A Geospatial Framework to Analyze Impacts from Disruptions to Critical Infrastructures in Rail Network

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On today’s economy, shipping elevated amount of goods depends upon the efficiency of a multimodal transportation infrastructure. Rails are keys to support the socio-economic development on regional and federal standpoints. Conversely, even considering investments in planning and maintenance, the transportation infrastructure is not prepared to face man-made and/or natural disasters. Disruptions to critical infrastructures in rail network have been considered within the Homeland Security issues. Lessons learned from hurricane Katrina showed that collapsed bridges and impacts in other vulnerable features along the coastal railroad corridor produced billions in loss. This scenario forced the relocation to alternative railroads crossings upstream in the Mississippi River. A complete problem-review requires large-to-local investigations involving land-use, bio-physical and socio-economic scenarios coupled with intermodal infrastructure and commodities origin-destination.

Using Geospatial technologies, this study combines regional transportation infrastructure and economic development to compile a framework for identification and planning in terms of critical infrastructure in rail network in Southeast U.S. Given the potential to disruptions caused by disasters, two other areas are identified:

1) the rail bridges at Memphis-TN, which are directly to the New Madrid fault. Memphis-TN is the third largest rail hub in the nation and an earthquake could potentially devastate commerce throughout the southeast region;

2) the rail bridge at Vicksburg-MS, with is critical to the freight movements through the Crescent City Corridor, Meridian Speedway and I-69 NAFTA Corridor. It is a cantilever through truss over the Mississippi River and considered the most challenging Mississippi River Bridge to navigate, where several barges have hit it and causing disruption.

The core of the method is the MCDM that integrates existing geodata and outputs from transportation datasets to compute scenarios and cost-cumulative surfaces. The framework enables multiple scenarios to be considered and alternatives corridors to be generated in a systematic manner to assist the decision makers.