Project Title:
Identifying Critical Waterway Infrastructure and Managing Risk Associated with Natural Disasters

Project Abstract (Brief Description):
The transportation system in the U.S. is extremely vulnerable to disruptions and delays from natural disasters. Recently, record hurricane and flooding events have impacted urban transportation and strained the coastal and maritime transportation infrastructure unlike ever before. Agencies are looking to ease modal congestion in urban areas (during extreme events, but also in general) by shifting more freight movement to marine "highway" routes; however, the infrastructure supporting these navigable waterways (e.g., levee systems, ports, locks and dams) is well beyond its design life and increased use of these routes means an increase in the risk of failure during a future extreme weather event. In order to reduce the risk, proper maintenance of this infrastructure is necessary; however, there is currently a backlog of maintenance projects due to the lack of funds available. There is a need for an assessment strategy capable of capturing the probability of failure and associated economic impacts for maritime and inland waterway infrastructure subjected to flooding and other natural disasters.  The overall goal of this research is to develop a risk assessment framework that can be used to aid  decision  making  and mitigation  strategies  for  maritime  infrastructure  deemed  critical  to  the  U.S.  transportation system and economy. This goal will be achieved through the following objectives: (1)  survey past flooding and natural disaster events, the performance of maritime infrastructure, and the  impact  on  transportation activities  and  the  economy,  (2)  develop  a  risk  assessment  and  analysis  framework  using  both qualitative  and  quantitative  models  to  identify  transportation  critical  infrastructure and estimate the associated risk and impact from disruption, and (3) validate the risk  assessment and analysis frame work and evaluate various disaster response and mitigation strategies.  The proposed approach will provide a decision making tool to determine which maintenance issues should be addressed first based on the probability of failure, likelihood of detection, and the associated  economic impacts. The propose d framework can also be extended to consider a number of different causal relationships and impacts such as modal shifts to reduce risk of transporting hazardous materials, and disaster response options.

Describe Implementation of Research Outcomes (or why not implemented) - Place any photos here
*To be determined upon conclusion of the project*: (1) database and system map connecting disaster recurrence, transportation system, and infrastructure health, (2) a FMEA document showing all dimensions, input numbers, and risk priority number for each infrastructure item, which can be updated and maintained by the stakeholders, and (3) a final prioritization recommendation for risk mitigation strategies and maintenance planning. The project findings and deliverables will be publicly shared and submission of the findings to peer reviewed journals and conferences are planned during the project.

Impacts/Benefits of Implementation (actual, not anticipated)
*To be determined upon conclusion of the project:* describe impacts and benefits: Previous studies have considered the transportation aspects and the conditions of the supporting
infrastructure (levee systems, locks and dams) separately; however, the PIs are unaware of any studies which have combined this information into a framework that can be used to guide decision making and mitigation strategies.

Web Links: martrec.uark.edu

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| Budget (Funding) Amounts & Source(s) (US DOT +Match(s) =Total Costs): MarTREC funds $149,940 plus cost share funds $77,963 Total funds $227,903 |
| Project Start and End Dates: July 1, 2020-June 30, 2022 |
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| Principal Investigator Institution (University): University of Arkansas |