What to Do When the Trains Don't Run on Time.

Bethany Stich, Mississippi State University
Joseph "Jody" Holland, Mississippi State University

Project Description

Background

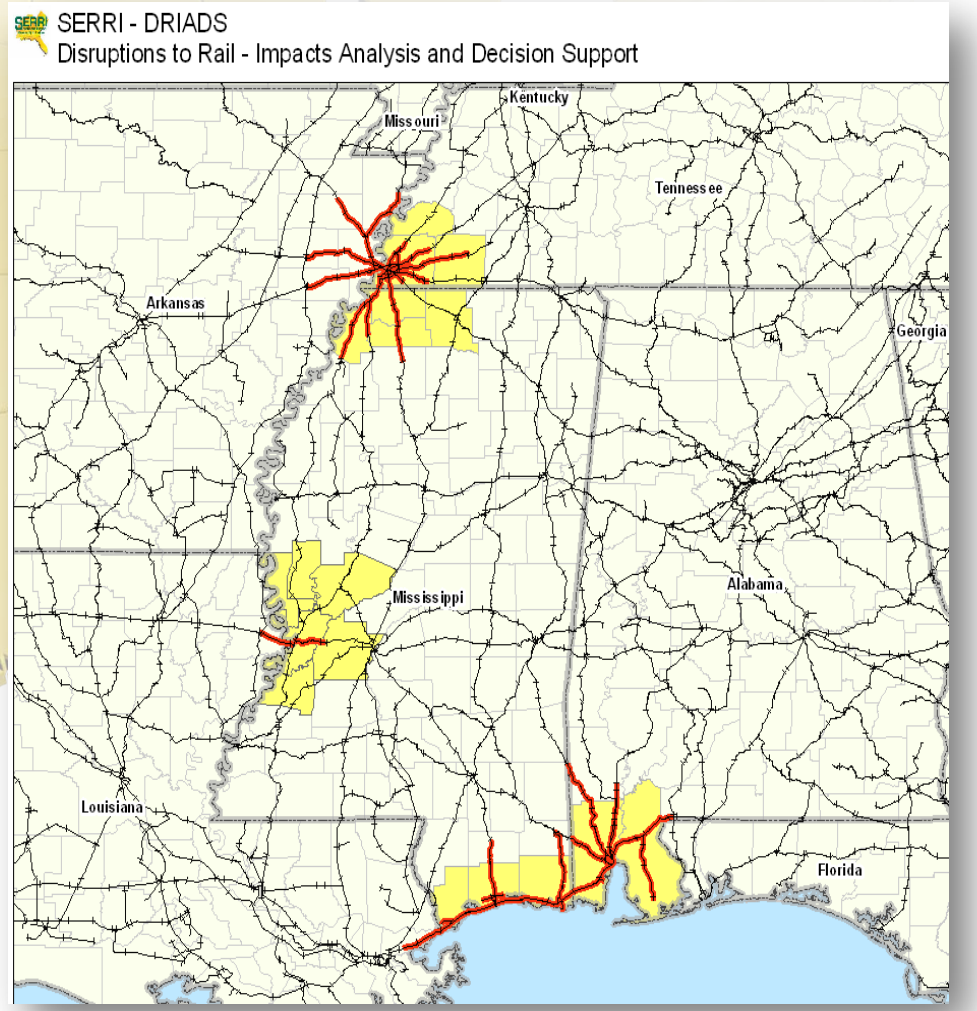
The project seeks to analyze the impact of a disaster on the transportation infrastructure of the southeast region of the United States. Multiple processes and data sets will be utilized in this project to establish a more effective decision tool for emergency management personnel. This is an on-going study with a final completion date in 2011.

Objectives

- Determine alternative rail network flows in case of a man-made and/or natural disaster
- Estimate transportation and regional economic impacts due to such a disaster
- Disseminate the fundamental information to stakeholders and decision makers for prioritizing projects and efficient usage of public resources

Project Description

- The intent is to determine an alternative network and disseminate the information to transportation specialists, engineers, state and local transportation personnel, trade and economic development professionals, academics, and community planners.
- The simulation of these critical points will provide stakeholders with the ability to engage in content sensitive solution (CSS) principles throughout the planning and decision-making process for current and future transportation projects, economic development, emergency response and recovery efforts.



Problem Statement

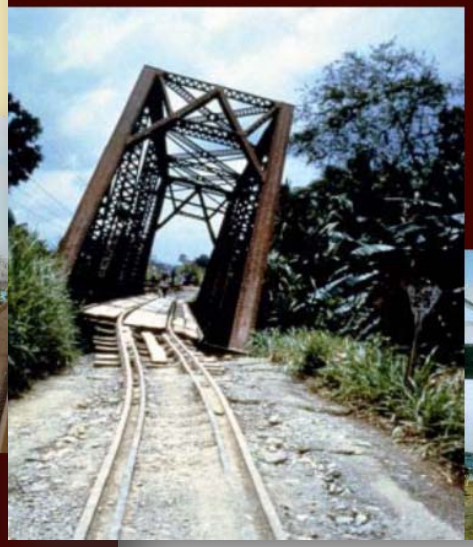
Hurricane Katrina 2005 → collapsed bridges and impacts on other vulnerable features along the coastal railroad.

Problem Statement

Earthquake Damage

Bridge Damage

Liquefaction results in movement of bridge supports



Costa Rica, 1991 (left) & Kobe, Japan, 1995 (below)

Rail Damage

Bullet train derailment (right), Japan 2004

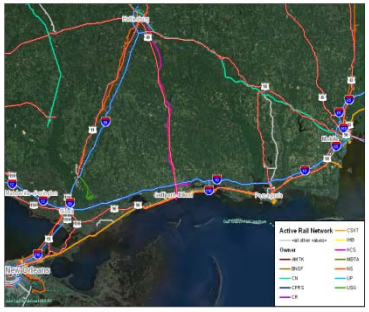
Ground settlement beneath elevated train tracks (right), Japan 2004

Problem Statement

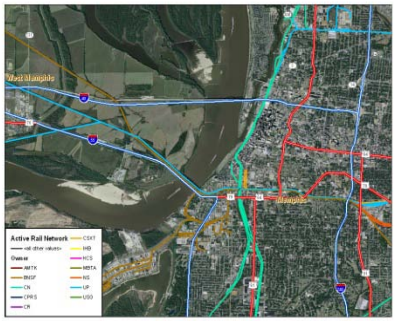
Bridge Outage

Potential Solution and Research Methodology

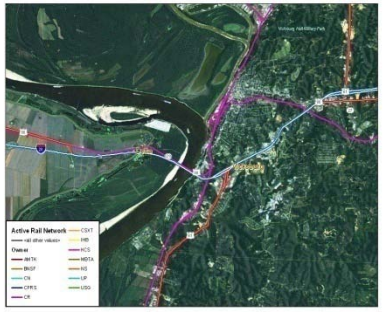
***Scenario 1* – Gulf Coast CSX Coastal Rail Corridor**



***Scenario 2*– Memphis, Tennessee Rail Bridges**



***Scenario 3* – Vicksburg, Mississippi Rail Bridge**

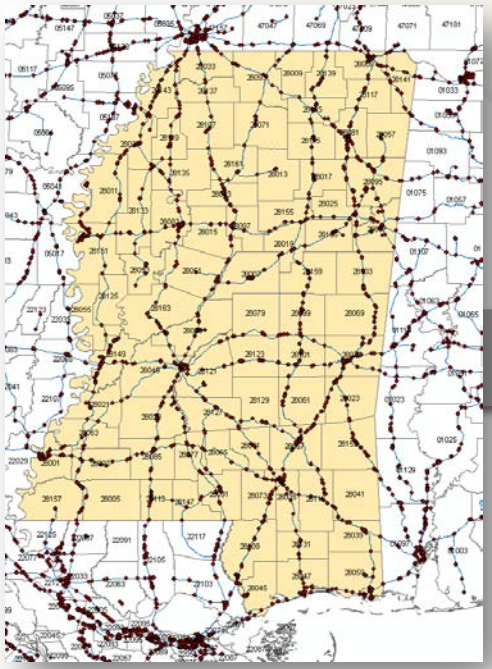


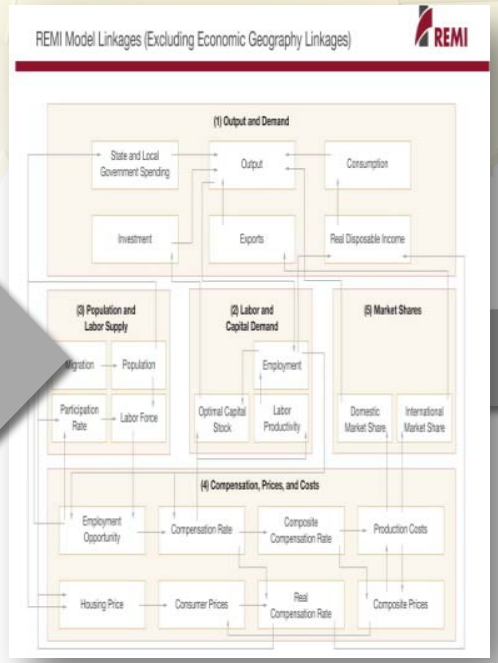
•The research team will utilize freight flow-modeling and Rail Re-Route Model (RRRM) software, REMI and EMSI economic modeling software, and GIS and Remote Sensing applications to develop visualizations and imagery illustrating the impact a man made and/or natural disaster would have on the region's transportation network.

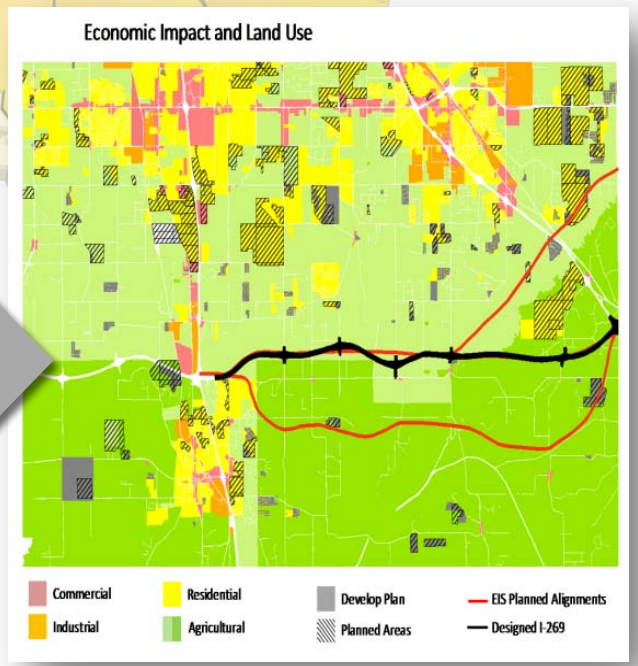
•This combined approach provides a geographically specific, but highly transferable demonstration of a solution which integrates currently disparate geospatial and transportation analysis and modeling systems with policy and decision-making. This new generation of modeling capabilities can significantly improve regional transportation system resiliency.

Potential Solution and Research Methodology

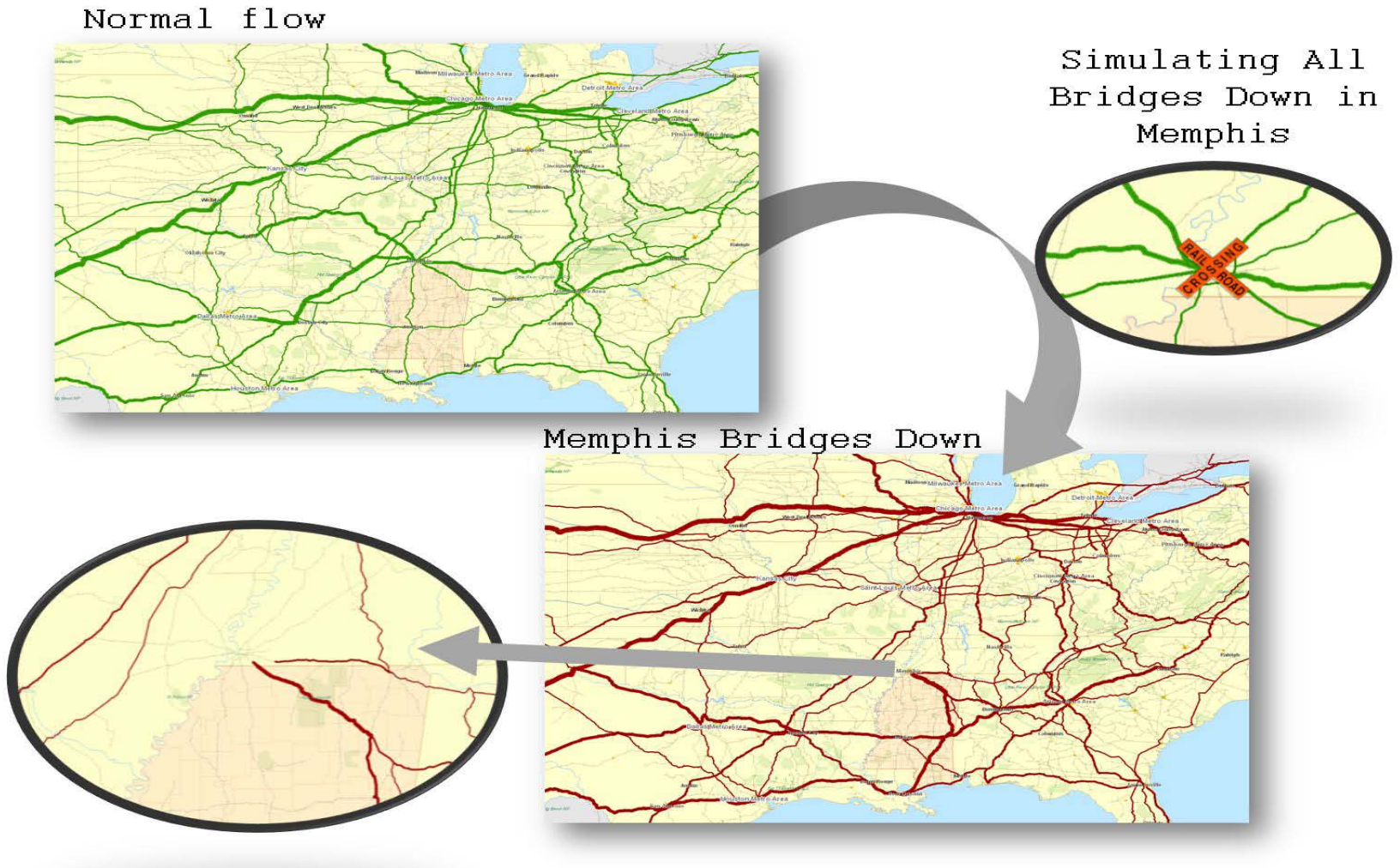
The project concentrates on integrating the forecasted freight flow disruption patterns with specific economic modeling tools, such as REMI, to determine the economic impacts, which will be utilized to develop visualizations that illustrate the impact a man made and/or natural disaster would have on the region's transportation network. These research deliverables illustrate disruptions and economic impact patterns that will affect community and commerce flow so planners in economic development, transportation, land-use and emergency evacuation can work with identical data to find solutions toward resiliency.





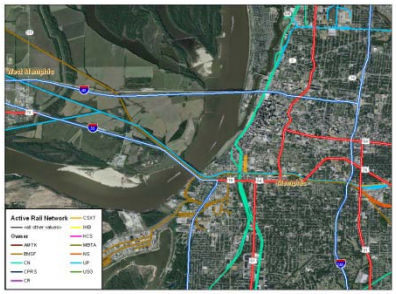


Attaining the Solution and Results

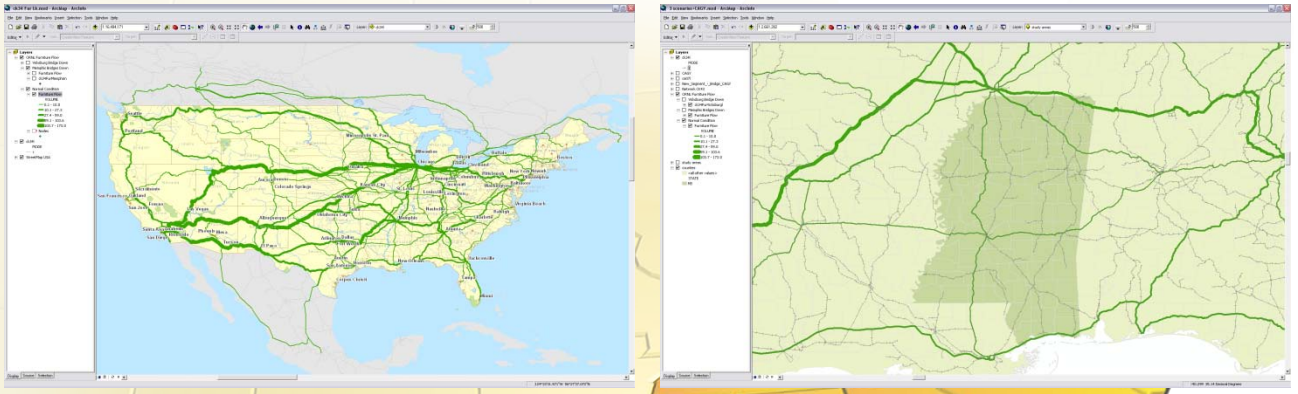


Attaining the Solution and Results

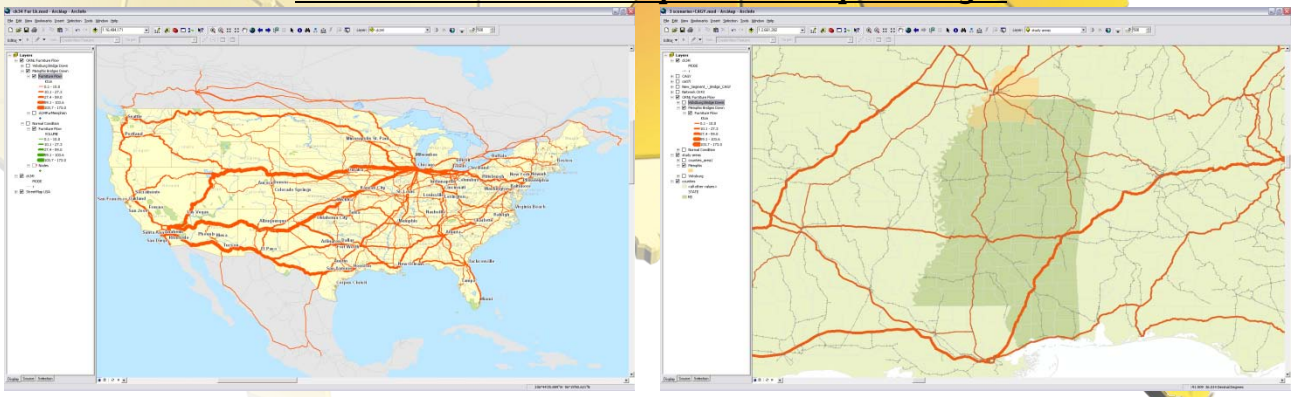
Memphis, Tennessee Rail Bridges



Baseline RRRM Data Run for Furniture Commodoties



RRRM Model Run for Disruption of Memphis Bridges



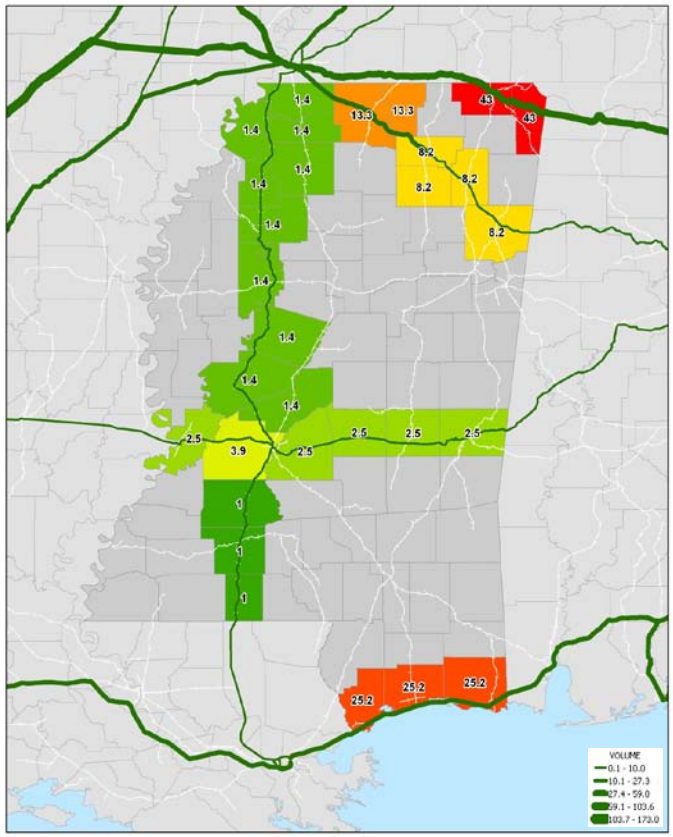
Actions: Disrupted Memphis Bridges (New Madrid Fault Scenario).

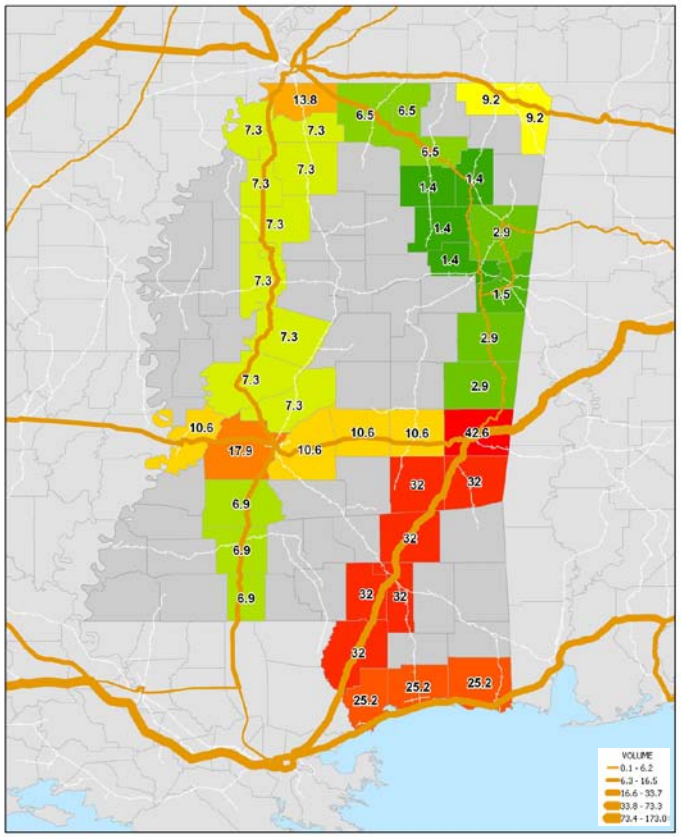
Results: Major impacts noted for MS O/Ds for furniture industry commodities.

Findings: With multiple major rail services in Memphis (a major gateway and hub), all regional manufacturing is likely to be significantly impacted. Ability to plan and prioritize re-routing of vital goods is noted as a missing capability.

Needs: Streamlined methods for planning and prioritizing re-route of vital goods

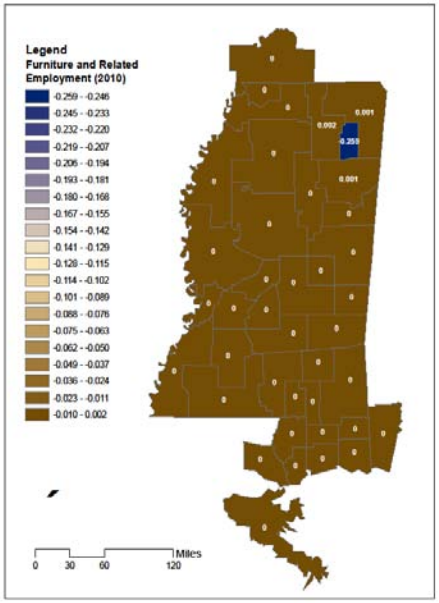
Attaining the Solution and Results

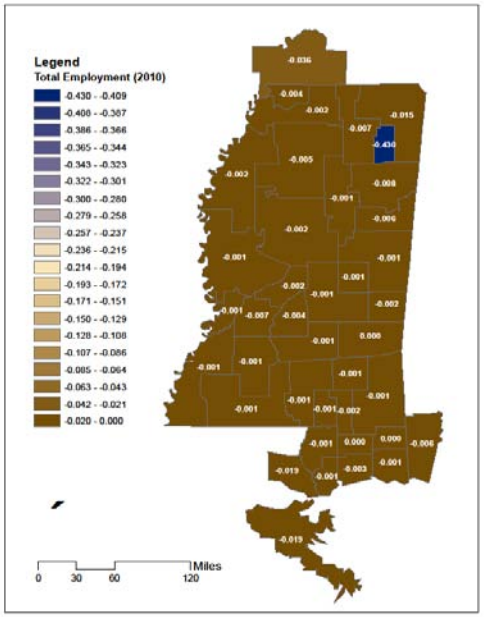


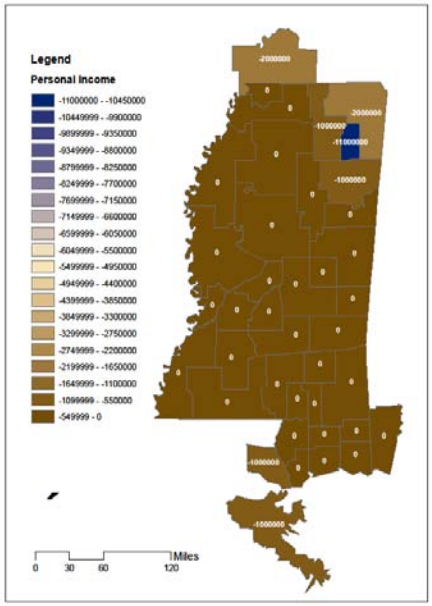


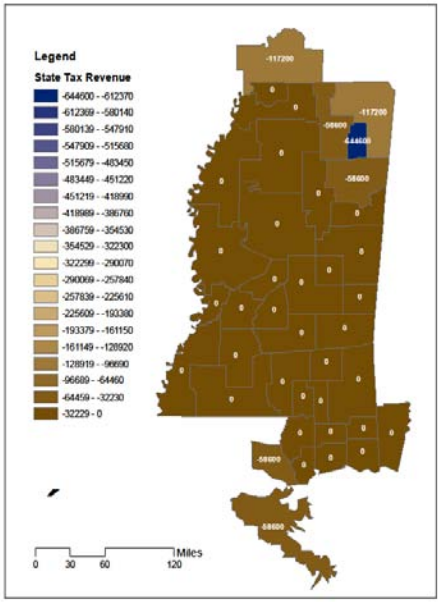
Attaining the Solution and Results

	Lee County Impacts	Regional Impacts	State of Mississippi Impacts
Total Employment Changes	-430	-459	-513
Furniture Sector Employment Changes	-259	-255	-262
Aggregate Personal Income Changes	-$11 million	-$15 million	-$17 million
Tax Revenue Changes	-$644,600	-$879,000	-$996,200









Summary & Conclusions

- This systematic process of coupling technological tools enabled the researchers to integrate advanced instruments to determine the economic impacts associated with the disruption of the rail network.

- Going forward, the methodological process will be employed to examine economic impacts related to rail disruption along the additional two scenarios. The continued efforts on the research project will concentrate on the additional two study sites, the rail bridge in Vicksburg, MS, and the CSX rail bridge in Hancock County, MS.

- As shown, rail networks have significant benefits for local and national economies. Understanding the impacts associated with rail disruptions, decision-makers can plan accordingly. As such, additional rail corridors would add redundancies in the current railroad networks. Such redundancies could make the national railroad transportation network and communities more resilient and less vulnerable.