

**Project Title:** QUANTIFICATION OF MULTIMODAL TRANSPORTATION NETWORK VULNERABILITY: A PILOT STUDY IN MISSISSIPPI

**Project Abstract (Brief Description):** There are pressing needs to develop a network based quantification framework to assess vulnerability of multimodal transportation and infrastructure network exposed to both natural and man-made hazards. Thus the objective of this exploratory study is to identify critical transportation network and its vulnerability to a wide variety of hazard conditions based on real-world data. In this study, three research questions will be addressed: 1) possible scenarios of future climate changes with respect to projected sea level rise and changes in storm surge intensity specific to the Mississippi coast; 2) inventory of critical transportation infrastructures; and 3) sustainability and effectiveness of the transportation network under possible hazard conditions. Proposed research activities are aligned with the Maritime Transportation Research and Education Center (MarTREC) research interest in the area of “Multimodal Supply Chain Efficacy” by proposing a quantitative framework of multimodal transportation network to address vulnerability from natural and man-made hazards. The study objectives will be accomplished through systematic inventory of transportation facilities in Mississippi and prognostic modeling of infrastructure vulnerability using network model. We strongly believe that the outcome of this study will be cursory towards developing a comprehensive design, adaptation and mitigation framework for the State DOT and MPOs in order to address risk and vulnerability of Mississippi’s transportation infrastructure due to hazards.

**Describe Implementation of Research Outcomes:** Based on the long term records and downscaled climate projections, a 0.3 meter (1.0 foot) sea level rise scenario is projected for the Gulf coast pilot project for future vulnerability analyses. From our findings, although extreme rainfall within the study area may remain unchanged, possible intensification of hurricanes in future may need to be explored while addressing storm surge vulnerability. Critical infrastructures vulnerable to future climate condition and storm surge scenario are identified, and then organized into a database. This database will be helpful to conceptualize and explore future vulnerability and sustainability of multimodal transportation and infrastructure network under a wide variety of hazard conditions.

**Impacts/Benefits of Implementation:** We have developed a conceptual quantitative framework and database identifying critical transportation infrastructure and their vulnerability to natural hazards using existing data, modeling while incorporating downscaled climate scenario specific to the Mississippi Gulf Coast. It is recommended that the current inventory database should be supplemented with other critical transportation assets managed by state and MPO(s). This enhanced database will be helpful to explore future vulnerability and sustainability of multimodal transportation and infrastructure network under a wide variety of hazard conditions. It is recommended that the inventory of critical transportation infrastructures that has already been developed must be linked into a network algorithm. Later response and recovery of the perturbed network must be quantified through what-if scenarios.

**Web Links:** [martrec.uark.edu](http://martrec.uark.edu)

Budget (Funding) Amounts & Source(s) (US DOT +Match(s) =Total Costs): 28.75 USDOT + 14.375k matching = 43.125k total
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Principal Investigator(s) and Contact Information: Himangshu Das
Principal Investigator Institution (University): Jackson State University