capabilities using the existing open source POLARIS technology, a final product was delivered that demonstrates the integration of real-time data feeds with transportation modeling software, representing an emerging technique that will continue to gain value as monitoring technologies and the quality of data sources advance. The methods, procedures, techniques, and strategies for hazard impacts mitigation investigated will integrate transit assets into the core of developing countermeasures that are effective with respect to efficiency, response time, and cost that may be employed in case of various emergency situations.

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This research project was conducted by teams from Argonne National Laboratory, University of Illinois at Chicago, Illinois Institute of Technology, University of Chicago, George Mason University, Michigan Technological University, and Pace Suburban Bus. For more information, contact FTA Project Manager Raj Wagley at (202) 366-5386 or [Raj.Wagley@dot.gov](mailto:Raj.Wagley@dot.gov)

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