MarTREC
Maritime Transportation Research & Education Center

BIL MarTREC Tier 1 UTC Project Request Form
Completed form should not exceed 2 pages
Return to Amy Shell at shell@uark.edu

Submission Date: January 26, 2024
Lead Recipient/Grant Number: University of Arkansas / 69A3552348331
Principal Investigator Institution: Vanderbilt University
Center Name: Maritime Transportation Research and Education Center
USDOT Research Priority: Preserving the Existing Transportation System
Primary USDOT Strategic Goal (*select drop down*): Climate and Sustainability
Principal Investigator(s) with ORCID(s) and Contact Information: **Dr. Hiba Baroud** (ORCID No. 0000-0003-3641-6449) Assistant Professor of Civil and Environmental Engineering, PMB 351831, 2301 Vanderbilt Place, Nashville, TN 37235-1831, phone: 615-322-0471, email: hiba.baroud@vanderbilt.edu; **Co-Principal Investigator(s): Dr. Paul M. Johnson** (ORCID No. 0000-0002-6585-3034, Postdoctoral Research Fellow, Vanderbilt University School of Engineering, PMB, 351831, 2301 Vanderbilt Place, Nashville, TN 37235-1831; phone: 770-893-7363; email: paul.m.johnson@vanderbilt.edu); **Dr. Craig Philip** (ORCID No. 0000-0001-9564-6418) Research Professor of Civil and Environmental Engineering, PMB 351831, 2301 Vanderbilt Place, Nashville, TN 37235-1831, phone: 615-322-6013, craig.e.philip@vanderbilt.edu)
Project Partners: *N/A*
Project Type (*select drop down*): Applied Research
Project Research Topic Type (*select drop down*): Maritime Sustainable and Resilient Infrastructure
Transportation Modes Involved (*check all that apply*): ☒Waterway ☐Road ☐Rail ☐Pipeline ☐Other
Research Project Funding: **(**USDOT + Matching funds = Total Cost): USDOT (MarTREC) funds: $93,368; matching: $46,684. Total Cost: $140,052.
Project Start and End Dates (Format month/day/year to month/day/year): 02/01/2024 to 08/31/2025
Project Title: Climate Financing for Marine Transport: Analyzing the Impact of Climate Adaptation Investments in Inland Waterways (Part II)
Project Abstract (Brief Description): The U.S. inland waterways play a vital role in the domestic economy, but extreme weather events (e.g., floods) perennially threaten to disrupt their operations. Exacerbating these concerns, climate change is expected to increase the frequency and severity of these disruptions in the future. However, despite these known risks, researchers have devoted little attention to evaluating the financial implications of climate change on inland waterway supply chains. In Part I of the project, our research team successfully integrated global climate models with downscaled flood projections. This task took longer than we initially expected because of how nuanced the climate models are and because running the downscaled projections required additional computational resources that we didn't originally anticipate. Additionally, we successfully integrated these flood scenarios with agent-based and economic models used to simulate supply chain disruptions and resulting economic impacts. In Part II of this project, we focus on integrating the decoupled net present value (DNPV) financial framework with the simulations. Doing so will allow us to highlight cases where investments in resilient, water-borne infrastructure can offer cost-effective means of mitigating projected impacts of climate change. We aim to use the development of The Port of Cates Landing, a flood-resilient port located near the mouth of the Upper Mississippi River, as an in-depth case study to demonstrate this approach. However, our work can be extended to other sections of the waterways and transportation modes.
USDOT Priorities: Our project paves the way for researchers being able to quantify the return on investment from climate adaptation strategies based on economic impacts of climate change on inland waterway supply chains. Additionally, this work will greatly improve our understanding of the expected

economic impacts of floods along the Mississippi River and help identify key areas where investments in resilient infrastructure can serve as cost-effective mitigation and adaptation strategies.
Outputs (results of the work performed): Our project will establish a baseline methodology for researchers in being able to quantify the benefits and costs of investing in climate resilience in inland waterway supply chains. This methodology is a state-of-the-art, data-driven solution to evaluating climate finance strategies for investments in resilient waterborne infrastructure based on future costs of inland waterway supply chain disruptions due to climate change. The approach integrates the decoupled net present value (DNPV) with climate modeling, simulation methods, statistical models, and economic models.
Outcomes/Impacts: This achievement will fill a substantial knowledge gap in the scientific literature. Additionally, our results and modeling framework can help policymakers better allocate funding for mitigating future supply chain disruptions.
Technology Transfer Activities: Knowledge transfer will be pursued, including presentations of project results at major conferences (e.g., TRB annual meeting, Society of Risk Analysis, and more) and publication in peer-reviewed journals. Vanderbilt will also seek to disseminate results to and obtain model feedback from stakeholders via its connections with the Lower Mississippi River Science Symposium, Ingram Barge Company, and United States Army Corps of Engineers.
Final Research Report: Upon completion of the project, provide a URL link to final report will be provided
Project Deliverables: ☒ PI agrees to submit all deliverables within 4 weeks after the project end date.
Data Management Plan (DMP): ☒ PI has reviewed and agrees to adhere to MarTREC DMP. Proposed project DMP must be attached to the submission email along with this form.
Center Director Approval Signature and Date: Heather Nachtmann 02.12.24