MarTREC
Maritime Transportation Research & Education Center

MarTREC UTC Project Information Form
USDOT Tier 1 University Transportation Center
Agency ID or Contract Number DTRT13-G-UTC50

Project Title: Quantifying Resiliency of Maritime Transportation Systems

Project Abstract (Brief Description): Worldwide, maritime transportation networks facilitate the movement of nearly 90 percent of total world trade and 60 percent of global fuel and oil delivery[1]. In 2011, US foreign and domestic waterborne trade totalled more than 2.1 billion metric tons of goods, with 62.5 percent of this total bound for international destinations [2]. This total also accounted for about 15 percent of total global waterborne trade activity. Waterborne shipping has increased at an average annual rate of nearly one percent between 2009 and 2012 [3] . This trend is expected to continue, if not increase significantly, as emerging markets enter the global economy.

This research will leverage and adapted archival NAIS data for resilience analyses of coastal port operations following disruptive events. As part of this effort, archival vessel position reports will used to establish a baseline of channel operations under "routine" non-event conditions. Observed losses in system functionality following a major disruption will be used to quantify the resiliency of the waterway using time dependent performance analysis. This type of analysis is critical when investigating the efficacy of the recovery process protocols and management strategies employed in the days and weeks that follow a major disruptive event.

The primary contribution of this research is that it represents some of the first steps toward creating a systematic, objective means of measuring commercial port resiliency. The methods developed here can be used as a basis for future studies of post-disaster operations and protocols, such as evaluations of channel operations after a disruption so as to better understand MTS characteristics that increase resiliency.

Describe Implementation of Research Outcomes: The results of the research show that an AIS is an excellent source of quantitative data on postdisaster measures of resiliency. The time-dependent performance models developed from these data show the cascading effects of disruptions and quantify the benefits gained by recovery efforts in a time-progressive series. One of the more interesting findings is the manner in which the data show, in quantifiable terms, reductions in performance resulting from incremental, less-publicized disruptions (February 2014 at Galveston Bay) and evidence, albeit limited, of the benefits of warning before a disruptive event. The proposed approach can also be applied to longer disruptions. The West Coast labor dispute and associated port slowdowns in late 2014 and early 2015 provide a prime example of the need for unbiased analysis and can be studied within the context of this research in future work.

Impacts/Benefits of Implementation: These findings are first steps toward the development of standardized metrics for quantifying MTS operational resiliency. AIS data, collected from nearly all commercial vessels on a semicontinuous basis, are a rich source with many applications in disasterscience. The methods developed and applied in this research incorporate an all-hazards approach to quantifying resiliency in navigable waters and can be applied across a range of temporal and spatial scales.

Web Links: martrec.uark.edu

Budget (Funding) Amounts & Source(s) (US DOT +Match(s) =Total Costs): $225,000 (USDOT) + $113,059 (Match) = $338,059

Project Start and End Dates: 10/01/15 and 09/01/18. Project complete.
Principal Investigator(s) and Contact Information: (PI) Dr. Brian Wolshon, Civil & Environmental Engineering, LSU, Baton Rouge, LA 70803 email: brian@rsip.lsu.edu, 225-578-5247 (co-PI) Dr. Scott Parr, Assistant Professor, Civil and Environmental Engineering, CSUF, Fullerton, CA 90621 email: sparr@fullerton.edu, 954-937-8610
Principal Investigator Institution (University): Louisiana State University