

MarTREC

Maritime Transportation Research & Education Center

October 2020—September 2021



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MarTREC



UNIVERSITY OF
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VANDERBILT



Cover photo courtesy of USDOT

MESSAGE FROM MarTREC DIRECTOR



The disruption of the COVID pandemic has elevated the importance of our work. Never in my lifetime has our dependence on a well-functioning, multi-modal supply chain been more apparent. We are proud to share this update on our MarTREC team and their contributions over the past year. You will see how productive the team has been while navigating remote teaching and learning, hybrid classes, zoom after zoom after zoom meetings, and other virtual research activities. We are anxiously watching development of the federal infrastructure bill which we hope will provide future funding for the USDOT University Transportation Center program. Thank you for your continued interest and support of MarTREC!

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Courtesy of ARDOT

MarTREC

Maritime Transportation Research & Education Center

ABOUT

MarTREC is a U.S. Department of Transportation Tier 1 University Transportation Center funded through the Office of the Assistant Secretary for Research and Technology. Under MAP-21, MarTREC built economic competitiveness through efficient, resilient, and sustainable maritime and multimodal transportation systems. MarTREC, through continued funding under the FAST Act, is working to preserve the Nation's transportation system through efficient, resilient, and sustainable maritime and multimodal logistics and infrastructure.

VISION

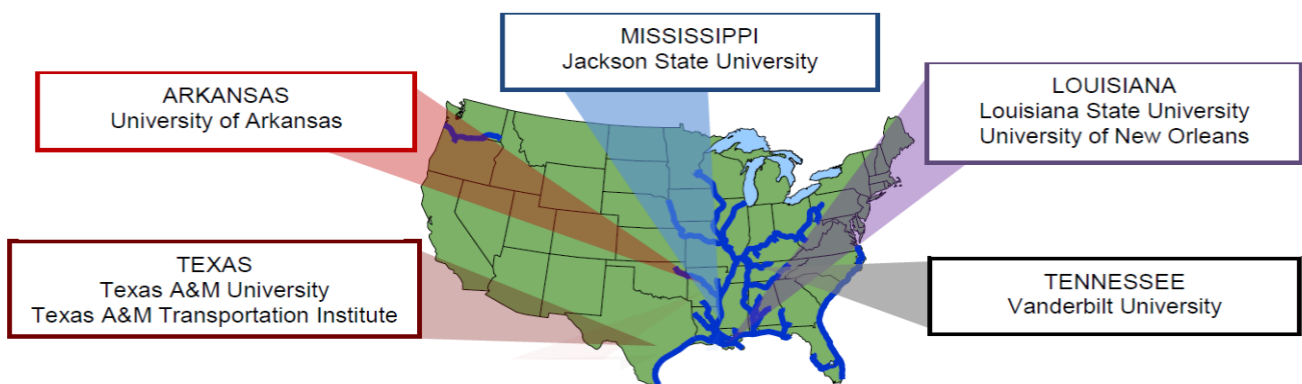
Our vision is to be recognized as the Nation's premier source for expertise on maritime and multimodal transportation research and education. The MarTREC consortium consists of renowned maritime transportation researchers dedicated to transferrable research and inclusive education and workforce development.

CONSORTIUM

Our consortium includes the University of Arkansas (UARK), Jackson State University (JSU), Louisiana State University (LSU), Texas A&M University/Texas A&M Transportation Institute (TAMU/TTI), University of New Orleans (UNO), and Vanderbilt University (VU). Each consortium member is strategically located to support MarTREC's theme: UARK, JSU, LSU, and UNO are located along the Mississippi River; VU along the Cumberland River; and JSU, LSU, UNO, and TAMU/TTI along the Gulf Coast.

RESEARCH

MarTREC conducts research activities in three topic areas: 1) Maritime and Multimodal Logistics Management to expand decision support and facilitate improved operations within the Nation's multimodal supply chain networks; 2) Maritime and Multimodal Infrastructure Preservation to advance state-of-the-art resilient multimodal transportation infrastructure preservation, repair, design, and construction; and 3) Disaster Response and Transportation Planning for Coastal and River Valley Communities to enable the resilience, safety, efficiency, and effectiveness of multimodal transportation systems during disaster response or other major events.



NEW MarTREC FAST Act PROJECTS

Inland Waterway Travel Time Prediction

Jim Kruse, MBA

Texas A&M Transportation Institute

November 2020-April 2022

This project will build an inland waterways travel time prediction model that builds on and improves existing work at the U.S. Army Corps of Engineers Engineer Research and Development Center. The model will be developed in steps. In the first iteration the team will forecast and analyze travel times in one of the simplest river segments. The resulting forecast model will then be applied to a more complex river segment involving locks and possibly bridges. In every case, explanatory variables will be explored and incorporated as appropriate.

Modal Comparison Update: 2001-2019

Jim Kruse, MBA

Texas A&M Transportation Institute

March 2021-December 2021

In December 2007, the Texas A&M Transportation Institute submitted a report to the U.S. Maritime Administration and the National Waterways Foundation titled “A Modal Comparison of Domestic Freight Transportation Effects on the General Public”. Since that time, several updates to the study have been performed, with the last update covering the period 2001 to 2014. This study will cover the period 2001 to 2019. Effects will cover congestion, emissions, energy efficiency, safety, and infrastructure impacts.

The Changing Legal Landscape of Intermodalism – Part 1

Bethany Stich, PhD

University of New Orleans

July 2021-June 2022

This project investigates the ongoing legal challenges surrounding chassis. In 2020, Intermodal Motor Carriers Conference (IMCC) of American Trucking Associations and the Ocean Carriers Equipment Management Association (OCEMA) were involved in negotiations to resolve what IMCC charged were high-priced and inferior quality chassis at many of the nation’s ports. Chassis are considered the linchpin of the intermodal system. Legal challenges at a variety of fed-

eral agencies could fundamentally alter the dynamics of intermodalism and the associated supply chains that rely upon it. The economic loss associated with chassis mismanagement in the United States is in the billions of dollars. Helping the maritime, drayage and terminal operators understand the changing environment in which chassis must legally operate will be essential to avoid disruptions in the transportation system and domestic supply chains.

The Changing Legal Landscape of Intermodalism – Part 2

Janey Camp, PhD, PE, GISP, CFM

Vanderbilt University

August 2021-July 2022

Collaborative project with The Changing Legal Landscape of Intermodalism - Part 1

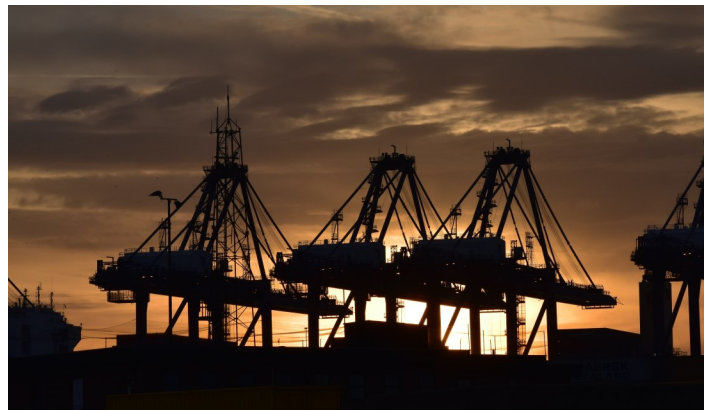
A Digital Twin for Visualizing, Evaluating and Maintaining Multimodal Transportation

Haitao Liao, PhD, Shengfan Zhang, PhD, and Heather Nachtmann, PhD

University of Arkansas

August 2021-June 2023

This research project will develop a digital twin that enables visualizing, evaluating and maintaining multimodal transportation infrastructure. The ultimate goal is to provide an opensource software tool and machine learning-based decision-making approaches that assist the relevant stakeholders in improving their information collection and tracking capabilities, and enhancing the resilience of multimodal transportation infrastructure and beyond.



Courtesy of Matthew Cassidy, Unsplash

Driving Simulators as Educational Outreach for Freight Transportation

Sarah Hernandez, PhD, PE
University of Arkansas
August 2021-June 2023

The purpose of this project is to enhance outreach efforts for middle and high school student groups for freight career awareness by using truck driving simulators. There is a shortage of truck drivers across the U.S. which contributes to inefficiency in the freight system. While there are many complex factors leading to the driver shortage, lack of awareness of the trucking profession is among them. Through engaging workforce outreach programs, it may be possible to attract a new generation to freight careers.

Continued Study of Rapidly Deployable Soil-Cement Mixtures

Cameron Murray, PhD, PE & Michelle Barry, PhD, PE
University of Arkansas
September 2021-June 2023

The maintenance and repair of maritime infrastructure is critical to maintaining important shipping channels and preventing unnecessary loss of life or economic impact from severe weather events. The fastest repair, reconstruction, and maintenance techniques may become more desirable as labor costs in-

crease and delays become costlier. The objective of this research is to identify the properties and proportioning of Belitic Calcium Sulfoaluminate (BCSA) soil-cement mixtures most effective for use in waterway structures. BCSA cement is a rapid setting, low-shrinkage cement which can be used in a similar fashion to portland cement.

K8 MEMES: K-8 Maritime Education Modules to Engage Students

Gary Prinz, PhD, PE
University of Arkansas
September 2021-June 2023

This education project will create entertaining, informative, and STEM promoting "plug-and-play" curriculum learning modules for K-8 educators, using maritime transportation and infrastructure related topics to teach STEM concepts. Coupling music memory, fun STEM theories, and innovative experiential demonstrations into entertaining video learning modules, the objective of this project is to open the door for student excitement in learning of science topics and to develop a new virtual learning paradigm that: 1) excites curiosity, 2) engages alternative cognitive processes, and 3) promotes future engagement in the STEM areas.



Courtesy of Shraga Kopstein, Unsplash

ONGOING MarTREC FAST Act PROJECTS

**Changing Trade and Transportation Patterns:
NAFTA, Cuba, and the US Gulf Coast**
Bethany Stich, PhD
University of New Orleans
March 2018-June 2022

This research is working toward determining how changes in NAFTA has affected intermodal freight flows in the Gulf Coast region. In order to satisfy the current regulations and public policies, the transportation planning process can no longer solely rely on the basics of engineering; it is now forced to find the way in a sea of data, values and actors towards a comprehensive and integrated solution. As a consequence, the variety, quality, and quantity of data to be processed has become one of the big issues for transportation practitioners.

**Informing Post-Disaster Restoration Through
Modeling Interdependent Agriculture and
Transportation Networks**
**Sarah Nurre, PhD, Kelly Sullivan, PhD, and
Benjamin Runkle, PhD**
University of Arkansas
August 2018-November 2021

Agriculture supply chains are of utmost importance for the function of society and are complex due to their interdependency with critical infrastructure systems including energy, water, and maritime and multimodal transportation. This complexity is increased due to the dependence on time-sensitive and capital-intensive operations, uncertain natural events, and volatile commodity markets. This project will develop models that determine how to effectively use transportation to make ag supply chains more resilient.

**Informing Post-Disaster Restoration through
Modeling Interdependent Agriculture and
Transportation Networks-Phase II**
Janey Camp, PhD, PE, GISP, CFM
Vanderbilt University
October 2018-June 2022

Agriculture is a critical part of the U.S. economy. Agriculture is interdependent on certain sectors, particularly transportation to get seed and fertilizers to fields at appropriate times and in getting products that may

spoil to market efficiently. This project will develop models which determine how to effectively use transportation and coordinate restoration efforts to make ag supply chains more resilient .

**Modeling Dynamic Behavior of Navigable Inland
Waterways**
Heather Nachtmann, PhD and Justin Chimka, PhD
University of Arkansas
August 2018-June 2023

The inland waterway transportation system of the United States handles 11.7 billion tons of freight annually and connects the heartland of the United States with the rest of the world. The system is challenged with aging infrastructure and limited operations and maintenance budgets which can cause transportation delays and economic losses. We have developed gap research areas and questions to explore related to the McClellan-Kerr Arkansas River Navigation System (MKARNS) and the feasibility of developing container-on-barge transport in the United States.

**Assessment of Evacuation Network Performance
under Different Evacuation Scenarios**
Brian Wolshon, PhD, PE, PTOE and Scott Parr, PhD
Louisiana State University
July 2019-April 2022

This study will utilize data from Hurricane Irma (2017) to compare traffic characteristics during the evacuation with those observed during routine non-emergency operations. The research will be conducted in the coastal communities in the Florida Keys.

**Development of Freeway Corridor Capacity Measure
to Improve Transportation Resilience**
**Brian Wolshon, PhD, PE, PTOE and
Siavash Shojaat, PhD**
Louisiana State University
July 2019-April 2022

Although evacuations have a long track record of success, they can be complex, costly, and risky. Capacity is one of the most important characteristics of a freeway, which quantifies traffic carrying capability, and is a critical component to the resilience of transporta-

tion systems and the evacuation process. An approach which considers the whole freeway corridor as a system with bottlenecks and different characteristics is needed to assess traffic carrying ability. This study will introduce the concept of corridor capacity to estimate the resilience of freeway operation.

Evaluation of Hydrogel–stabilized Expansive Soils in Mississippi for Sustainable Maritime Infrastructure Design

Yadong Li, PhD, PE

Jackson State University

August 2019-December 2021

Expansive soil causes a variety of maritime transportation infrastructure problem, such as cracks, damage to pipeline, and the differential settlement of foundation. This project seeks the feasibility of using innovative hydrogel treatment as alternative expansive soil stabilization. Hydrogel is a network of polymer chains that are hydrophilic, which has physical entanglement and chemical bonding to integrate solid and liquid properties. The hydrogel treatment may provide opportunities as cost-effective alternative.

Dredging Projects Selection when the Random Shoaling Effect is Considered

Bruce Wang, PhD

Texas A&M University

October 2019-December 2021

Dredging is a constant operation necessary to maintain the waterway shipping capacity. The goal of this project is to provide decision support to achieve a maximum network capacity for dredging operations to support the regional and national economies within a given budget.

Planning for Managed Retreat: Decision Making in the Face of Climate Uncertainty

Leah Dundon, JD, PhD and Mark Abkowitz, PhD

Vanderbilt University

December 2019-May 2022

Sea level rise, increased frequency and intensity of flooding, and other extreme weather events have sparked a growing recognition that managed retreat must be among the solutions considered. This project examines the need for managed retreat and the significant challenges to implementing managed retreat as an adaptation strategy with a particular focus on

transportation and its interdependencies with other critical infrastructure systems.

Bio-Inspired Stabilization of Levee Slope on Expansive Yazoo Clay at the Maritime and Multimodal Transportation Infrastructure in Mississippi

Sadik Kahn, PhD, PE

Jackson State University

April 2020 – June 2022

The existence of Yazoo clay in Mississippi frequently causes distress in levee and highway embankment slopes, which are an integral component of maritime and multimodal transportation infrastructure. This project investigates the effect of vetiver grassroots to stabilize levee slopes at the maritime and multimodal transportation infrastructures at Mississippi.

Evacuation Behavior and its Mobility Impacts in Coastal Communities from Across the Nation

Brian Wolshon, PhD, PE, PTOE and Scott Parr, PhD

Louisiana State University

July 2020-April 2022

Coastal communities are at risk from a multitude of potentially disruptive events. Severe weather, climate change, and sea-level rise all pose serious and long term societal challenges. This research seeks to develop a better understanding of the travel flow principles that govern the evacuation process and its impact on the mobility of a community for different hazard types.

Identifying Critical Waterway Infrastructure and Managing Risk Associated with Natural Disasters

Michelle Barry, PhD, PE and Shengfan Zhang, PhD

University of Arkansas

July 2020-June 2022

The transportation system in the U.S. is extremely vulnerable to disruptions and delays from natural disasters. 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 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.

Modifying Ramp Management Strategies to Enhance Resiliency of Freeway Facilities

Brian Wolshon, PhD, PE, PTOE

Louisiana State University

July 2020-April 2022

Increased traffic demand of coastal areas during emergency evacuations have been shown to affect transportation systems negatively. Application of the ramp management algorithms modified by this method becomes increasingly important during emergency evacuation. This project will study and improve these ramp management strategies.

Port Infrastructure Resilience through Combined Wind-Surge Demand Characterization

Gary Prinz, PhD, PE

University of Arkansas

July 2020-June 2022

This project aims to understand the interactive effects of severe wind and storm surge demands on port infrastructure and to develop hazard demand models to aid improvements to infrastructure design. An integrated analytical and experimental research approach will combine information from detailed fluid-structure-interaction simulations and scaled wind-wave experiments to support port resilience.

Rapid Assessment of Internal Erosion Damage and Erodibility in Levees

Michelle Barry, PhD, PE and Clint Wood, PhD, PE

University of Arkansas

July 2020-June 2022

Recent flooding events have tested our nation's levee systems and highlighted the vulnerability of our transportation system. Traditional drilling and sampling techniques only provide discrete data points which

can lead to ineffective repairs and wasted funds. The ability of geophysical methods to enable quick measurements of material properties over large areas was demonstrated in previous project. This project seeks to make a correlation between geophysical properties and vital engineering properties such as erodibility.

The Unintended Consequences of Flood Mitigation along Inland Waterways – A Look at Resilience and Social Vulnerabilities

Janey Camp, PhD, PE, GISP, CFM

Vanderbilt University

July 2020-June 2022

The objective of this project is to evaluate different flood mitigation efforts in terms of the community costs such as residential buyouts or elevation of structures. This research utilizes agent-based models and empirical data from select communities where significant buyouts have taken place to simulate and estimate the extent to which buyouts may negatively affect community resilience.

Policy and Infrastructure Evaluation Model of Commodity Flows through Inland Waterway Ports

Sarah Hernandez, PhD, PE and Sandra Eksioglu, PhD

University of Arkansas

August 2020-June 2022

The purpose of this project is to guide strategic investment into port capacity through the development of a policy and infrastructure evaluation model of inland waterway commodity flows. A multi-stage stochastic optimization model will be developed to evaluate tradeoffs in strategic, long-term port infrastructure investment with mid-term capacity expansion decisions and provision of complementary highway infrastructure and shorter-term operational practices.



Courtesy of Kelly Sikkema, Unsplash

COMPLETED MarTREC FAST Act PROJECTS

Economic Impact of the Gulf Intracoastal Waterway on the States It Serves

Jim Kruse, MBA and Brianne Glover, JD
Texas A&M Transportation Institute
September 2017-August 2018

This project examined the total economic impact of the GIWW across all sectors shipping goods along the waterway, in the states that it serves. Using IMPLAN (Economic Impact Analysis for Planning), this report estimated the economic impact of the GIWW to be \$61.5 billion annually. Of this, \$31.8 billion was generated in Texas, \$23.1 billion in Louisiana, \$4.5 billion in Mississippi, \$1.9 billion in Alabama, and \$0.2 billion in Florida. Furthermore, the GIWW supports 143,000 jobs and generates \$14.5 billion in labor income annually, with the majority of this occurring in Texas and Louisiana. The GIWW complements the highway system and rail network, requiring less additional investment to add capacity.

A Multimodal Network Approach to the Inland and Coastal Waterway System

Bruce Wang, PhD
Texas A&M University
July 2017-November 2018

Two different maintenance operations are performed annually to rehabilitate the waterway system and keep it functional: dredging which removes sediments in the waterway to restore the lost navigational draft depth, and lock and dam repair due to aging and deterioration. This research solves this special knapsack problem considering the budget constraints, system randomness, and network connectivity to minimize the costs of operations in order to choose the most beneficial projects. By using the data from the Ohio River basin network, the model is solved with Cplex. The results show that the optimal solution is not dependent on the perceived value of time in vessel delay at locks and dams, nor on the costs of vessels. It shows a clear preference to locks and dams repair over dredging operations in the optimal allocation of the maintenance budget.

Large Scale Evaluation of Erosion Resistance of Biocementation against Bridge Scour and Roadway Shoulder Erosion

Lin Li, PhD, PE
Jackson State University
March 2018-February 2019

This study explored an alternative approach for armoring the riverbed with biocementation through MICP to mitigate soil erosion. Long-term erosion exposed to outdoor environment, rainfall induced erosion, and accelerated erosion were conducted on MICP-treated samples to prove the feasibility of the MICP technique for potential applications in prevention of bridge scour and road shoulder erosion. Results indicated that the bio-mediated particulate material based on MICP can provide an effective solution for problematic cases of sandy soil in prevention of bridge scour and road shoulder erosion.

Developing and Applying a Methodology to Identify Flow Generation Influences between Vessel and Truck Shipments

Mario Monsreal, PhD and Jim Kruse, MBA
Texas A&M Transportation Institute
December 2017-March 2019

Truck activity is logically connected to, and generated by, vessel activity at a port. In turn, vessel activity is generated by truck shipments. Although one might expect a 1-to-1 relation between the two types of shipments, that is unlikely the case. This study shed light on the relationship between multimodal flows (trucks and vessels), which will enable agencies and organizations to increase efficiency – and thus competitiveness – for industry, while minimizing negative impacts on a region. Specifically, this analysis provided estimates of specific traffic changes in specific roads, with specific directions of traffic flows and the time when those changes could be expected. These coefficients represent the main contribution of this study. Even though general results are intuitively straightforward, the magnitude of the impact and delays may not be obtained by simple observation.

Development and Implementation of Sustainable Transportation Resilience Indicators

Mark Abkowitz, PhD

Vanderbilt University

June 2017-June 2019

Much has been discussed about resilient transportation infrastructure as well as sustainable practices, but only recently have their interdependencies been brought to light in terms of a community's ability to develop sustainable (economic, social and environmental) resource capacity necessary to be resilient in the face of natural hazard events that could lead to catastrophic consequences. This research created a methodology that can be replicated by other counties and regions who wish to evaluate their flood resilience and improve decisions regarding future flood management. The transferability and scalability of this approach provides considerable value beyond the locale where the case study was implemented.

Interdependency of Port Clusters During Regional Disasters

Brian Wolshon, PhD, PE, PTOE and Scott Parr, PhD

Louisiana State University

January 2018-August 2019

Ports play a vital role in the economy of nations and provide a critical link in the supply chain. Often times, ports form the gateway by which essential goods are received within large geographic regions. Because of their function, ports are exposed to substantial risk of flooding, storm events, sea-level-rise, and climate change. This research quantified port resiliency that is applicable at the individual port level and regionally. In general, the results showed that regionally, ports are more resilient to disruptive events than the individual ports that make up the region. This was likely because as one port enters the disrupted state, another may be entering the recovered state.

Exposure to STEM:

Diversity in Maritime Transportation

Rick Coffman, PhD, PE

University of Arkansas

August 2018-September 2019

The goal of this project was to develop an educational model to open doors to all students, regardless of socio-economic background, who want to pursue careers in maritime and multimodal transportation. The

project proved successful in exposing underrepresented students to STEM related concepts by using examples of maritime and multimodal transport infrastructure. First through fourth grade students were afforded with hands-on experiences with soils that fluoresce and panel dams to help make science fun. Ninth through twelfth grade students were provided with an opportunity to tour several lock and dam systems.

Shipping Container Chassis in the US: The Legacy of Ocean Carriers

Bethany Stich, PhD

University of New Orleans

March 2018-November 2019

Containerized shipping, which accounts for approximately 60 percent of all world seaborne trade while generating approximately 12 trillion United States (US) dollars in 2017, links trading partners between the water, rail, and air modes. If motor carriers could choose a lessor from among the chassis pools, based upon cost-competitiveness, rather than being mandated to one with legacy linkages to ocean carriers, the market would generate cost savings. A necessary condition to achieve this is the exit of the ocean carriers from the chassis node of the supply chain. A fuller answer is to encourage the developing practice of trucker ownership of chassis, this is the global model.

Liquefied Natural Gas Phase (LNG) II: The Future of LNG for the US and Gulf Coast Economies

Bethany Stich, PhD

November 2017-December 2019

The continued growth of Liquefied Natural Gas (LNG) production and long-distance trade has traditionally been taken as a given by global energy analysts, who have premised their positive estimates on gas being both relatively scarce and demand for it virtually unquenchable. Current conditions in the global energy market suggest that what many have predicted as a near perpetual increase in the volume of traded LNG is in fact a bubble that is now in the process of bursting. This project evaluated the feasibility and best practices of equipping the Port of New Orleans for potential storage and shore-side infrastructure for fueling vessels powered by LNG, as well as the feasibility of widespread use of LNG as marine fuel.

Effect of Permeability Variation of Expansive Yazoo Clay at the Maritime and Multimodal Transportation Infrastructure in Mississippi

Sadik Khan, PhD, PE

Jackson State University

September 2018-December 2019

Yazoo clay soil in Mississippi frequently causes pavement distress in multimodal transportation infrastructure. This study investigated the change in unsaturated vertical and horizontal permeability and its effect on the maritime and multimodal infrastructures such as pavement subgrade's moisture variation. The analysis improves the design of the undercut of the pavement, which is critical for deformation and deterioration of pavement of multimodal infrastructure.

Green Technology Approach for Capturing Pollution Washed from Transportation Infrastructures

Danuta Leszczynska, PhD

Jackson State University

March 2018-December 2019

The aim of this research was to produce and investigate a carbon-based substance, namely biochar, as a new material for the in-situ adsorption of pollutants carried by the stormwater runoff from the roads. This research has successfully generated results that are aligned with proposed objectives. New material, namely biochar, was manufactured from various waste biomasses, and investigated in correlation between sources of biomass, firing conditions, presence/absence of oxygen during production, time and temperature of pyrolysis

Liquefied Natural Gas Phase III: Export Competition in a Well Supplied, Flow-Shifting Global Economy

Bethany Stich, PhD

University of New Orleans

March 2018-December 2019

With trillions of cubic feet of shale reserves, the United States' (US) abundance of natural gas has prompted an increase in production of LNG as an export commodity. UNOTI continues to urge that U.S. natural gas energy policy best practice is not to focus on export and export alone, but rather adopt a diversified and climate responsible energy policy that focuses on the Ports of South Louisiana, the Gulf Coast, and the U.S. remaining globally competitive by investing in necessary LNG fueling infrastructure, as well as

continued investment in the existing petrochemical sector of Coastal Louisiana and the Gulf Coast.

Trade-Off Analytics for Infrastructure Preservation

Greg Parnell, PhD and Ed Pohl, PhD

University of Arkansas

August 2018-December 2019

This project developed a course that could be taught to civil engineers, industrial engineers, and the maritime and multimodal infrastructure community for trade-off analytics as a tool to assist in their infrastructure preservation efforts. This course was also packaged as a webinar for practicing professionals.

Visualizing Sea Level Rise Impacts in Transportation Planning

Brian Wolshon, PhD, PE, PTOE and John L. Renne, PhD, AICP

Louisiana State University

January 2018-December 2019

Transportation planners regularly engage communities through public meetings to seek input and engagement on planning for the future including impacts of sea level rise on streets and neighborhoods. New media options allow for three-dimensional (3D) imaging utilizing virtual and augmented reality. It is displayed on glasses that connect to smartphones. This project tested and compared new technologies in South Florida to see if 3D technology helps residents better understand the impacts of sea level rise on transportation infrastructure and communities.

Utilizing Graceful Failure As An Opportunity for Flood Mitigation Downstream to Protect Communities and Infrastructure

Janey Camp, PhD, PE, GISP, CFM and Craig Philip, PhD

Vanderbilt University

May 2018-March 2020

In 2011, prior research observed how "graceful failure" through planned damages to the Birds Point Levee by the U.S. Army Corps of Engineers (USACE) was enacted to alleviate extreme flooding on the Mississippi River. This action, reduced flooding and damage to waterway infrastructure and communities downstream. This research identified areas presently protected by levees that could be utilized for floodwater attenuation and storage along inland waterways.

Interdisciplinary Educational Outreach with Traffic Sensor Build Kits

Sarah Hernandez, PhD, PE

University of Arkansas

May 2019-May 2020

The purpose of this project was to develop learning modules that introduce students to new transportation data collection technologies that can be applied to better understand inland waterway port activity. The research developed a low-cost traffic sensor build kit that includes a mini inductive loop detector, detector card, and laptop. To accompany the build kit, we created lesson plans, how loops function, how to build a loop, and two additional lesson plans with targeted activities for middle and high school students. Each lesson plan includes a colorful slide presentation that features a scenarios of port investment prioritization with examples local to Arkansas. Six complete build kits were assembled and in future work will be shared with summer camps at the UA and with professional transportation groups for outreach events.

Measures of Freight Network Resiliency:

An expanded data capture of Truck Drivers and Support Services under Pandemic Distress

Sarah Hernandez, PhD, PE

University of Arkansas

May 2020-September 2020

COVID-19 responses by public agencies and private citizens have affected drivers and driver support systems. This project considered an expanded definition of the freight network, beyond roads and warehouses, to include truck drivers and driver support systems. Driver support systems include physical infrastructure like public and private rest stops as well as operational protections like Hours of Service (HOS). The purpose of this research was to collect timely data on the impacts of the Covid-19 pandemic on truck driver and trucking operations with a specific focus on issues that affect driver health and safety. An online opt-in panel survey was developed using the Qualtrics survey platform. The survey questionnaire contained 65 questions with skip logic dependent on responses. A total of 523 responses were collected between the dates of May 19th and June 1st, 2020. The dates of the survey correspond to the period of lifted HOS restrictions.

Analysis of Blockchain's Impacts on and Applicability to Maritime Industry

Jim Kruse, MBA

Texas A&M Transportation Institute

May 2019-October 2020

It is unclear how relevant or critical the use of blockchain is for maritime business. It is clear to maritime shipping industry members that cargo tracking is an important function for customer satisfaction as it ties the physical movement of goods with payments, inventory management, and accountability. Since it is new to an industry that is international, fragmented, and complex, this project explores questions from the application of blockchain to maritime supply chains and logistics, in particular, the possible integration with existing technologies such as automatic identification and data capture technologies.

Combining Truck and Vessel Tracking Data to Estimate Performance and Impacts of Inland Ports

Sarah Hernandez, PhD, PE and Chase Rainwater, PhD

University of Arkansas

January 2019-December 2020

Performance-driven prioritization has shifted public sector focus to freight performance measurement. As a result, quality, multi-modal data is needed to support planning efforts, such as long-range freight travel demand modeling. The purpose of this project is to develop a method to fuse truck and marine vessel tracking data to better estimate performance of multi-modal supply chains that use inland waterway ports.



Courtesy of Wesley Tingey, Unsplash

Engaging the Business and Tourism Industry in Visualizing Sea Level Rise Impacts to Transportation Infrastructure in Waikiki, Hawaii

Brian Wolshon, PhD, PE, PTOE and John Renne, PhD, AICP

Louisiana State University

March 2018-December 2020

This research built upon another related project that focused on visualizing sea level rise impacts to transportation infrastructure in South Florida and extends and focuses on the business and tourism industry of Waikiki HI. Waikiki is facing major impacts from sea level rise. Transportation and community planners engaged with stakeholders through meetings to seek input and engagement on planning for the future including impacts of sea level rise on streets, buildings and neighborhoods.

Fatigue Crack Control in Waterway Lock Gate Pintle Locations Subjected to Multi-Modal Fracture

Gary Prinz, PhD, PE

University of Arkansas

August 2018-March 2021

Lock gates are an important part of the transportation infrastructure within the United States, having many economic, safety, and environmental benefits over rail and highway transportation systems. Many existing lock gates throughout the U.S. have reached or exceeded their initial design life and require frequent repairs to remain in service. This project sought to improve lock gate reliability by identifying and developing fracture mitigation strategies for multi-mode fatigue issues that arise near key pintle locations.

Towards Integrating Resilience into Everyday Transportation in Coastal Communities

Brian Wolshon PhD, PE, PTOE

Louisiana State University

August 2018-March 2021

Coastal communities have become increasingly vulnerable to sea level rise, hurricanes and other natural disasters. These events force the communities to evacuate in a relatively unpredictable way. This research leveraged technologies such as traffic simulation to help transportation agency entities maximize their resilience practices within their budgets.

Development of AIS Model of Texas Gulf Intracoastal Waterway Travel Times

Jim Kruse, MBA

Texas A&M Transportation Institute

October 2019-April 2021

The focus of this research was to perform analysis on the Texas portion of the Gulf Intracoastal Waterway (GIWW). The Texas GIWW presents a level of complexity significantly greater than rivers mentioned above because of the intersections with ship channels and the fact that some barges go into and exit port areas while others pass through. The project established origins and destinations, segmented the waterway into links, analyzed AIS data to identify vessel transits and associated transit times on the links, and developed a methodology for predicting travel times.

Learning from USACE Open Data for Locks

Justin Chimka, PhD

University of Arkansas

August 2018-May 2021

In August 2017, the USACE began to enable unprecedented data access by publishing its Open Data for Navigation online. This project sought to explore the new USACE Open Data for Locks, describe its relevant datasets, and inventory their contents, identify responses or variables across relevant datasets, and diagnose efficient statistical models of the usable subsets in order to make general statements about USACE lock data and public lock unavailability.

Using CSA Cement for Novel Waterway Repair Materials

Cameron Murray, PhD & Michelle Bernhardt, PhD, PE

University of Arkansas

August 2018-May 2021

Calcium Sulfoaluminate-Belite (CSA) cement is a rapid setting hydraulic cement. Due to its rapid hardening characteristics and lower shrinkage and creep compared to typical portland cement, it is an ideal candidate as a repair material. This research worked on developing new mixtures utilizing CSA cement that can be applied to waterway repairs. A grout mixture capable of setting up rapidly underwater and a soil-cement mixture that can rapidly stabilize slopes and waterway structures will be developed.

COMPLETED MarTREC PROJECTS

Maritime and Multimodal Logistics Management

Dynamic Decision Modeling for Inland Waterway Disruptions

Shengfan Zhang, Ph.D.
Heather Nachtmann, Ph.D.
University of Arkansas
December 2016

https://martrec.uark.edu/research/dynamic_decision_modeling_final_report.pdf

Economic Impacts of Lock Usage and Unavailability

Justin R. Chimka, Ph.D.
University of Arkansas
June 2016

<https://martrec.uark.edu/research/chimka-final-report-2016.pdf>

Efficient Dredging Strategies for Improving Transportation Infrastructure Resilience

Kelly Sullivan, Ph.D.
University of Arkansas
December 2016

https://martrec.uark.edu/research/efficient_dredging_strategies_final_report.pdf

Multimodal Transport and TransLoad Facilities in Arkansas

Justin R. Chimka, Ph.D.
University of Arkansas
January 2015

<https://martrec.uark.edu/research/multimodal-transport-and-transload-facilities-in-arkansas.pdf>

Regional Economic Impact Study of the McClellan-Kerr Arkansas River Navigation System

Heather Nachtmann, Ph.D.
University of Arkansas
August 2015

https://martrec.uark.edu/research/mkarns_final.pdf

Supporting Secure and Resilient Inland Waterways

Heather Nachtmann, Ph.D.
Justin Chimka, Ph.D.
University of Arkansas
June 2018

https://martrec.uark.edu/research/ua_ssriwi_final.pdf

Supporting Secure and Resilient Inland Waterways: Phase Two

Heather Nachtmann, Ph.D.
Justin Chimka, Ph.D.
University of Arkansas
August 2018

https://martrec.uark.edu/research/ua_ssriwii_final.pdf

Maritime and Multimodal Infrastructure Preservation

Climate Impacts on Lock Use and Performance

Justin Chimka, Ph.D.
University of Arkansas
August 2018

https://martrec.uark.edu/research/ua_climate_final.pdf

Corrosion-Tolerant Pre-Stressed CFRP Fatigue Retrofits for Improved Waterway Lock Reliability

Gary Prinz, Ph.D., P.E.
Clint Wood, Ph.D., P.E.
University of Arkansas
September 2018

https://martrec.uark.edu/research/ua_corrosion_final_report.pdf

Effect of Swell-Shrink Characteristics on Landslides in Yazoo Clay

Mohammad Sadik Khan, Ph.D., P.E.
Jackson State University
June 2018

https://martrec.uark.edu/research/jsu_final_effect.pdf

Exploration of Novel Multifunctional Open Graded Friction Courses for In-situ Highway Runoff

Yadong Li, Ph.D., P.E.
Lin Li, Ph.D., P.E.
Jackson State University
June 2016
<https://martrec.uark.edu/research/yadong-li-final-report-2016.pdf>

Evaluating the Performance of Intermodal Connectors

Sarah Hernandez, Ph.D.
University of Arkansas
September 2018
https://martrec.uark.edu/research/ua_evaluating_performance_final_report.pdf

Development of a Design Protocol: Sustainable Stabilization of Slope using Recycled Plastic Pins in MS

Mohammad Sadik Khan, Ph.D., P.E.
Jackson State University
October 2017
https://martrec.uark.edu/research/development_of_a_design_protocol.pdf

Identifying High-Risk Roadways for Infrastructure Investment Using Naturalistic Driving Data

Brian Wolshon, Ph.D., P.E., PTOE
Louisiana State University
June 2015
https://martrec.uark.edu/research/identifying_high_risk_roadways_corrected.pdf

In-Situ Monitoring and Assessment of Post Barge-Bridge Collision Damage for Minimizing Traffic Delay and Detour

Wei Zheng, Ph.D., P.E.
Jackson State University
June 2016
<https://martrec.uark.edu/research/wei-zheng-final-report-2016.pdf>

Innovative Bio-Mediated Particulate Materials for Sustainable Maritime Transportation Infrastructure

Lin Li, Ph.D., P.E.
Jackson State University
June 2017
https://martrec.uark.edu/research/lsu_innovative_bio-mediated_final.pdf

LNG Bunkering for Marine Vessels at the Port of New Orleans: Siting and Facility Components

Bethany Stich, Ph.D.
James R. Amdal
University of New Orleans
January 2016
https://martrec.uark.edu/research/uno_lng.pdf

Optimal Dredge Fleet Scheduling within Environmental Work Windows

Chase Rainwater, Ph.D.
Heather Nachtmann, Ph.D.
University of Arkansas
August 2016
<https://martrec.uark.edu/research/optimal.pdf>

Optimal Dredge Fleet Scheduling - Phase 2 Research

Chase Rainwater, Ph.D.
Heather Nachtmann, Ph.D.
University of Arkansas
November 2017
https://martrec.uark.edu/research/ua_optimal_dredge_phase2.pdf

Predicting Soil Type from Non-destructive Geophysical Data using Bayesian Statistical Methods

Michelle Bernhardt, Ph.D, P.E.
University of Arkansas
August 2018
https://martrec.uark.edu/research/ua_predicting_final.pdf

Quantifying Resiliency of Maritime Transportation Systems

Brian Wolshon, Ph.D., P.E., PTOE
Louisiana State University
June 2018
https://martrec.uark.edu/research/lsu_quantifying_final_report.pdf

Rapid and Non-Destructive Assessment of Levees for Strength and Liquefaction Resistance

Clinton Wood, Ph.D., P.E.
Michelle Bernhardt, Ph.D., P.E.
University of Arkansas
July 2017

https://martrec.uark.edu/research/ua_final_levees.pdf

Disaster Response and Transportation Planning for Coastal and River Valley Communities

Development of a Large-Scale Traffic Simulation Model for Hurricane Evacuation of Mississippi Coastal Region

Feng Wang, Ph.D., P.E.
Jackson State University
August 2015

https://martrec.uark.edu/research/martrec_final_report_development.pdf

Evaluating Coastal and River Valley Communities Evacuation Network Performance Using Macroscopic Productivity

Scott Parr, Ph.D., E.I.T.
Louisiana State University
May 2017

https://martrec.uark.edu/research/evaluating_coastal_lsu.pdf

Measurement of Traffic Network Vulnerability for Mississippi Coastal Region

Feng Wang, Ph.D., P.E.
Jackson State University
July 2017

https://martrec.uark.edu/research/jsu_final_measurement_of_traffic.pdf

National Inventory and Analysis of Transit Oriented Development in Proximity to Coasts and Port Facilities

John L. Renne, Ph.D., AICP
University of New Orleans
September 2017

https://martrec.uark.edu/research/uno_tod.pdf

Quantification of Multimodal Transportation Network Vulnerability: A Pilot Study in Mississippi

Himangshu Das, Ph.D., P.E.
Jackson State University
April 2017

https://martrec.uark.edu/research/quantification_multimodal.pdf

Road Sign Recognition during Computer Testing versus Driving Simulator Performance for Stroke and Stroke+Aphasia Groups

Neila J. Donovan, Ph.D.
Louisiana State University
June 2015

<https://martrec.uark.edu/research/road-sign-recognition-during-computer-testing.pdf>

Statistical Analysis of Vehicle Crashes in Mississippi

Feng Wang, Ph.D., P.E.
Jackson State University
July 2017

https://martrec.uark.edu/research/jsu_final_statistical_analysis.pdf

Vulnerability of Fuel Distribution Systems to Hazards in Coastal Communities

John Pardue, Ph.D., P.E.
Louisiana State University
March 2017

https://martrec.uark.edu/research/vulnerability_fp.pdf

MarTREC STUDENT ACHIEVEMENTS



Kaley Collins, MarTREC's 2020 Outstanding Student of the Year

Kaley is working to make critical port structure more reliable through research on modeling combined storm surge and wind demands during extreme meteorological events such as hurricanes. While an undergraduate Civil Engineering student at the University of Arkansas, Kaley performed an honors research project characterizing 3-D printed steel material properties. Kaley completed her M.S. in Civil Engineering in May 2021. Kaley is now working on her PhD, and she intends to pursue a career in the private sector.

For the past 29 years, the U.S. Department of Transportation has honored an outstanding student from each active University Transportation Center at a special ceremony held in conjunction with the TRB Annual Meeting. Due to the impact of the coronavirus pandemic (COVID-19), a virtual awards ceremony was held January 6, 2021.



ITE Student Chapter Earns Victory at Traffic Bowl

At the spring 2021 meeting of the Missouri Valley District of the Institute of Transportation Engineers (MOVITE), teams from the University of Arkansas, Washington University and the University of Kansas competed in the annual Traffic Bowl. This was the inaugural competition of this "Jeopardy" style quiz game, witnessed by more than two hundred professional MOVITE chapter members.

The Arkansas team, mentored by civil engineering assistant professor Sarah Hernandez, consisted of undergraduates Mir Ali, Mariah Crews, Simon Rothwell, and Ph.D. student Sanjeev Bhurtyal. Along with their victory in the Traffic Bowl, the team tied for 1st place with their chapter video submission.



Andrew Brown presents at CCAPPTIA Conference, Climate Change Adaptation Planning for Port, Transportation Infrastructure, and the Arctic

Andrew Brown, student at the Master of Maritime Business Administration and Logistics Program at the Department of Maritime Business Administration of Texas A&M University at Galveston. In this research, he had the opportunity to present at Climate Change Adaptation Planning for Port, Transportation Infrastructure, and the Arctic (CCAPPTIA) in the summer of 2021. This conference is the premier forum for researchers and stakeholders of the region to gather and provide feedback on major issues. Browns' research co-authored by Dr. Cassia Galvao, focuses on port development regarding the future of the Asian energy market.

MarTREC FACULTY ACHIEVEMENTS



Two MarTREC faculty receive prestigious National Science Foundation Early CAREER Award for 2021.

Sarah Hernandez, PhD, PE, Assistant Professor of Civil Engineering, University of Arkansas, NSF CAREER project entitled “Towards Unbiased Long-Range Freight Planning Through Passive-Sensors and Workforce Diversity.”

Sadik Khan, PhD, PE, Assistant Professor of Civil Engineering, Jackson State University, NSF CAREER project entitled “Climate Resilient Landslide Repair on Expansive Soil Using Vetiver Grass.”



Janey Camp, PhD, PE, GISP, CFM, Research Associate Professor of Civil and Environmental Engineering, Vanderbilt University, has been selected as a contributor to the Fifth National Climate Assessment, a quadrennial report on the varied impacts and risks presented by global climate change across the country.

Camp has expertise in infrastructure resilience and flood mitigation and response strategies, and she will serve as an author of the Southeast chapter. The report will address the risk of climate change in the Southeastern U.S. as well as provide research-backed response strategies for the area. The states included for the study are Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee and Virginia.



CHANGING THE TIDE IN TRANSPORTATION—A webinar series on equity and the Black experience in transportation hosted by the Council of University Transportation Centers.

Melissa Tooley, PhD, PE, Director of External Initiatives, Texas A&M Transportation Institute, steering committee member.

Thomas Carter III, BS, Assistant Dean, Academics and Student Affairs, College of Engineering, University of Arkansas, speaker.

CTTP AWARD FROM ARDOT



The award in the amount of \$900,000 dispersed over three years will allow the Center for Training Transportation Professionals to continue to offer training and certification programs for all industry professionals performing quality control and quality assurance testing of materials on federally funded highway construction projects in the state of Arkansas.

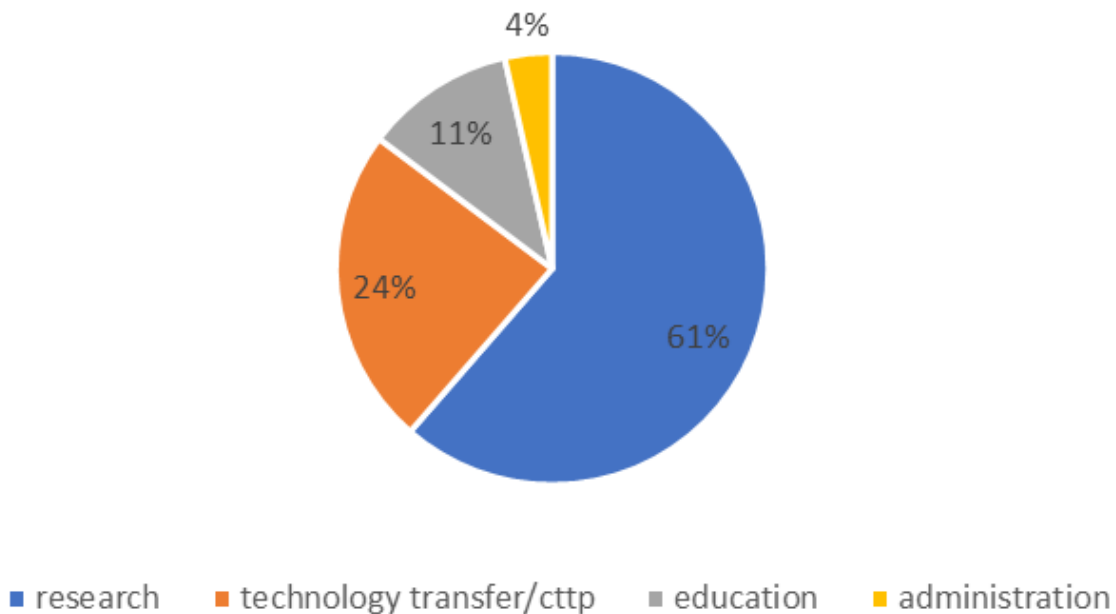
This sponsorship from the Arkansas Department of Transportation will support the Department of Civil Engineering and the Center for Training Transportation Professionals in continuing their mission of educating future civil engineers in the ever-changing landscape of public infrastructure, with an eye towards

the interaction between technology and nature. The programs of the training center allow the U of A a strong connection to industry, maintaining a close relationship with the Arkansas Department of Transportation. These collaborations also provide hourly positions for civil engineering students, allowing them to interact and network with industry professionals.

“The Center for Training Transportation Professionals has a long tradition of providing quality training and certification programs and is recognized as one of the best programs in the nation,” Stacy Williams, director of Center for Training Transportation Professionals. “This award represents a continued commitment and recognition of the quality programs offered by CTTP that serve a vital role in the transportation industry.”

MBTC FINANCIALS FY2021

Fiscal Year 2021 Total Expenditures
\$1,778,136



CENTER FOR TRAINING TRANSPORTATION PROFESSIONALS



**Frances Griffith, Roselie Conley, Talley Faulkner, Austin Williams
Stacy Williams, Mary Fleck, Katie Juniel**

The Center for Training Transportation Professionals (CTTP) has continued to adapt to the ever-changing conditions of the pandemic. While CTTP already demonstrated a strong online presence, these resources have been invaluable in assisting technicians with training needs when social distancing restrictions prevented in-class attendance. The CTTP website, cttp.uark.edu, contains a complete suite of mobile-friendly training materials for each certification course, including training modules, knowledge checks, videos, practice problems, and study guides. In particular, the training modules and videos have been utilized extensively not only in Arkansas, but worldwide, and the videos have received nearly 400,000 views since the pandemic began.

CTTP's online resources were originally intended to be used for class preparation, as a study aid, and as a refresher after the course was completed. However, social distancing directives limited class participation, and the online tools were incorporated into an alternative certification scheme such that a technician could complete the training in the virtual format, and then attend in-person to complete the written and performance exams. This option has benefitted many in the transportation industry who are struggling to fill available positions with certified technicians.

CTTP has also been instrumental in providing technology transfer opportunities in a virtual format. Several existing classes, including Asphalt Pavement Maintenance, Pavement Management, Asphalt Paving, and Stormwater Management, have been converted to a series of shorter, more targeted topics that are more suitable for live webinar delivery. The virtual format has allowed local agencies to continue training efforts within the context of existing travel restrictions and has also allowed participation from across the country. Since this conversion, approximately 1200 attendees from 24 states and territories have participated in infrastructure workforce development training webinars instructed by CTTP.

CIVIL ENGINEERING RESEARCH AND EDUCATION CENTER



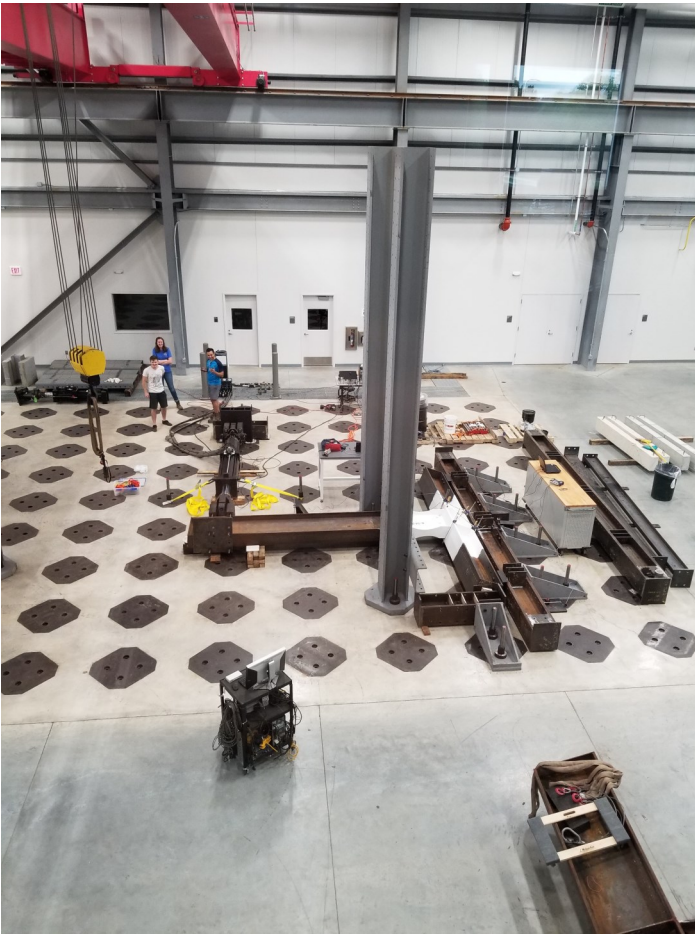
Grady E. Harvell, president of W&W|AFCO Steel and University of Arkansas graduate of civil engineering, was a major contributor and driving force in the construction of the Grady E. Harvell Civil Engineering Research and Education Center. Therefore, the new building was named in his honor.

Harvell said the space will improve faculty research capabilities and will prove attractive for future students and faculty as well as industries and organizations supporting research projects. Harvell explained that as Arkansas' steel industry has grown so has the need for a facility like this one.

CEREC includes a high-bay structural testing facility with a four-foot thick "strong-floor" capable of testing large-scale structural systems and components. It also houses a 25-ton rail crane to move heavy materials to allow students and faculty members alike to conduct real world research.



CIVIL ENGINEERING RESEARCH AND EDUCATION CENTER



The Department of Civil Engineering and the College of Engineering at the University of Arkansas celebrated the completion of the Grady E. Harvell Civil Engineering Research and Education Center (CEREC). First conceived as a project goal by the Arkansas Academy of Civil Engineering in 1999, the goals for CEREC are providing a facility that will allow students and faculty to conduct research and provide teaching laboratories related to material testing and full-scale material testing. CEREC will also allow the University to consolidate research labs that are currently spread across three facilities on separate campuses.

The 37,400 square-foot state of the art facility will provide space and opportunities for civil engineering students for decades to come. Along with hosting several graduate-level courses, CEREC provides laboratory space for 15 faculty members and 75 students to conduct research. This facility is phase one of a two phase plan. Phase one includes a structural high-bay with strong floor and lay-down yard, concrete and steel materials labs, and a fabrication shop. Phase two will include geotechnical and asphalt testing labs, laboratory, classroom, and certification spaces for the Center for Training Transportation Professionals.



COMPLETED MBTC RESEARCH PROJECT

Data Simulation to Support Interdependence Modeling in Emergency Response and Multimodal Transportation Networks

Haitao Liao, PhD

Heather Nachtmann, PhD

University of Arkansas

September 2017-August 2020

The inland waterways in the United States (U.S.) are used to transport approximately 20% of America's coal, 22% of U.S. petroleum products, and 60% of farm exports making these waterways a significant contributor to the U.S. multimodal transportation system. General freight movements via the inland waterways are expected to increase in the upcoming years due to economic and logistic drivers, nonetheless, current studies addressing the impacts of disruptions on waterways operation and multimodal commodity flow along with the economic analysis are limited. One reason for the limited number of studies is the lack of tools to facilitate research in this area by providing data-driven models. For a full utilization of the nation's multimodal transportation

infrastructures and the improvement of their effectiveness and safety in response to extreme conditions, a data-driven system needs to be put in place to quantify the interdependency of different modes of transportation, coordinate their operations, and evaluate how disruptions of interrelated ICIs affect economic outcomes. In this study, data about natural extreme events affecting inland waterways were collected and used to predict possible occurrences of such events in the future using a spatio-temporal statistical model. We investigated the waterways disruptions effect on interconnected transportation systems using a simulation tool built on a statistical model. A case study based on the Mississippi River and McClellan-Kerr Arkansas River Navigation System (MKARNS) illustrates the use of the simulation tool in interdependence modeling and decision making for the operation of a multimodal transportation network.

Completed projects can be found at:

https://mack-blackwell.uark.edu/Research/completed_project_reports.php

ONGOING MBTC RESEARCH PROJECT - TransMAP

Transportation and Maritime Analytics Partnerships

Justin Chimka, PhD

Jack Cothren, PhD

Heather Nachtmann, PhD

Chase Rainwater, PhD

University of Arkansas

Jim Kruse, MBA

Texas A&M Transportation Institute

October 2019—September 2022

Conducted through the Maritime Transportation Research and Education Center (MarTREC), the Transportation and Maritime Analytics Partnerships Hub (TransMAP) project is supported by the Maritime Administration of the U.S. Department of Transportation. The team, led by the University of Arkansas in partnership with the Texas A&M Transportation Institute, is working to make available large-scale data and visualization tools related to maritime freight

transportation on infrastructure, systems, and networks accessible to humans and machines through the Internet of things, in order to enable improved resilience, planning, investment and operational decisions. TransMAP's goal is to develop a 'visual decision space' for effective planning, management, and advancement of efficient, resilient, and sustainable multimodal transportation systems including highway, rail, maritime, and pipeline. Efficient, resilient, and sustainable multimodal transportation is a national priority. To meet the challenging environment of the Nation's complex and ever-changing transportation system, large-scale data sets need to be captured and analyzed to support research and planning, and made available for real-time access for use by government agencies, industry and citizens. Intelligently using big data is critical to manage, improve, maintain, design and build our transportation infrastructure.

BRIEF HISTORY OF MBTC

The Mack-Blackwell Transportation Center (MBTC) has served the state of Arkansas and the nation for over 30 years by providing state-of-the-art research, quality transportation education, and technology transfer.

In 1987, Congress authorized the U.S. Department of Transportation (USDOT) University Transportation Center (UTC) program, which led to the establishment of ten regional UTCs, one in each of the ten federal regions. The UTC program was designed to improve transportation research and education in the United States by advancing technology and expertise across multiple modes of transportation and addressing vital workforce needs for the next generation of transportation leaders. The center was named in the Intermodal Surface Transportation Efficiency Act of 1991, which was signed into law by President George H. W. Bush. Dr. Bob Elliott coined the center name cited in the bill – the National Rural Transportation Study Center.

In 2007, MBTC was designated as one of seven members of the U.S. Department of Homeland Security National Transportation Security Center of Excellence, in accordance with HR1, implementing the recommendations of the 9/11 Commission Act of 2007. The center fulfilled transportation security research needs for six years under this designation.

In 2013, MBTC partnered with Jackson State University, Louisiana State University and the University of New Orleans to form the Maritime Transportation Research and Education Center (MarTREC), which was competitively selected as a USDOT Tier 1 University Transportation Center under the MAP-21 transportation bill. With continued funding in 2016, the MarTREC consortium added Texas A&M University and Vanderbilt University and, through the FAST Act, is working to preserve the Nation's transportation system through efficient, resilient, and sustainable maritime and multimodal logistics and infrastructure.

DEAN'S OFFICE APPOINTMENTS



Kim Needy, dean of the Graduate School and International Education, has been named dean of the College of Engineering. Needy previously held an academic appointment at the University of Pittsburgh (1993-2008) and served as the department head of industrial engineering (2008-2014) and dean of the Graduate School and International Education (2014-2020) at the University of Arkansas. Needy is a national leader in the field of industrial engineering. She has co-authored more than 150 papers and the textbook, *Fundamentals of Engineering Economic Analysis*. She has been awarded 38 research grants from various agencies including the National Science Foundation and Construction Industry Institute.

Heather Nachtmann, senior associate vice chancellor for research and innovation, Earl J. and Lillian P. Dyess Endowed Chair in Engineering, and professor of industrial engineering, has been re-named associate dean for research in the College of Engineering. As associate dean, Nachtmann will support the goals of the dean of engineering by supervising the college's research and graduate missions to promote and advance scholarship, facilitate multidisciplinary research activities and articulate and implement the research vision for the college. She has been with the College of Engineering since 2000, starting as an assistant professor in the Department of Industrial Engineering.

Kevin Hall, university professor of civil engineering, has been named associate dean for academics in the College of Engineering. As associate dean, Hall will have programmatic and financial oversight of all college academic programs, including on-line programs, in coordination with the college fiscal officer. Hall joined the Department of Civil Engineering as an assistant professor in 1993. He was promoted to associate professor in 1997, full professor in 2002 and university professor in 2020. He served as head of the Department of Civil Engineering from 2005-2016.

MACK-BLACKWELL TRANSPORTATION CENTER CELEBRATING 30 YEARS



Courtesy of ARDOT

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MBTC STAFF

Heather Nachtmann, Ph.D.
Director

Kevin D. Hall, Ph.D., P.E.
Executive Director

Amy M. Shell, M.S.
Center Coordinator

Stacy G. Williams, Ph.D., P.E.
CTTP Director

Frances Griffith, M.S.
CTTP Associate Director

Roselie Conley
CTTP Research Technologist

Mary Fleck
CTTP Instructor

Austin Williams
CTTP Programmer

Talley Faulkner
CTTP Program Specialist

Katie Juniel
CTTP Administrative Specialist

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ARKANSAS

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Director of External Initiatives, Texas A&M Transportation Institute

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MACK-BLACKWELL TRANSPORTATION CENTER

October 2020—September 2021



mackblackwell.uark.edu