

**Southwest Region University Transportation Center  
Project Proposal - FY 2012**

TITLE OF PROPOSED PROJECT: THE CONFLUENCE OF TRANSPORTATION AND ECONOMIC ACTIVITY IN A MEGA REGION DISASTER

STRATEGIC GOAL(S) ADDRESSED: STATE OF GOOD REPAIR, ENVIRONMENTAL SUSTAINABILITY, ECONOMIC COMPETITIVENESS

CONSORTIUM MEMBER: UNO

TOTAL PROJECT BUDGET: \$37,613.07

PRINCIPAL INVESTIGATOR: DR. BETHANY STICH  
PHONE NUMBER: 662-325-7859  
EMAIL ADDRESS: BSTICH@PSPA.MSSTATE.EDU

HAS THIS PROPOSAL BEEN SUBMITTED FOR FUNDING ELSEWHERE? NO

DID THIS PROPOSAL RECEIVE FUNDING FROM ANOTHER SOURCE? NO (MATCH FUNDING ONLY)

DOES THIS PROPOSED RESEARCH INVOLVE THE USE OF HUMAN SUBJECTS? NO

WILL THIS PROPOSED RESEARCH INVOLVE OTHER ORGANIZATIONS AS PARTNERS? NO

PROJECT MONITOR:  
ROD MOTAMEDI  
REGIONAL ECONOMIC MODELING, INC.  
433 WEST ST.  
AMHERST, MA 01002  
413-549-1038

ABSTRACT OF PROJECT:

This research project examines the resilience of businesses and labor markets in response to transportation disruptive events in a mega region. The disruptive events analyzed are natural disasters of all types and lengthy electric power outages. The study uses data from the Quarterly Census of Employment and Wages (QCEW) and several data sources for information on disruptive events to estimate the impacts of those events on employment, taxes, revenues and payrolls over varying timespans. Several regional economic factors that affect community

resilience are included in the analysis, including industry diversity, the distribution of establishment size, and employment concentration. Fifty years of historical data on natural disasters and electric power outages provide the detailed history to examine the importance of previous community exposure to disruptive events and how that experience affects resilience. This research proposes a novel perspective for investigating infrastructure protection and disaster management while building on existing research findings. While federal, state, and local emergency management agencies have focused on short and mid-term preparedness and recovery plans, the role of the critical transportation infrastructures should be better explored. According to the literature and recent feedback from the Alabama Development Authority, the Mississippi Emergency Management Agency (MEMA), and Greater New Orleans Inc., the relationship of disruptions in transportation modes to the wide-ranging effects in economy and security have not yet been clearly investigated and articulated.

# ***The Confluence of Transportation and Economic Activity in a Mega Region Disaster***

## ***PROBLEM STATEMENT***

Understanding the full spectrum of responses to mega region disasters can help allocate more effectively government resources that are used to mitigate the impacts of natural disasters. By predicting the most vulnerable establishments and industries in each community, these findings will assist infrastructure operators, building owners, and government agencies in their cost-benefit analyses of prevention and mitigation investments. Post-event government support can be more efficiently targeted to affected businesses if the distribution of losses and their full magnitude is known. The study's research findings generate improved estimates of business interruption costs that are important to many stakeholders, including insurance companies, state and local emergency management agencies, and federal agencies such as the Department of Homeland Security and the Bureau of Economic Analysis.

## ***BACKGROUND***

This proposed research combines and expands two disparate but equally important research projects and associated team members. This proposed research expands Robust Analytics previous work on the modeling of critical infrastructure sectors conducted for the Department of Homeland Security Science and Technology Directorate. That study developed an analytical framework to assess resilience of the drinking water infrastructure and included an approach to measure the economic impact of infrastructure disruptions. Second, it builds on the Mississippi State University led DHS-SERRI project that investigated disruptions on the US railroad system (DRIADS) which determined alternative network flows in case of a disaster. A multimodal analysis framework and modeling capability provided the ability to consider, model, and visualize existing regional multimodal transportation capacity and congestion as well as the impacts of new planned or potential transportation infrastructure projects. Integrating our analyses would provide government policymakers a more complete understanding of how disasters could affect their state and local economies by applying to a wider variety of disasters and allowing us to quantify how different causes of infrastructure disruption can have different consequences. Together, the projects can analyze a large number of historical disasters and use the estimates to inform and perhaps even validate the findings of the DRIADS simulations.

## ***OBJECTIVES OF STUDY***

The objective of this research is to present a multi-disciplinary, multi-scale, decision-making structure to combine vital information for economic recovery process derived and/or affected by the changes in freight movements, availability and timeliness.

## ***WORK PLAN***

It is proposed that the project will be completed within a period of 18 months (July 1, 2012 – December 30, 2013).

| Task   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|--|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|
| 1. Catalogue and Archive Disruptive Event Data Sources             | ■ | ■ | ■ | ■ | ■ | ■ |   |   |   |    |    |    |    |    |    |    |    |    |
| 2. Identify measurable Business Responses to Disruptive Events     |   |   | ■ | ■ | ■ | ■ | ■ | ■ | ■ |    |    |    |    |    |    |    |    |    |
| 3. Multi-Criteria Decision Making and Time-Series Scenarios        |   |   |   |   |   |   |   |   |   | ■  | ■  | ■  |    |    |    |    |    |    |
| 4. Analyze the Impacts of Disruptive Events on Economic Resilience |   |   |   |   |   |   |   |   |   |    |    | ■  | ■  | ■  | ■  |    |    |    |
| 5. Final Report and Delivery                                       |   |   |   |   |   |   |   |   |   |    |    |    |    |    | ■  | ■  | ■  | ■  |

- Task 1: (Start to Month 6) – *Catalogue and Archive Disruptive Event Data Sources*
- Task 2: (Month 3 to 9) - *Identify Measurable Business Responses to Disruptive Events*
- Task 3: (Month 10 to 12) - *Multi-Criteria Decision Making and time-series scenarios*
- Task 4: (Month 12 to 15) - *Analyze the Impacts of Disruptive Events on Economic Resilience*
- Task 5: (Month 15 to 18) - *Final Report and Delivery*

**STAFFING PLAN**

The project will be completed under the direction of Dr. Bethany Stich, Center of Urban and Public Affairs. Dr. Stich is an Associate Professor of Urban and Public Affairs at the University of New Orleans. Previously, Stich served as the Associate Director of the Transportation Policy in the John C. Stennis Institute of Government and Community Development at Mississippi State University. Dr. Stich was principal investigator studying freight movements throughout the Southeast Region as part of the revitalization efforts of the C&G railroad, as well as Disruptions in Rails, Impact Analysis and Decision Support (DRIADS) and Phase II, Disruptions in Ports, Impact Analysis and Decision Support (PRIADS).

To help foster the educational component of the UTC mission, a graduate assistant from the Department of Planning and Urban Studies has been included as a key staffing component of the project. The graduate assistant will work with the PI on key tasks such as data collection, analysis and report writing.

**SCHEDULE OF ACTIVITIES AND DELIVERABLES**

- **Task 1:** Catalogue and Archive Disruptive Event Data Sources (Award Date + 6 months).
  - 1.1- Collect data from SHELDUS, FEMA, Energy Information Agency, NERC NOAA Snow Cover, etc.
  - 1.2- Create Data Dictionary
- **Task 2:** Identify Measurable Business Responses to Disruptive Events (Award Date + 9 months).
  - 2.1- Collect data from the Quarterly Census of Employment and Wages (QCEW), Current Employment Statistics (CES), etc.

- 2.2- Review currently available economic modeling software for best uses: REMI, EMSI, etc.
- 2.3- Integrate in the Data Dictionary created in Task 1.
- **Task 3:** Multi-Criteria Decision Making (MCDM) and scenarios (Award Date + 12 months).
  - 3.1- Definition of time increment for releasing updated scenarios
  - 3.2- Combine multi-scale/multi-disciplinary data into a GIS framework
  - 3.3- Refine weight priorities for goods, places, economic impact and transportation modes
  - 3.4 - Construct indices to characterize the severity of different event types
  - 3.5 - Develop a statistical characterization of the historical exposure of mega regions to disruptive events of varying significance
- **Task 4:** *Analyze the Impacts of Disruptive Events on Economic Resilience of Mega Regions.* (Award Date + 15 months).
  - 4.1- Empirically analyze how changes in employment, wages and business establishments in mega regions depend on the characteristics of those communities and the nature of disruptive natural disasters
  - 4.2- Identify suitable visualization method
  - 4.3- Presentation (meeting or web-based) for mega region Emergency Management Agencies and other stake holders towards further implementation and technology transfer.
- **Task 5:** Finalization (Award Date + 18 months).
  - 5.1-Write and deliver final report

***PLAN TO PURSUE ADDITIONAL FUNDING AFTER CONCLUSION OF SWUTC PROJECT:***

This project is an expansion of previous Department of Homeland Security funding. At the completion of this phase of the research, it is expected the research team will apply for funding from the National Science Foundation's [Division of Social and Economic Sciences](#), Science, Technology, and Society (STS) program to address data issues in freight transportation modeling and economic impact analysis.