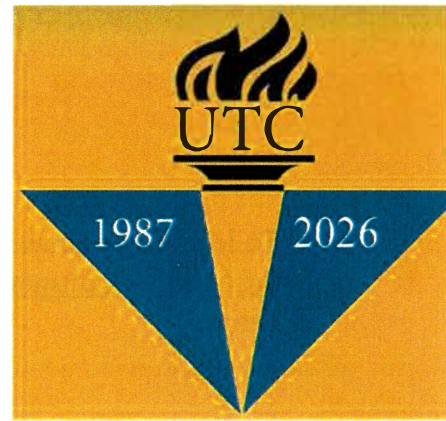
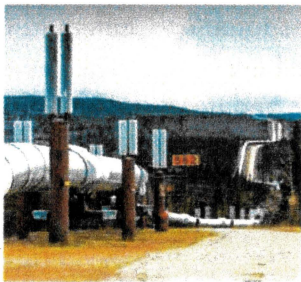
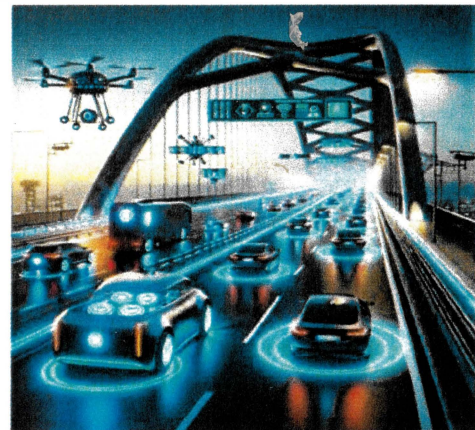
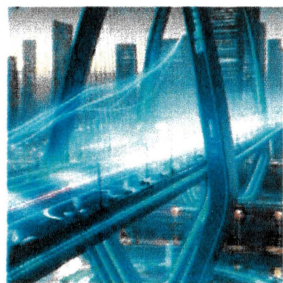
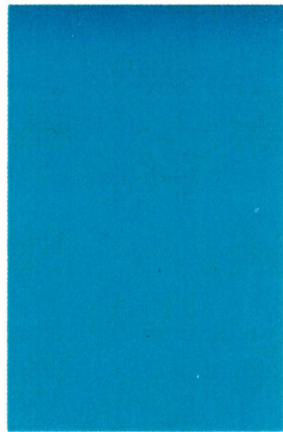
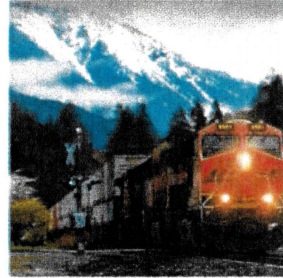




University Transportation Centers Program (UTC)

PROFILES OF PROGRESS

Bipartisan Infrastructure Law (BIL)
Fiscal Years: 2022–2026



To learn more about the University Transportation Centers (UTC) visit our website at:
<https://www.transportation.gov/content/university-transportation-centers> - or- scan the QR Code
below:



DISCLAIMER:

This booklet highlights research activities and projects by University Transportation Centers (UTC) funded under President Biden's landmark Bipartisan Infrastructure Law (BIL). The objectives and research initiatives presented are solely those of the authors and not necessarily the views of the Office of the Assistant Secretary for Research and Technology or the U.S. Department of Transportation.

A LETTER FROM THE DEPUTY ASSISTANT SECRETARY OF TRANSPORTATION FOR RESEARCH AND TECHNOLOGY

Greetings,

This past year has been an exciting year for the U.S. Department of Transportation, and especially for our University Transportation Centers (UTC) program. Since 1987, the University Transportation Centers (UTC) Program has worked to advance transportation expertise and U.S. technology in the varied disciplines within the field of transportation through:

- Research
- Education and workforce development
- Technology transfer activities

Internationally recognized for their capacity to lead, innovate, and educate, UTCs enhance and transform our transportation system, keeping it in step with our nation's economic, environmental, and societal goals. The program continues to serve a vital need—developing the next generation of transportation professionals to create and lead the Nation's transportation future.

Thanks to President Biden's landmark Bipartisan Infrastructure Law, we have unprecedented resources to deploy in the service of our mission, delivering improvements that will endure for generations—including \$90 million in annual funding for the next generation of UTCs.

In February, after a record number of applications, U.S. DOT announced 34 of the 35 new UTCs under the BIL—including the first Historically Black College and University (HBCU) to become a national UTC grantee. And as of December, the 35th UTC representing Region 8 was selected. These UTCs will work to drive research and innovation in one of the seven strategic priority areas and continue to advance our nation's technology and expertise through solutions-oriented research and deployment, and novel ideas and approaches.

Over the past several months, I've had the honor of visiting some of these new UTCs, and I am immensely impressed with the innovation and groundbreaking research that's taking place. As I visit with students and faculty at these Centers, I continue to be inspired by the new generation of visionary leaders who will help to transform our transportation system to a safer, more resilient, sustainable, equitable "system of systems".

The University Transportation Centers Program *Profiles of Progress* is an opportunity a look at our new UTCs and to gain some insight into the people and research that will drive our transportation future. I encourage you all to take a look at the amazing work being done across the nation.

I want to also take this opportunity to thank each of our UTCs, university and other sector partners, leaders, researchers, faculty, staff and students for your part in making this program a success. It is your hard work, commitment and ingenuity that will continue to drive us forward.

Sincerely,

A handwritten signature in cursive script, reading "Robert C. Hampshire".

Robert C. Hampshire, PhD
Deputy Assistant Secretary of Transportation for Research and Technology
and Chief Science Officer, U.S. DOT

For further information on the University Transportation Centers Program, or the Department's research, development, and technology portfolio, please contact:

Caesar Singh, P.E.
Director, University Grants Programs
Caesar.Singh@dot.gov

LIST OF CENTERS

Lead University - Center Name - Consortium Members

NATIONAL CENTERS

Carnegie Mellon University

Safety21

- Community College of Allegheny County
- Community College of Philadelphia
- Morgan State University
- The Ohio State University
- University of Pennsylvania
- The University of Texas Rio Grande Valley

Clemson University

National Center for Transportation Cybersecurity and Resiliency (TRACR)

- Benedict College
- Florida International University
- Morgan State University
- Purdue University
- South Carolina State University
- University of Alabama at Tuscaloosa
- University of California at Santa Cruz
- University of Texas at Dallas

Prairie View A&M University

National Center for Infrastructure Transformation (NCIT)

- Arizona State University
- Blinn College District
- Michigan State University
- Rutgers, The State University of New Jersey
- Texas A&M University

University of California, Davis

National Center for Sustainable Transportation (NCST)

- California State University, Long Beach
- Georgia Institute of Technology
- Texas Southern University
- University of California, Riverside
- University of Southern California
- The University of Vermont

The University of Texas at Austin

Center for Understanding Future Travel Behavior and Demand (TBD)

- Arizona State University
- California State Polytechnic University, Pomona
- City College of New York
- Diné College
- Georgia Institute of Technology
- University of Michigan
- University of Washington

REGIONAL CENTERS

1) University of Massachusetts Amherst

New England University Transportation Center (NEUTC)

- Bunker Hill Community College
- Holyoke Community College
- Massachusetts Institute of Technology
- Norwich University
- University of Connecticut
- University of Maine
- University of New Hampshire

2) City College of New York

Center for Social and Economic Mobility for People and Communities through Transportation (SEMPACT)

- CUNY Bronx Community College
- New Jersey Institute of Technology
- New York University
- Princeton University
- Rensselaer Polytechnic Institute
- Rutgers, The State University of New Jersey
- SUNY University at Albany
- SUNY Polytechnic Institute
- SUNY Stony Brook University
- University of Puerto Rico, Mayaguez

3) Morgan State University

Sustainable Mobility and Accessibility Regional Transportation Equity Research Center (SMARTER)

- Howard University
- University of Delaware
- University of Maryland
- University of Pittsburgh
- University of Virginia
- Virginia Polytechnic Institute and State University
- West Virginia University

4) North Carolina A&T State University

University Transportation Center for Regional and Rural Connected Communities (CR2C2)

- Clemson University
- Florida Atlantic University
- The University of Alabama, Tuscaloosa
- University of Georgia
- University of Kentucky
- University of Tennessee Knoxville

5) University of Michigan

Center for Connected and Automated Transportation (CCAT)

- University of Connecticut

6) University of Oklahoma

Southern Plains Transportation Center (SPTC)

- El Paso Community College
- Louisiana State University
- Louisiana Tech University
- Navajo Technical University
- Oklahoma State University
- Texas A&M University
- Texas Southern University
- University of Arkansas
- The University of New Mexico
- The University of Texas at El Paso

7) University of Nebraska-Lincoln

Mid-America Transportation Center for Transportation Safety and Equity (MATC)

- Nebraska Indian Community College
- Missouri University of Science and Technology
- The University of Iowa
- The University of Kansas
- University of Missouri-St. Louis

8) North Dakota State University

Center for Transformative Infrastructure Preservation and Sustainability (CTIPS)

- Colorado State University
- University of Denver
- Fort Lewis College
- University of Colorado Denver
- South Dakota State University
- United Tribes Technical College
- University of North Dakota
- The University of Utah
- University of Wyoming
- Utah State University

9) University of Southern California

Pacific Southwest Region University Transportation Center (PSR UTC)

- California State University, Long Beach
- Northern Arizona University
- Pima Community College
- University of California, Berkeley
- University of California, Davis
- University of California, Irvine
- University of California, Los Angeles
- University of Hawaii at Mānoa
- University of Nevada, Las Vegas

10) University of Washington

Pacific Northwest Transportation Consortium (PacTrans)

- Northwest Indian College
- Portland State University
- University of Alaska Anchorage
- University of Idaho
- Washington State University

TIER 1 CENTERS

Florida A&M University

Rural Equitable and Accessible Transportation Center (REAT)

- Cleveland State University
- Florida State University
- SUNY Stony Brook University
- Tallahassee Community College
- University of Washington

Florida International University

Innovative Bridge Technologies/Accelerated Bridge Construction University Transportation Center (IBT/ABC-UTC)

- Florida A&M University
- Texas A&M University
- University of Georgia
- University of Nevada, Reno
- University of Oklahoma
- University of Washington

Howard University

Research and Education in Promoting Safety (REPS)

- San José State University
- University of Maryland
- University of Nevada, Las Vegas

Illinois Institute of Technology

Center for Assured and Resilient Navigation in Advanced Transportation Systems (CARNATIONS)

- Chicago State University
- Stanford University
- University of California, Riverside
- Virginia Polytechnic Institute and State University

Johns Hopkins University

Center for Climate-Smart Transportation (CCST)

- Diné College
- Massachusetts Institute of Technology
- Morgan State University
- The University of Texas at Austin
- The University of Utah

New York University

Connected Communities for Smart Mobility Toward Accessible and Resilient Transportation for Equitably Reducing Congestion (C2SMARTER)

- CUNY New York City College of Technology
- North Carolina A&T State University
- Rutgers, The State University of New Jersey
- Texas Southern University
- The University of Texas at El Paso
- University of Washington

The Ohio State University

Center for Automated Vehicle Research with Multimodal Assured Navigation (CARMEN+)

- North Carolina A&T State University
- *University of California, Irvine
- The University of Texas at Austin

San José State University

Mineta Consortium for Equitable, Efficient, and Sustainable Transportation (MCEEST)

- Howard University
- Navajo Technical University
- University of South Florida

Texas A&M University, College Station

Center for Advancing Research in Transportation Emissions, Energy, and Health (CARTEEH)

- Georgia Institute of Technology
- Johns Hopkins University
- Morehouse School of Medicine
- North Dakota State University
- University of California, Riverside
- The University of Texas at El Paso

Texas State University

Coastal Research and Education Actions for Transportation Equity (CREATE)

- Oregon State University
- Texas A&M University
- University of Miami
- University of Puerto Rico, Mayaguez

University of Arkansas

Maritime Transportation Research and Education Center (MarTREC)

- Jackson State University
- Louisiana State University
- Texas A&M University
- The University of New Orleans
- Vanderbilt University

University of Houston

Transportation Cybersecurity Center for Advanced Research and Education (CYBER-CARE)

- Embry-Riddle Aeronautical University
- Rice University
- Texas A&M University-Corpus Christi
- University of Cincinnati
- University of Hawaii, Honolulu

University of Illinois Urbana-Champaign

Transportation Infrastructure Precast Innovation Center (TRANS-IPIC)

University of Maryland

Center for Multi-Modal Mobility in Urban, Rural and Tribal Areas (CMMM)

University of Missouri-Kansas City

Environmentally Responsible Transportation Center for Communities of Concern (ERTC3)

The University of New Mexico

Center for Pedestrian and Bicyclist Safety (CPBS)

The University of New Orleans

Center for Equitable Transit-Oriented Communities (CETOC)

University of Tennessee, Knoxville

Center for Freight Transportation for Efficient and Resilient Supply Chain (FERSC)

University of Texas at Arlington

Center for Durable and Resilient Transportation Infrastructure (DuRe-Transp)

University of Texas Rio Grande Valley

University Transportation Center for Railway Safety (UTCRS)

- Louisiana State University
- Purdue University
- SUNY University at Buffalo
- The University of Texas at San Antonio

- Morgan State University
- North Dakota State University
- San José State University
- White Earth Tribal & Community College

- Tennessee State University
- Texas State University
- University of Louisville
- Washington State University

- San Diego State University
- University of California, Berkeley
- University of Tennessee Knoxville
- University of Wisconsin-Milwaukee

- Florida Atlantic University
- University of Colorado Denver
- University of Florida
- The University of Utah

- California State University, Long Beach
- North Carolina A&T State University
- Oregon State University
- Texas A&M University
- University of Illinois Chicago

- Howard University
- Missouri University of Science and Technology
- Oregon State University
- Purdue University
- University of Puerto Rico, Mayaguez

- South Texas College
- Texas A&M University
- University of California, Riverside
- University of Nebraska-Lincoln
- University of South Carolina

NATIONAL CENTERS

Center Vision and Objectives

Change is coming to transportation, whether we're ready for it or not. We're entering a transportation landscape rich with possibility and full of challenges. Technological advances offer the promise of safety, efficiency, sustainability, and improved access.

The state of the art in vehicle autonomy however is not mature enough for widespread deployment. Connectivity presents new threats to privacy and cyber-physical security. Recent roadway deaths of a pedestrian, motorcyclists, and vehicle operators due to failures of autonomy features raise legitimate questions of trust and reliability. Much to our detriment, other countries can take over leadership in promising new technologies invented in the US. Given these crossroads, we must remain competitive by furnishing domestic industry and workers with the technology, policy frameworks and training that are sorely needed.

Safety21, the National University Transportation Center for Safety, will leverage new technologies and revolutionary trends in transportation, to research, develop and deploy cutting edge technologies, policies, and develop workforce and educational programs that directly address the challenges of integrating Autonomous, Connected, Electric and Shared vehicles (ACES) with a transformative focus on safety, equity, sustainability and economic growth.

Center Initiatives

Safety21 aims to take a revolutionary leap in our transportation network, enabled by a transformative



USDOT Deputy Secretary of Transportation, Polly Trottenberg with Safety21 Researcher Prof. Corey Harper

approach which offers safety and reliability in an equitable, sustainable, and efficient fashion across multiple modes.

Safety21 consists of researchers from Carnegie Mellon University, Morgan State University, Ohio State University, University of Texas – Rio Grande Valley and University of Pennsylvania. They will collaborate closely with the Community College of Allegheny County and the Community College of Philadelphia to provide education and training for the existing and emerging transportation workforce.

The expected transformational impact of Safety21 technology and policy research is the knowledge and understanding of how to apply a Multimodal Safe Systems approach to capitalize on opportunities arising from ACES and mitigating its risks. The beneficiaries of this increased knowledge and understanding will include local, state, regional and federal transportation managers, mobility advocacy organizations, new and traditional transportation companies, public officials, and the general public.

Research: The Safety21 research program adopts an innovative system-of-systems approach to integrate ACES systems safely, equitably, sustainably, and efficiently into the transportation network. ACES systems provide both great opportunity and risks for the traveling public as well as infrastructure owners and operators (IOO).

As various levels of automation are already beginning to be commercialized and deployed on our roads, our research portfolio targets innovations in technology and policy to enable communities to benefit from the opportunities while mitigating the risks. Our macro-goal is to retain the US technological and commercial lead in CAVs, as competitors around the world are increasingly active in this domain. Our current Deployment Partner Consortium of 190+ organizations will support our researchers in ensuring adoption and impact.

Education and Workforce Development: Educating, recruiting, and training new workers will be critical to managing our country's infrastructure safely and efficiently. Safety21 strives to help develop an equitable and sustainable transportation workforce capable of designing and maintaining the complex transportation systems of tomorrow.

Leveraging our Deployment Partner Consortium, we will provide students with real-world partners who will show pathways for integrating both equity and deployment strategies into student course work as well as research. In our education programs, we are incorporating innovative technologies and tools such as AI, digital twinning, and data analytics to prepare the emerging and existing transportation workforce for the modern transportation system of the future. We are also incorporating examples of our research activity into our education programs.

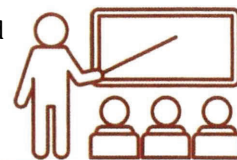
Technology Transfer: We will continue to base our tech transfer strategy on deployment. It is the bridge activity between R&D and technology transfer. Our approach since 2010 has been and will be Research, Development and Deployment (R&D&D). Technology transfer cannot happen without demonstrating the applicability, utility, and value of the technology first.

Every UTC project will thus be undertaken with the goal of actually deploying. When deployment succeeds, the technology is more likely to be transferred. CMU's previous UTC Technology Transfer Plan was identified by the USDOT as a model for other UTCs and CMU was awarded the 2022 CUTC Technology Transfer Leadership Award.

The real-world partnerships that must be forged for each research project – including public agencies, non-profits, and private enterprises – are key to this success. These partnerships ensure the research team



does not proceed in an academic vacuum, while ensuring that ready and willing advocates are available for implementation and transfer.



DOT Director of UTC Grants Program, Caesar Singh with Safety21 Director Raj Rajkumar

Products & Outcomes

The research phase is only the beginning. We focus on bridging the gap between research and practice to deliver real impact on the current landscape of transportation. Our technology transfer program provides strategic training, workshops, nationwide conferences, and technical assistance that provide researchers with an opportunity to solve real-world problems.

Technology transfer cannot happen without demonstrating the utility of the technology first. Thus, every research and development project will be undertaken with the goal of actually deploying a pilot demonstration. When deployment succeeds, the technology will be transferred.

Using our operating philosophy of performing Research and Development and Deployment (R&D&D), we will continue to create additional opportunities for Safety21 research to make a lasting and transformative impact on making transportation safer and more efficient.

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YouTube: www.youtube.com/user/Traffic21TSET
Facebook: www.facebook.com/traffic21.tset

CONSORTIUM MEMBERS

University of Pennsylvania
The Ohio State University
Community College of Allegheny County
Community College of Philadelphia
The University of Texas Rio Grande Valley
Morgan State University



Carne Mellon University



National Center for Transportation Cybersecurity and Resiliency (TraCR)

Clemson University

Center Type – National
Focus Area – Reducing Transportation Cybersecurity Risks

Center Vision and Objectives

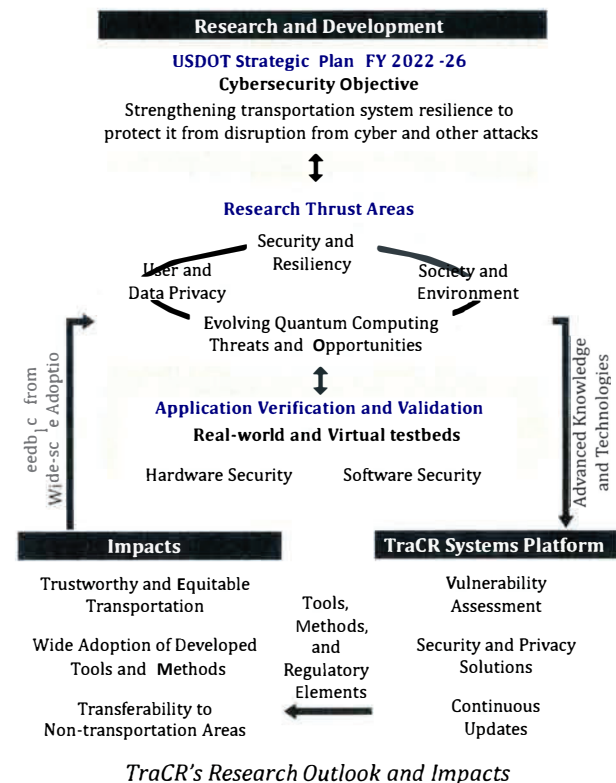
Against a backdrop of ever-rising cyber threats, the National Center for Transportation Cybersecurity and Resiliency (TraCR) was established in 2023 by the U.S. Department of Transportation (USDOT) as part of the University Transportation Centers (UTC) program. TraCR is focused on building an ironclad defense against cyberattacks on the nation's transportation systems by pioneering advanced security strategies and solutions.

TraCR has a transformative approach toward transportation cybersecurity and resiliency, blending research, education, workforce development, and technology transfer activities. The center is leading in the development and implementation of practical and cost-effective technologies, policies, and procedures in both the public and private domains to address the cyber vulnerabilities of today and tomorrow.

Center Initiatives

TraCR's outlook is multifaceted and fosters collaboration among myriad disciplines. Its scope includes all facets of transportation cybersecurity and their impacts on society, from mobility to safety to sustainability to equity. TraCR focuses on hardware and software, communications and computing, policies, and public and private initiatives related to transportation cybersecurity and resiliency. The center engages with a wide range of stakeholders who create, administer, fund, use, and benefit from transportation systems, including those who have traditionally been underrepresented and underserved.

Research: TraCR's consortium members are exploring the multifaceted vulnerabilities that remain unaddressed throughout the nation's transportation cyber-physical-social systems. TraCR continuously monitors the fast-moving world of transportation cybersecurity challenges and threats as they appear across different modes, geographies, and applications. To address the shortcomings in these systems, TraCR's research thrusts include security and resiliency, user and data privacy, society and environment, and evolving quantum computing threats and opportunities. TraCR's research addresses basic science and the creation of cutting-edge, ready-to-deploy cybersecurity technologies.



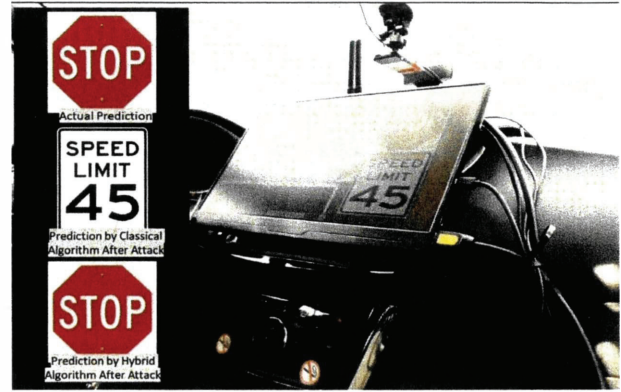
TraCR's Research Outlook and Impacts

Further, TraCR focuses on developing standards, procedures, and policies to ensure that threats are minimized. TraCR's technological innovations are tested with proof-of-concept studies using a cluster of testbeds located at its consortium institutions throughout the nation.

Education and Workforce Development: TraCR is committed to developing the cybersecurity leaders of tomorrow. Its educational programs reach students from elementary schools to two-year colleges to undergraduate programs to the doctoral level. TraCR's special, though not exclusive, focus is on offering a host of courses, research opportunities, and mentoring programs at consortium institutions, utilizing the unique insights of the center's minority-serving institutions (MSIs)—Benedict College, Florida International University, Morgan State University, and South Carolina State University. TraCR's education and workforce development programs are creating a new paradigm for the next generation of diverse cybersecurity experts. For example, TraCR is collaborating with selected MSIs around the nation to



Student Collaboration in Hardware Security Research



Adversarial Defense System

build cybersecurity programs and create a pipeline of cybersecurity professionals through its MSI Advance initiative.

Technology Transfer: To increase the consortium's technology transfer capacity, TraCR is utilizing Local Technical Assistant Programs (LTAPs) and other resources in each consortium member's home state and member universities' technology transfer programs. This results in hosting training courses, workshops, and demonstration events. In addition, TraCR is providing technical assistance to consortium institutions to create transportation cybersecurity testbeds and platforms.

Products & Outcomes

TraCR's initiatives are dedicated to developing a systems platform to protect the nation's transportation infrastructure. Once deployed, this platform will conduct an in-depth vulnerability assessment of any transportation system or infrastructure, followed by the identification, development, and deployment of customized security and privacy solutions for that system or infrastructure. As threats evolve and, over time, newer ones emerge, the methods and tools within the TraCR's systems platform will be continuously updated with new defense strategies. The platform will thus serve as a reference architecture and design blueprint for the development of future secure and resilient transportation systems.



Cyber-Resilient GNSS-based Navigation System

Among the noteworthy products and outcomes, TraCR has developed quantum artificial intelligence-enabled and generative adversarial network-based cyber-defense strategies and systems for autonomous vehicles, cyber-resilient solutions for enhanced GNSS-based navigation systems, and cybersecurity policy guidelines for addressing the existing gaps within the nation's cybersecurity regulatory landscape. As several new TraCR projects start in January 2024, more products and outcomes will continue to enrich TraCR's systems platform initiatives.

Cybersecurity challenges are broad and evolving; however, TraCR possesses the capacity to address them effectively. With an ethos of collaboration across institutions and disciplines, TraCR's work is broad in scope and deep in focus.

LEAD UTC CONTACT:

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LinkedIn: <https://www.linkedin.com/company/tracr-usdot-utc/>
YouTube: <https://www.youtube.com/@TraCR-UTC>
Twitter/X: twitter.com/TraCR_UTC

CONSORTIUM MEMBERS:

Benedict College
Florida International University
Morgan State University
Purdue University
South Carolina State University
The University of Alabama at Tuscaloosa
The University of California at Santa Cruz
The University of Texas at Dallas



National Center for INFRASTRUCTURE TRANSFORMATION

Led by: Prairie View A&M University

National Center for Infrastructure Transformation (NCIT)

Prairie View A&M University

Center Type – National

*Focus Area – Improving the Durability and Extending
the Life of Transportation Infrastructure*

Background

The establishment of the National Center for Infrastructure Transformation (NCIT) presents a transformative vision for America's transportation infrastructure. This national-tier University Transportation Center (UTC) focuses on improving the durability and extending the life of transportation infrastructure through its research, education, and technology transfer programs.

Equity is a guiding principle for NCIT and is addressed through better infrastructure policy and workforce opportunities for underserved and under-represented populations. Environmental stewardship through infrastructure policy and materials recycling addresses climate and sustainability, as does the center's durability and resiliency research in developing the robust transportation infrastructure of the 21st century.

About the Center

NCIT is led by Prairie View A&M University (PVAMU), a Historically Black College and University (HBCU) founded in 1876. PVAMU is deeply rooted in culture and tradition, and is well qualified through leadership and experience to shape research and policy in the critically important national priority area of infrastructure. PVAMU is supported by the following consortium partners:

- the Texas A&M Transportation Institute (TTI) and Texas A&M University (TAMU)
- Rutgers University (RU)
- Michigan State University (MSU)
- Arizona State University (ASU)
- Blinn College District (BCD)

The consortium meets the need for national-tier UTC leadership from the HBCU community. PVAMU hosts a number of federally funded centers sponsored by the National Science Foundation, the Department of Energy, and others, and serves as a regional UTC consortium partner. The other NCIT partners have extensive UTC experience at the national, regional, and Tier 1 levels. The partners have collectively provided meaningful contributions in infrastructure design, maintenance and construction methods, and infrastructure planning and policy across transportation modes, with a proven track record of implementable innovations.

The consortium employs highly regarded researchers with proven leadership in the transportation community, a history of effective technology transfer, and strong ties to the transportation industry.



Initial Research Focus Areas

The unique strengths of the consortium and its vision for transformative infrastructure programs are key elements in developing NCIT's three topical research pillars. Both innovation and implementation are essential for transformation to occur, and both are integral to the research programs of the center.

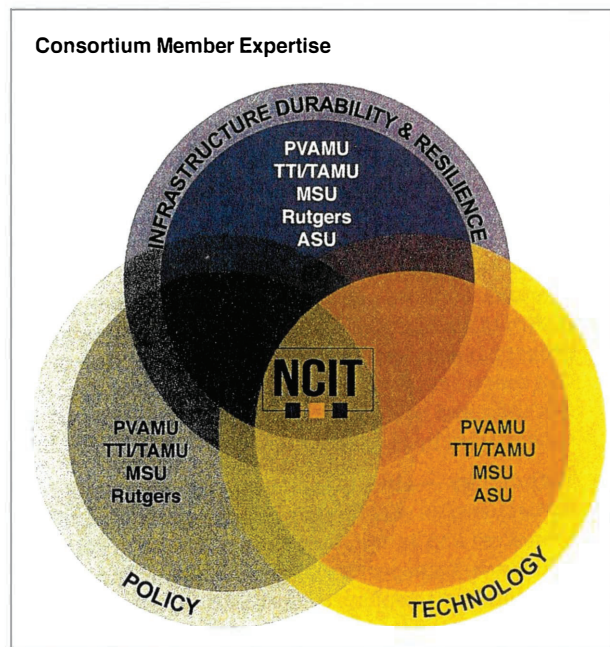
These three pillars provide support and direction for NCIT's research programs:

- **Infrastructure durability and resilience**— aims to transform American infrastructure, increase the life span and resiliency of transportation assets, and enable transportation infrastructure to be prepared for, adapt to, and rapidly recover from natural or man-made disruptions. Included are better ways to design, build, and maintain all modes of transportation infrastructure; robust pavements research, including new and innovative construction materials and intelligent construction methods; and new ways to enhance environmental stewardship by recycling.
- **Technology** — aims to address the impacts and potential benefits of technological innovation, including connected and automated vehicles, the electrification of vehicles on transportation infrastructure, and the use of technology to enhance construction project delivery. The consortium is also investigating the use of machine learning, artificial intelligence, unmanned aerial vehicles, and more to enhance proactive infrastructure management.
- **Policy**— aims to improve decision-making for financial resource allocation, including equity and social justice considerations, improved economic analysis for transportation improvements, innovative transportation finance methods, environmental stewardship, policy pertaining to enhanced project delivery methods, innovative construction methods, and other infrastructure-related policy issues. With the Infrastructure Investment and Jobs Act's (IIJA's) historic investment in American infrastructure, good policy enabling fully informed decisions has never been more important.



How NCIT Supports the United States Department of Transportation

NCIT's philosophy is fully aligned with the U.S. Department of Transportation (USDOT) strategic goals, specifically transformation, equity, economic strength and global competitiveness, and climate and sustainability. Because durability and resilience are closely linked through NCIT initiatives, the center's focus is consistent with the USDOT statutory priority of preserving the existing transportation system as well. The center's ability to transform policy to guide infrastructure investment is especially critical as the provisions of the IIJA are implemented.



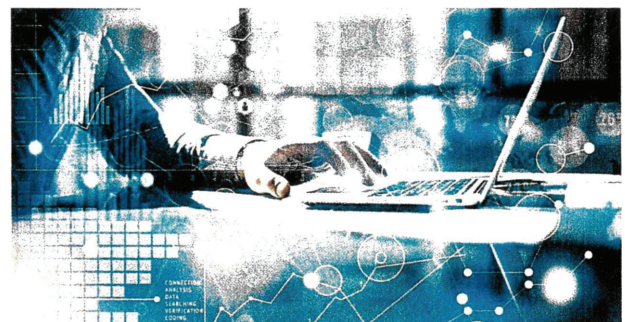
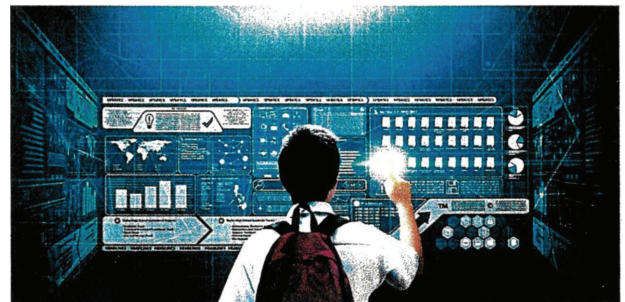
Initial Technology Transfer and Education Initiatives

The research pillars complement an equally robust approach to the center's education and technology transfer programs. The outreach and education programs provide ladders of opportunity for underrepresented and underserved populations at the K-12, associate, undergraduate, and graduate levels. The programs' successful execution can enhance the diversity of the transportation workforce.

The education programs take full advantage of the diversity, size, and reach of the consortium partners to maximize their impact, increasing awareness of transportation as a profession, tapping into diverse pools of talent, and preparing the transportation infrastructure workforce of the future.

NCIT's education programs provide technical, academic, and professional training for the transportation enterprise, enhancing economic strength and global competitiveness with an improved transportation infrastructure system for commerce and freight.

The technology transfer effort engages industry partners that participate in research projects from the development of project statements through research implementation.



LEAD UTC CONTACT:

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Phone: 936-261-1655

Website: <https://ncit.pvamu.edu/>

CONSORTIUM MEMBERS:

Texas A&M Transportation Institute
and Texas A&M University
Rutgers University
Michigan State University
Arizona State University
Blinn College District



National Center for Sustainable Transportation (NCST)

University of California, Davis

Center Type – National
Focus Area – Preserving the Environment

Center Vision and Objectives

The National Center for Sustainable Transportation (NCST) was established in 2013 by the U.S. Department of Transportation (USDOT) as part of the University Transportation Centers (UTC) program. In 2023, the six original members of the NCST consortium were joined by Texas Southern University, an Historically Black University.

The NCST addresses the challenge of accelerating reductions in greenhouse gas emissions while enhancing transportation equity. Our work contributes to the **fundamental policy transformation** essential to accelerating decarbonization in a way that ensures that the benefits of the transportation system are broadly distributed and that the well-being of people in overburdened and historically disadvantaged communities is substantially improved.

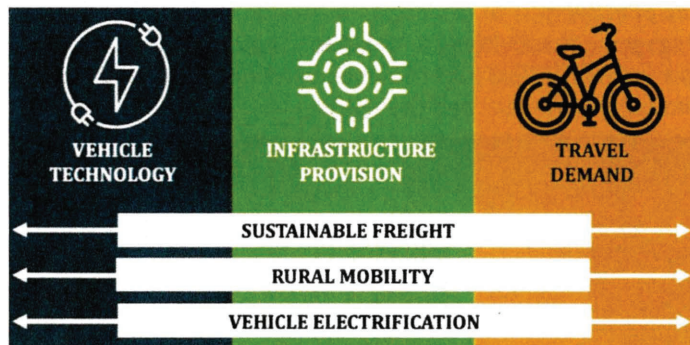
Center Initiatives

The three elements of the NCST program are complementary and intertwined:

- A cutting-edge research program that provides the tools and datasets, policy elements, evaluation studies, and basic knowledge necessary for a policy transformation that equitably decarbonizes the transportation system;
- An innovative technology transfer and engagement program using multiple techniques and involving all levels of government, tribal councils, other public and private sector stakeholders, and communities themselves; and
- Education and workforce development programs, including community college collaborations, that build multiple pathways to careers in transportation, diversity in the transportation workforce, and provide the training needed to take on the challenges of equitable decarbonization.

Research:

The NCST's research focuses on three critical transportation domains that span both passenger and freight travel, all modes of travel, and all travel settings: **vehicle technology**, **infrastructure provision**, and **travel demand**. Important new initiatives include cutting-edge research on the critical issues of **sustainable freight**, **rural mobility**, and **vehicle electrification**. Each year, new research projects, selected through a rigorous peer-review process, build on prior work to address the most pressing challenges and most stubborn obstacles to policy transformation. The NCST supports policy



transformation by building **tools**, developing evidence-based **policy elements**, conducting **evaluation studies** to assess policy outcomes, and carrying out **basic research**. The NCST aims to evolve the culture of transportation research by building policy transformation and equity considerations into project development.

Education and Workforce Development:

The NCST provides education and workforce development programs designed to meet the world's growing needs for qualified, thoughtful, and dedicated transportation professionals who are prepared to meet today's challenges and those of the future. The NCST's education programs include new partnerships with community colleges and tribal governments, a workforce needs assessment, and the Environmental Justice Leaders in Residence program, as well as expanded undergraduate opportunities. These activities provide multiple pathways toward careers in sustainable transportation and are designed to increase diversity within the field.

The NCST's education and workforce development programs include:

- **K-12 programs** to attract students into the transportation field, building on existing programs at the consortium institutions.
- **Workforce training** focusing on programs at tribal and community colleges that provide technical skills related to sustainable transportation, particularly electrification.
- **University education** at the undergraduate and graduate levels, including research and other opportunities for students.
- **Professional development** that draws on graduate programs as well as research activities to provide continuing education for agency staff and other professionals.

Technology Transfer:

The goal of the NCST tech transfer and engagement program is to both translate and deliver research into the hands of policy makers and transportation practitioners, and to involve stakeholders in shaping the research program. This aim is achieved through collaborative and bi-directional activities that build trust and understanding, including easily accessible reports and briefs, events and webinars, targeted meetings, briefings, and workshops, and tools and technical assistance. The NCST consortium's diversity— in terms of geography, expertise, and types of institutions—improves the effectiveness of our engagement efforts. Outreach and engagement activities are tailored to reach all levels of government, tribal governments, advocacy groups, private industry, academia, and the public.



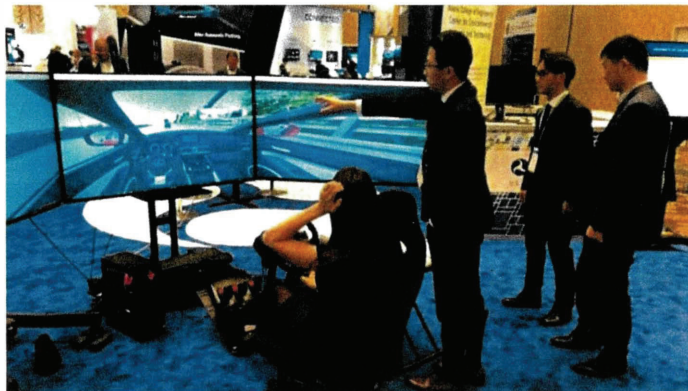
UC Davis's Biennial Asilomar Conference

Products & Outcomes

The NCST supports policy innovation to achieve equitable decarbonization through four kinds of research activities inspired by the US DOT goal of matching research and policy to advance breakthroughs:

- Building tools to support policy making, including datasets, lifecycle assessments, and predictive simulation models that support scenario planning;
- Developing policy elements, such as evidence-based standards, model regulations, pricing strategies, funding strategies, and others;
- Conducting evaluation studies that assess the outcomes of policies using techniques such as experimental designs and econometric modeling; and

- Undertaking basic research that provides a solid foundation for each of these activities by improving our understanding of the transportation system.



UC Riverside Eco-Driving Simulator

Among numerous noteworthy products and outcomes, NCST researchers have

- Provided the research underlying the California Low Carbon Fuel Standard (LCFS) and proposals for a national LCFS;
- Informed the development of the California Air Resource Board's groundbreaking Advanced Clean Cars II Regulation, which will require 100% of new vehicle sales in California be zero emission by 2035;
- Established an innovative research program in ECO-friendly Intelligent Transportation Systems;
- Developed the Induced Travel Calculator, a research-based tool for estimating the vehicle miles traveled induced by highway expansion projects;
- Created an EV Planning Toolbox for planning the location of plug-in electric vehicle charging infrastructure;
- Informed the design of the largest wildlife overcrossing in the country;
- Developed MOVES-Matrix, a modeling approach to produce convenient lookup tables of the US EPA's Motor Vehicle Emission Simulator for planners; and
- Partnered with MPOs to create and evaluate pilot programs for shared-use travel in rural marginalized communities to reduce transit costs, increase travel access, and reduce emissions.

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Georgia Institute of Technology

Texas Southern University

University of California, Riverside

University of Southern California

University of Vermont





National Center for Understanding Future Travel Behavior and Demand (TBD)

The University of Texas at Austin

Center Type – National

Focus Area – Improving Mobility of People and Goods

Center Vision and Objectives

The Center for Understanding Future Travel Behavior and Demand (TBD) is a National University Transportation Center established in 2023 by the U.S. Department of Transportation (USDOT). TBD's vision is to undertake breakthrough research that will fundamentally re-examine and transform the scientific base for measuring, monitoring, modeling, and managing traveler behavior, thus fostering the design, development, and operation of a people-centric, multimodal, intelligent transportation system that meets the needs of people, institutions, and businesses for generations to come.

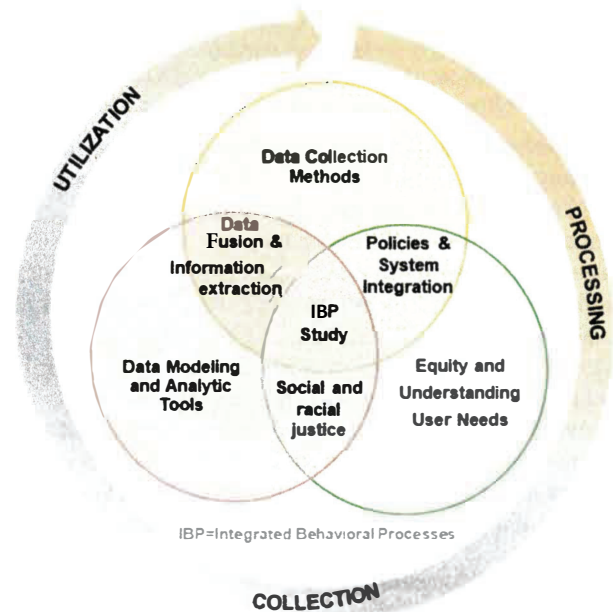
TBD aims to improve the mobility of people and goods within the nation's transportation systems through:

- 1) developing novel insights into travel behavior related to new technologies and mobility options in rural and urban areas, through integrated multidisciplinary streams of scientific inquiry,
- 2) transferring knowledge to inform decision-making, and disseminating innovative solutions, technologies, and methods to the profession for implementation,
- 3) educating the next generation of transportation professionals in fundamental concepts and emerging interdisciplinary techniques.

Center Initiatives

TBD is committed to serving all communities and the entirety of the US economy through the safe, efficient, accessible, equitable, and sustainable movement of people and goods. Its focus is on breakthrough research that can transform practice, while also fully engaging people, communities, businesses, DOTs, and planning agencies to ensure that all research is motivated by its potential to make a real-world impact. The consortium, with significant inclusion and participation of minority institutions, emphasizes the USDOT equity goals and action plan in all its activities, thereby creating clear opportunities for everyone.

Research: TBD research is centered on understanding evolving travel behaviors due to technological advances, demographic and cultural shifts, and environmental concerns. This requires updating our understanding of travel patterns, as well as the datasets and methods for forecasting future needs and behavioral responses to investments and policies. TBD research activities aim to unravel the underlying



TBD's Research and Innovation Areas

and interlinked behavioral processes that shape the movement of passengers and goods. The Center's research mission is anchored in three key innovation areas: (i) *Data Collection Mechanisms*, emphasizing methods for gathering, compiling, and integrating disparate data, (ii) *Data Modeling and Analytic Tools*, developing new models and dashboards to provide actionable insights for policymakers, and (iii) *Equity and Understanding User Needs*, advancing policies and investments to meet the needs of a heterogeneous population, including disadvantaged and rural communities. These areas intersect and foster interdisciplinary collaboration opportunities.

Education and Workforce Development: TBD is dedicated to developing a skilled, diverse workforce, ready to meet the evolving demands and opportunities in the transportation sector. Its educational approach extends beyond traditional degrees, offering hybrid programs, professional training, interdisciplinary certificates, and leadership development for professionals and students. To reach a diverse pool of students, TBD consortium with its minority-serving institutions CCNY, Cal Poly Pomona, and Diné College, facilitates summer research experiences, and mentoring opportunities, particularly for women, ethnic minorities, and physically challenged students. TBD also organizes

events for K-12 students, develops engaging docuseries, and creates interactive games, to ignite early interest in transportation careers.



TBD's Symposium "Back to Foundations: Travel Demand Analysis in a Fast Evolving Transportation Landscape" held from Oct 29 to Nov 1, 2023 in Austin, TX, with over 30 global experts from academia, industry, and the public sector.

Technology Transfer (T2): TBD aims to undertake a variety of activities to widely disseminate research findings and promote their practical application through collaborations with industry and public agency partners. These activities range from product demonstrations to publications and presentations. It also includes developing training modules and workshops, organizing symposiums, creating digital forums for sharing experiences, and producing newsletters, Op-eds, and media appearances. TBD researchers collaborate with key public and private sector stakeholders to brainstorm and co-design research, providing further T2 opportunities.

Products & Outcomes

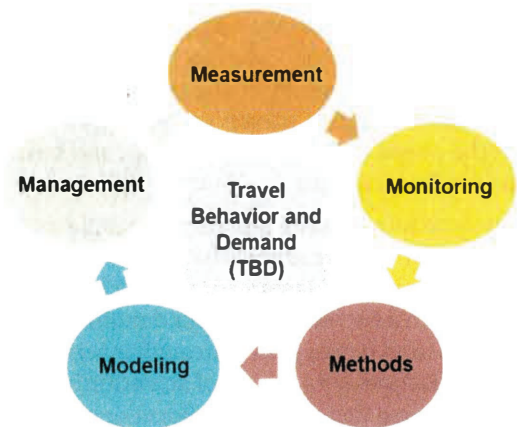
In addition to pursuing a multitude of research, technology transfer, and education and workforce development activities, TBD will undertake **two flagship endeavors of national, state, and local significance to bring about transformative impacts in planning and decision-making:**

1. A *travel behavior data hub* that the public, planners, and policymakers alike can leverage to understand the state of the transportation system, with built-in *quality of life, energy footprint, and mobility poverty calculators* to aid in advancing system performance, economic development, community wellbeing, sustainability, and equity.

2. *Transportation Heartbeat of America Travel Behavior and Demand Survey*, a longitudinal multi-year panel-based survey targeting individuals, employers, and service providers, to understand how travel behavior and demand are evolving, and derive insights into the future of transportation.

TBD will also conduct various innovative research projects. Key topics include commute and location choices in a telework-friendly environment; effects of information and communication technologies on travel demand; methods and data for integrated forecasting of freight and passenger travel in varied contexts; and impacts of emerging transportation technologies on travel behavior and demand.

These and other topics will be addressed through the deployment of an "M5" framework: **measurement** and **monitoring, methods, modeling**, and



The M5 Approach to Delivering Enhanced Mobility for All People and Goods

management. Specifically, through a continuous **measurement** strategy, it will be possible to **monitor** system evolution over time, thus enabling the estimation, calibration, and constant update of **models** using state-of-the-art computational **methods**. These models will provide predictions, analytics, and actionable insights that can lead to data-driven, well-informed policies, decisions, and investments – thus enabling optimal **management** and performance of the transportation system for **safety, traffic congestion reduction, travel reliability, and economic development.**

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California State Polytechnic University
City College of New York
Diné College
Georgia Institute of Technology
University of Michigan
University of Washington

REGIONAL CENTERS

New England University Transportation Center (NEUTC)

University of Massachusetts

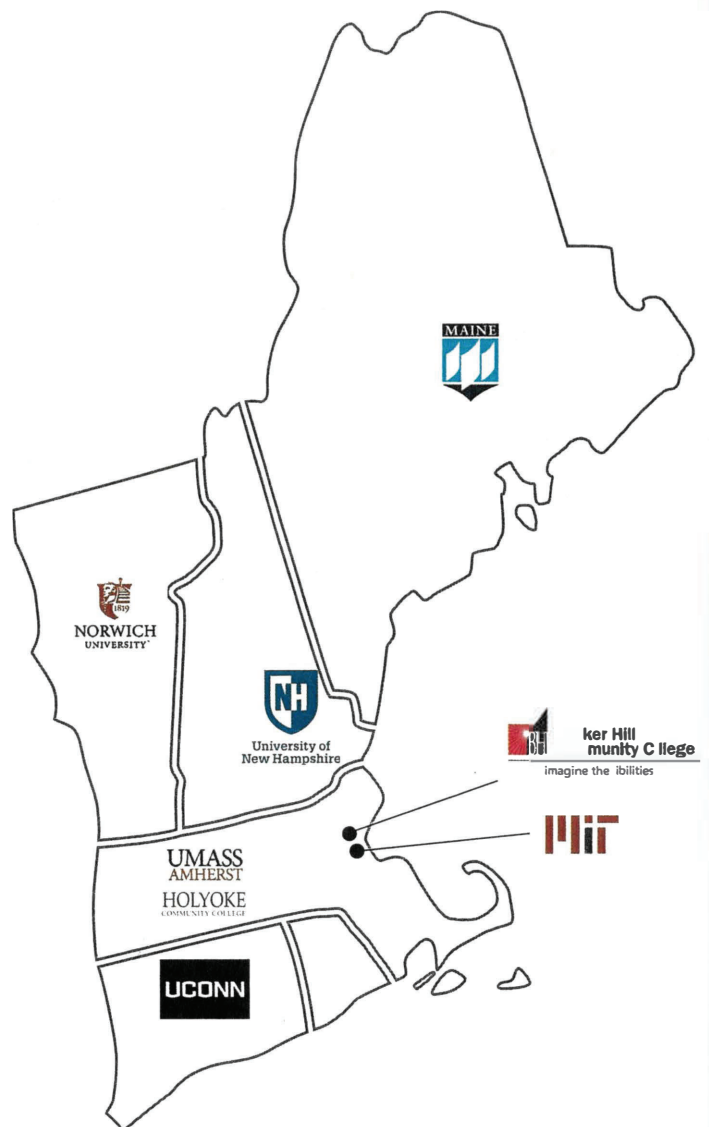
*Center Type - Regional
Focus Area - Promoting Safety*



The New England Regional UTC (NEUTC) is a diverse, multidisciplinary consortium committed to addressing the pressing issue of traffic safety. Our objective, in line with the Infrastructure Investment and Jobs Act (IIJA), is to drive transformative research, education, and technology transfer to address critical traffic safety needs in a time when roadway fatalities are distressingly high.

“The NEUTC mission is to advance equitable safety through transformational research, education, and technology transfer.”

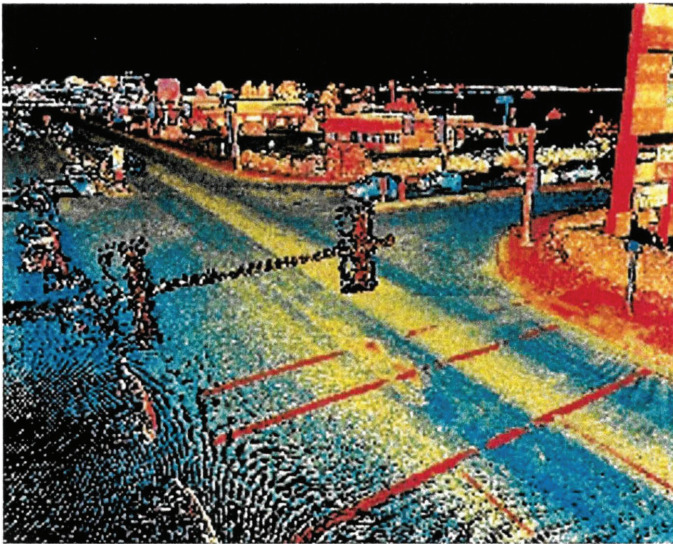
Our research and educational activities at UTC are guided by four principal safety themes, each addressing a critical challenge in transportation safety. These themes capture the various integral components of the transportation system, focusing on technology, infrastructure, vehicles, and users with a commitment to equity and public engagement. Our overarching theme is promoting safety, with the common underlying science being the study of behavioral, systemic, environmental, and mobility-driven factors on safety.



Our Thematic Focus

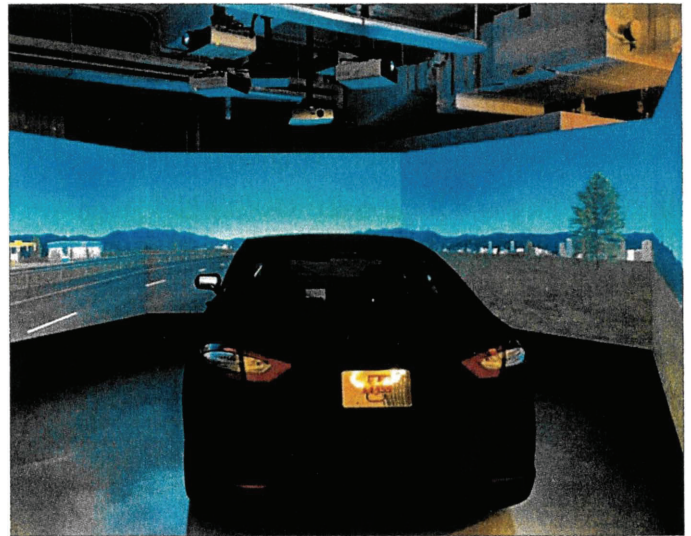
1) Embedding Equity and Community Engagement within Transportation Safety: developing and integrating best practices to comprehensively improve transportation safety through an equity lens (or existing inequities), while actively engaging the public in generation (e.g., knowledge co-development) and dissemination of safety solutions.

2) Developing Smart Infrastructure and Connected Systems: optimizing roadway infrastructure to improve safety and reduce congestion through advancements in telecommunication, sensors, improvement in geometric design, augmented reality, driver assistance systems, human-machine interactions, as well as by addressing cybersecurity risks of hardware, software, and infrastructure systems.



Developing Smart Infrastructure and Connected Systems

3) Improving Safety for all Modes and Populations: examining the synergistic relationships between safety and mobility and considering specific needs of vulnerable populations (e.g., underserved communities, disadvantaged populations, and people with disabilities) across modal preferences (e.g., pedestrians, bicyclists, commercial vehicles, and automated vehicles) to develop a fully integrated transportation system.



Promoting Automated Vehicle Safety

4) Promoting Automated Vehicle Safety: identifying, developing, and evaluating novel approaches that promote safety between automated vehicles, which move both people and goods, and all road users, including all types of vehicle drivers, bicyclists, and pedestrians; evaluating the human and machine interface as well as the cybersecurity risks of automated vehicle systems.

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CONSORTIUM MEMBERS:

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Massachusetts Institute of Tech. - Cambridge, MA

Norwich University - Northfield, VT

University of Connecticut - Storrs, CT

University of Maine - Orono, ME

University of New Hampshire - Durham, NH



SEMPACT

USDOT Region 2 University Transportation Center
New Jersey | New York | Puerto Rico | US Virgin Islands

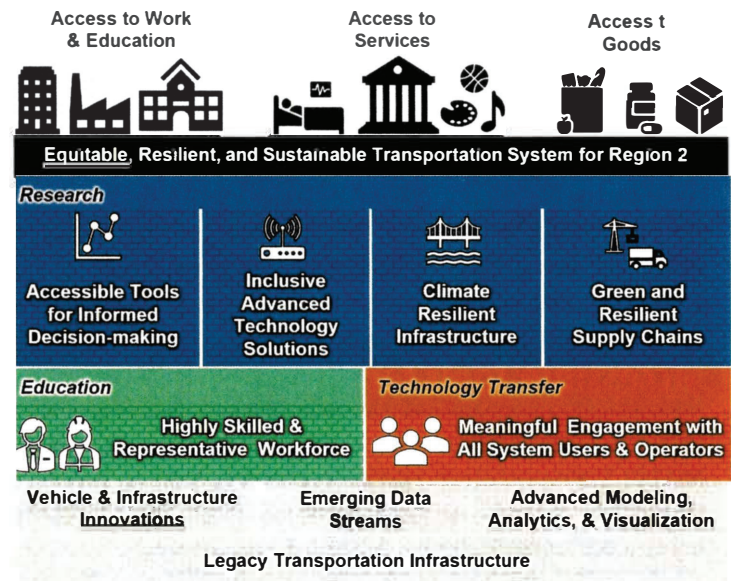
Led by **University Transportation Research Center (UTRC)** at the CUNY **City College of New York**, and building from the foundation of our existing legacy transportation systems, **SEMPACT** (Center for Social and Economic Mobility for People And Communities through Transportation) seeks to leverage recent advances in vehicle and infrastructure technologies; data; and modeling, analytics, and visualization to plan, design, implement, and operate a more equitable, resilient, and sustainable transportation system for Region 2 that supports mobility and access to opportunity for all the region's residents and businesses.

To advance toward these goals, the SEMPACT team will focus research in four priority areas that address both USDOT & regional needs. Work will address the statutory priority area Improving mobility of people and goods and the USDOT research priorities Economic Strength & Global Competitiveness (primary), Equity, and Climate & Sustainability.

SEMPACT prioritize research of:

- (1) accessible tools for informed transportation decision making
- (2) inclusive advanced technology applications
- (3) climate resilient infrastructure
- (4) green and resilient supply chains

SEMPACT Framework & Priorities



SEMPACT Objectives

US DOT Strategic Plan Research Priorities	SEMPACT Research Areas			
Economic Strength and Global Competitiveness				
System Performance	●	●	●	●
Resilient Supply Chains	●	●	●	●
Equity				
Equity and Accessibility Assessment	●	●	●	●
Mobility Innovation	●	●	●	●
Climate and Sustainability				
Sustainable, Resilient Infrastructure	●	●	●	●



The City College
of New York



SEMPACT

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SEMPACT RESEARCH AREAS

A Regional Assessment



We will initiate a cross-cutting comprehensive Region 2 transportation research needs assessment study. A key contributor to transportation system inequities has been a lack of meaningful engagement from some stakeholders – particularly minority, low income, and rural communities – in defining the transportation research agenda. To deliver our programs that addresses the needs of the region, we must first develop a comprehensive baseline understanding of the challenges and needs of all communities.

Accessible Tools for Informed Transportation Decision-Making



SEMPACT researchers will identify data sources, develop performance metrics, and develop analytical tools to enable transportation decision-making that is timely and that better incorporates equity considerations, multimodality, social and economic resilience, and sustainability, particularly in areas that have traditionally lacked advanced transportation planning resources.

Inclusive Advanced Technology Applications



SEMPACT researchers will design, model, pilot, and evaluate innovative technologies and services that improve mobility and accessibility for users with varying abilities and resources in diverse built environments. We will also investigate new technologies, including both vehicle and control systems, with potential to improve transportation sustainability.

Climate Resilient Infrastructure



SEMPACT researchers will develop and deploy improved models for identifying transportation infrastructure at risk from climate change and other natural and man-made events, and will develop technology, regulatory, or structural solutions to mitigate risk and improve the ability of communities to rapidly recover from unexpected disruptions.

Green and Resilient Supply Chains



SEMPACT researchers will develop data, models, and tools that support performance-based freight planning in urban, suburban, and rural communities to improve system performance, ensure freight system resilience, and reduce community externalities.



The City College
of New York



SEMPACT

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Center Director

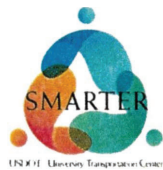
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Sustainable Mobility & Accessibility Regional Transportation Equity Research Center

Morgan State University

*Center Type – Regional
Focus Area – Improving the mobility of people and goods*

Center Vision and Objectives

The SMARTER Center is a USDOT regional university transportation center advancing the mobility of people and goods in the Mid-Atlantic. Our team taps into the knowledge and creativity of a diverse cohort of transportation professionals to create an accessible, sustainable, and efficient transit network for all. To achieve this goal, the center's research activities focus on providing immediate and near-immediate implementation capabilities for policy makers, industry, and the public at large.

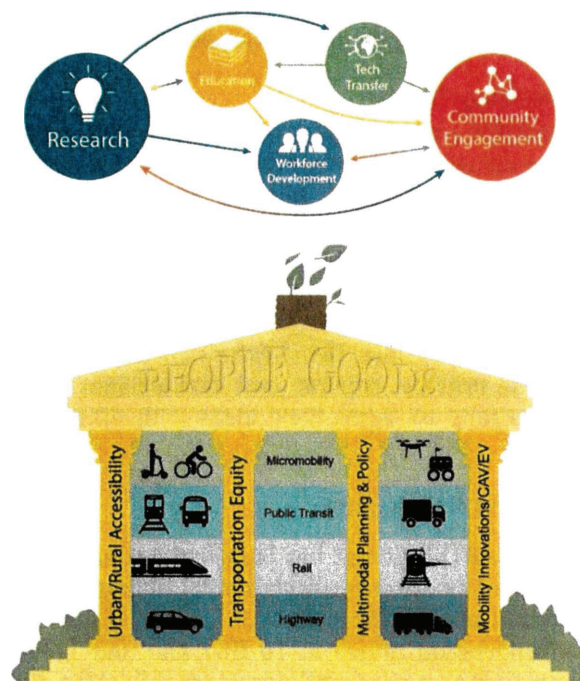
The Mid-Atlantic is a diverse landscape undergoing unique challenges to its urban and rural development strategies. Transit deserts, climate change, and growing congestion threaten the vitality and commerce of its communities. SMARTER's initiatives thus seek to provide technological and policy solutions to address these challenges and others.

Center Initiatives

The Center aims to develop and implement emerging transportation technologies to improve equity and mobility in the region. To that end, researchers will pursue a program of high-quality research, education, workforce development, technology transfer, and community engagement. These activities will allow the Center's researchers to effectively share their findings with key stakeholders and prepare the next generation of transportation professionals with satisfying careers that serve the public good.

Research:

The SMARTER Center pursues a comprehensive research strategy focused on enhancing mobility and equity. Each SMARTER research project aligns with one or more of our four research pillars: accessibility, broadening transit choices across various landscapes; equity, ensuring support for those in greatest need; multimodality, endorsing alternatives to cars; and innovation, harnessing the promise of connected, electric, and autonomous vehicles. These pillars collectively inform our approach to creating a more inclusive and sustainable transportation network. By enabling the seamless movement of both people and goods, we pave the way for urban and rural residents to more readily access vital resources like food, healthcare, and economic opportunities.



The SMARTER Center's Initiatives (top) and Research Program (bottom).

Community Engagement:

Based in a variety of urban and rural communities, the constituent universities of the SMARTER Center are keenly aware of the challenges faced by the region's diverse residents. Our researchers pursue a broad strategy of community engagement that builds partnerships with local media and community organizations to provide actionable knowledge and technical expertise to those who need it most.

Education and Workforce Development:

SMARTER draws on programs from all its consortium members to support students at every step of the professional development process. Summer programs for middle and high school students, such as Morgan State's National Summer Transportation Institute, serve to introduce students to STEM and transportation careers. The Center also supports students at its member institutions with a variety of internships, scholarships, fellowships, and graduate programs designed to place promising students in satisfying careers.



A demonstration of the autonomous wheelchair

Technology Transfer:

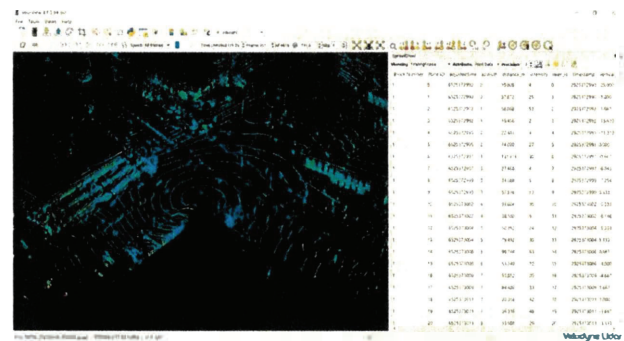
SMARTER's technology transfer activities are central to its mission, and its administrative body has a long history of successful patents and private sector partnerships. The SMARTER Innovation Lab builds on this legacy by providing students and researchers with the equipment necessary to test and develop new technologies. Workshops and other networking opportunities, like the Center's "Pizza & Patent" events, provide experts and technicians with the opportunity to share their ideas with others in the field.

Products & Outcomes

The SMARTER Center has launched a comprehensive lineup of research projects aimed at improving the safety and efficiency of the Mid-Atlantic's transportation network. To that end, our team has employed a range of methods which reflect the diverse expertise of our faculty. These include developing innovative technologies, forging key partnerships with government and industry, setting benchmarks and best practices for policymakers, constructing sophisticated traffic models, and deepening our understanding of traveler behavior. These varied strategies underscore SMARTER researchers' commitment to driving transformative change in the region.



A driving simulator at the Safety and Behavioral Analysis Lab



LiDAR feeds from the Mixed-use Connected and Automated Vehicle Testbed

SMARTER researchers are also well-positioned to take advantage of and accelerate the growing convergence between the transportation network and the digital world, evidenced by the advanced research facilities it has at its disposal. The Safety and Behavioral Analysis Lab, for example, employs simulators and eye tracking to study traveler behavior in scenarios too hazardous or complex for real-world investigation. Additionally, the Mixed Traffic Connected and Automated Vehicle Testbed, equipped with LiDAR and telecommunication systems, provides a practical environment for testing connected vehicle technology. These state-of-the-art facilities, along with the expertise of our researchers, place SMARTER at the forefront of emerging transportation technologies.

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University of Pittsburgh

Virginia Tech

University of Virginia

Howard University

University of Delaware

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LinkedIn: <https://www.linkedin.com/company/htcsmarter>

YouTube: <https://www.youtube.com/channel/UCQ4GSAiNdKTKz6qhWqH1hQA>



University Transportation Center for Regional and Rural Connected Communities (CR²C²)

North Carolina A&T State University

*Center Type – Regional, Federal Region 4
Focus Area – Improving Mobility of People and Goods*

Center Vision and Objectives

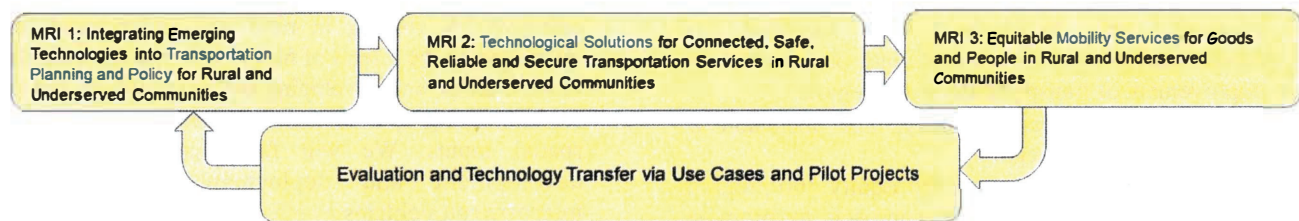
The Transportation Center for Regional and Rural Connected Communities (CR²C²) serves as the Region 4 University Transportation Center (UTC) charged with addressing transportation challenges within the southeastern region of the United States. The primary goal of CR²C² is to plan, implement, and evaluate an integrated research, education, workforce development, and technology transfer approach for providing innovative connected and coordinated multimodal technological solutions for rural and underserved communities. CR²C² will develop and improve equitable, efficient, and effective mobility solutions for the movement of people and goods. The CR²C² team includes North Carolina A&T State University (NCAT) – the nation's largest Historically Black College or University (HBCU) – and Florida Atlantic University – a Hispanic-Serving Institution (HSI), which positions CR²C² to support diversity, equity, and inclusion by increasing the involvement of underserved minorities in research, education, and technology transfer activities.

resources for residents of rural and underserved communities.

- MRI 2 addresses transformative technological solutions for connected, safe, reliable, and secure transportation services in rural and underserved communities.
- MRI 3 develops equitable mobility services for goods and people in rural and underserved communities by evaluating the reliability of our regional freight network and designing novel approaches for improving the performance of the freight system.

Education and Workforce Development: CR²C² increases the existing pipeline of transportation professionals with the skills needed to address transportation challenges in rural and underserved communities by integrating and implementing a wide range of education and workforce development components:

- Student Engagement Opportunities: CR²C² offers multiple outreach and educational activities targeting primary through undergraduate and



CR²C² Components

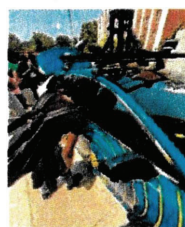
Center Initiatives

Our purpose-driven research, education, outreach, and technology transfer activities will lay the foundation for residents of rural and underserved communities to access socioeconomic opportunities through advanced, connected transportation technologies.

Research: In support of its primary goal and USDOT Innovation Principles, CR²C² will develop flexible and adaptable solutions for the adoption of emerging technologies in rural areas through three intertwined, multi-university Major Research Initiatives (MRIs):

- MRI covers innovative approaches for integrating emerging technologies into transportation planning and policy. It will fully leverage the emerging connected vehicles and infrastructure technologies as well as improve access to critical

graduate students to attract new entrants into the transportation industry. This includes certificate programs, courses and learning modules, transportation research, transportation diversity scholarships, transportation industry internships for undergraduate minority students, etc.



CR²C² supported the Summer Transportation Institute and hosted participants including rising juniors and seniors from North Carolina, South Carolina, Georgia, Florida, New York, Texas, Maryland, and Virginia.

- Outreach Programs: CR²C² fosters and supports innovative outreach and educational activities targeting K-12 students to attract new entrants into the transportation industry and STEM-related disciplines.
- Community Engagement Programs: CR²C² develops community-driven programs to close mobility gaps across rural populations and enhance public awareness of advanced transportation technologies.
- Workshops and Training Courses: CR²C² offers workshops, courses, and regular seminars on various emerging topics such as connected and autonomous vehicle technologies, equity, and accessibility.



CR²C² researchers organized a workshop for first responders on AV incident management ahead of deployment of AVs in an underserved community in North Carolina.

Technology Transfer and Collaboration (TTC): CR²C² provides leadership in technology transfer to stakeholders throughout the region and implements a sustainable and inclusive TTC program to foster and support collaborative technology transfer efforts by:

- Generating and disseminating high quality, high impact academic research on transportation issues of relevance in the southeastern U.S.
- Creating processes, standards, and structured opportunities for showcasing novel transportation solutions and facilitating the transition of transformative research concepts into practice for the improvement of transportation in the region.
- Increasing the diversity, equity, and inclusion of transportation in the region.

Equity 360: CR²C² implements the Equity 360 program which is a holistic, multilayer approach to promote, integrate, measure, and monitor equity throughout all Center activities. This includes: (a) direct outreach for inclusion of rural and underserved communities in the planning and implementation processes towards adopting

and developing technologies, such as connected micro-transit vehicles and CAVs, thus expanding affordable access to transportation systems, health care, jobs, and other resources; and (b) inclusion and engagement of students from underserved populations in Center activities to develop a creative and diverse workforce.

Products & Outcomes

CR²C² delivers transformational impact on rural transportation by developing innovative analytical and technological solutions, particularly in rural and underserved areas, to enhance functional integration of these communities in the national economy.



Joined by federal, state, and local leaders, CR²C² researchers launched the Aggie Autonomous Shuttle pilot program reaching out to the underserved community in East Greensboro and connecting neighborhoods around CAT with downtown Greensboro.

Outcomes of the Center include: delivering systematic tools for assessing the readiness of small/rural communities with regard to new transportation technologies; analyzing and optimizing the impact of new technologies on health services and the provision of rural health transportation services; developing AI-driven multimodal sensing and communication for advanced pedestrian, bicyclist, and animal detection and collision warnings, work zone and curve speed warnings, and road condition warnings; improving EV demand estimation, optimal EV charging infrastructure deployment and effective EV routing in rural and underserved areas; investigating the effects of freight information technology in rural areas; and developing the methodology and tools for identifying optimal corridors based on temporal and spatial inputs. We will focus particularly on the development and deployment of autonomous microtransit vehicles as effective and flexible mobility solutions in response to infrequent demand. We will investigate challenges in EV adoption to achieve more sustainable and equitable transportation in rural areas.

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LinkedIn: <https://www.linkedin.com/company/cr2c2>

YouTube: <https://www.youtube.com/@CR2C2UTC>

Twitter: <https://twitter.com/CR2C2UTC>

CONSORTIUM MEMBERS:

Clemson University
 Florida Atlantic University
 North Carolina Agricultural and Technical State University
 The University of Alabama
 The University of Georgia
 The University of Kentucky
 The University of Tennessee

Center for Connected and Automated Transportation (CCAT)

University of Michigan

Center Type – Regional
Focus Area – Safety, Cybersecurity, Mobility, and Equity

Center Vision and Objectives

Located at the focal point of the U.S. auto industry, the Center for Connected and Automated Transportation (CCAT) was formed in 2017 by the U.S. Department of Transportation (USDOT) as part of the University Transportation Centers (UTC) program. CCAT serves as the Region 5 UTC designated to address the field of comprehensive transportation safety, congestion, connected vehicles, connected infrastructure, and autonomous vehicles. In 2023, the center was renewed by USDOT and added the following partners: the University of Minnesota-Twin Cities, Northwestern University, and the University of Wisconsin-Madison.

CCAT plays a unique regional role in promoting connected and automated transportation research, education, workforce development, and technology transfer activities, which are of critical importance to the future of the region's economy. CCAT aims to significantly advance the evolution of the U.S. next-generation transportation systems with emerging technologies on safety, cybersecurity, mobility, and equity. CCAT will provide regional and national leadership in connected and automated transportation system research, education, training, and implementation.

Center Initiatives

CCAT works with multidisciplinary research teams to achieve its objectives and prioritizes projects that involve collaboration between many stakeholders. Emphasis is placed on technology evaluation and deployments in realistic testing environments to address research questions in a comprehensive and accelerated manner. Funded projects have led to the development of software applications and hardware solutions that impact traffic control systems, transportation system cybersecurity, and AV safety testing.

Research: CCAT consortium members are creating safer, greener, and more efficient roadways and do so by leveraging a variety of resources including the Ann Arbor Connected Environment (AACE), the Mcity Test Facility, and the Advanced Transportation Research & Engineering Laboratory (ATREL). CCAT's research



CCAT's Research Partnerships

thrusts include connected and automated transportation system safety, cybersecurity, mobility, and equity. CCAT's research solutions are tested at partner institutions and public roads and have been published in highly impactful journals including *Nature*, *Nature Communications*, and more.

Education and Workforce Development: We are on the cusp of a revolution in transportation on a scale we have not seen in over 100 years. As with all University Transportation Centers, CCAT is focused on education, training, and workforce development to help shape the transportation leaders of the future. CCAT consortium members provide a full spectrum of leadership development and educational programs, including 2- and 4-year degree programs. Washtenaw Community College leads the Advanced Transportation Center (ATC) which provides education and training in advanced transportation, advanced manufacturing, information technologies, and intelligent transportation systems. The CCAT grant supported the creation of the Automotive Cybersecurity Lab which introduces students to the skills and strategies needed to test security related to automobile networks and related infrastructure. CCAT members from the University of Michigan held a workshop with experts in connected and automated



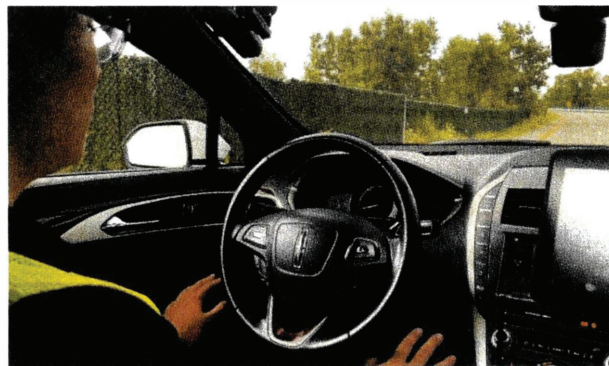
2023 CCAT HBCU Cohort

vehicles to identify gaps in transportation education and developed a white paper that identified a path forward to close them. In 2023, the Center launched the Internship Student Program in Research Engineering (InSPiRE) Program which pairs students from Historically Black Colleges and Universities (HBCUs) with transportation research employers. Finally, CCAT hosts its annual HBCU Conference which invites faculty and students from five minority institutions (Benedict College, Bowie State University, Central State University, Morgan State University, and Prairie View A&M University) to explore the variety of research opportunities available within the field of connected and automated vehicles, to discuss areas of collaboration between CCAT and the institutions, and to provide networking opportunities.

Technology Transfer: CCAT consortium members have extensive experience in moving research into practice. To ensure the highest quality research for connected and automated transportation, the center created a Technology Advisory Board (TAB) which consists of experts from industry, government, and academia. The TAB provides critical input that allows the Center to deliver results-driven research and maximize technology transfer. CCAT also works with the University of Michigan Innovation Partnerships to assist in technology transfer activities.

Products & Outcomes

Since its inception, CCAT's funded research has led to the creation of several products and outcomes that have the potential to significantly impact transportation safety. Dr. Henry Liu and his team



CCAT researcher serves as a safety driver during a safety validation test in a Level 4 Autonomous Vehicle



A University of Michigan student demonstrates the capabilities of the PREACT system

developed the Safe Artificial Intelligence Framework for Trustworthy Edge Scenario Tests (SAFE TEST) which more efficiently evaluates the safety performance of autonomous vehicles. It does this by utilizing an augmented reality environment which requires the vehicle under test to react to virtual road elements. It is estimated that it can reduce the number of miles required to be driven by 99.99%. With the adoption of autonomous vehicles, more people will become passengers which has the potential to increase motion sickness. Research from Dr. Shorya Awtar has led to the creation of the PREACT motion sickness prevention technology which employs prediction algorithms and makes preemptive interventions before vehicle movements happen.

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Northwestern University
Purdue University
University of Akron
University of Illinois at Urbana-Champaign
University of Michigan
University of Minnesota-Twin Cities
University of Wisconsin-Madison
Washtenaw Community College



SOUTHERN PLAINS
TRANSPORTATION CENTER

Southern Plains Transportation Center

The University of Oklahoma

Center Type - Regional

Focus Area – Improving the Durability and Extending the Life of Transportation Infrastructure

Center Vision and Objectives

Southern Plain Transportation Center's vision is to be a strong, diverse, and inclusive consortium dedicated to finding innovative, cost-effective, deployable, and equity-focused solutions to pressing transportation infrastructure durability problems in Region 6, particularly those caused by extreme weather and climate change while producing highly trained and skilled transportation professionals.

With 69 tribes, over six million rural lane miles, five of the seven nation's top seven cargo transportation ports, sizeable coastal areas, and a disproportionate number of underserved communities, Region 6 is a fertile ground for infusing equity and environmental justice in all UTC activities. SPTC aims to empower historically underserved communities by leveraging transportation-centric opportunities through research, education, and training.

Center Initiatives

Research: The vulnerability of transportation infrastructure to extreme weather and climate change is an ever-increasing danger in Region 6. Between 2012 and 2021, Region 6 states spent \$25B annually to combat climate extremes. SPTC leverages the unique expertise and facilities of its consortium members to confront these challenges. Consistent with its vision, SPTC assesses and mitigates the vulnerability of transportation infrastructure to climate change, severe weather, and sea-level rise through innovative research, effective implementation, a trained workforce, strong leadership, and well-organized programs where engineers and climate scientists work together to find implementable solutions. Improving the resilience of at-risk infrastructure enhances economic competitiveness and safety.



SPTC researchers plan to leverage novel materials and emerging technologies for sustainable transportation infrastructure.

USDOT priorities:

- Novel technologies and tools for extreme weather predictions and assessment of impact on infrastructure durability;
- Leveraging novel materials and emerging technologies and tools to enhance durability, sustainability, and extend infrastructure life;
- Innovative and cost-effective, methods to improve the durability of coastal, rural, and tribal infrastructure;
- Performance-based infrastructure life-cycle and asset management;
- Vulnerability assessment and safety enhancement of interdependent and multimodal transportation systems.



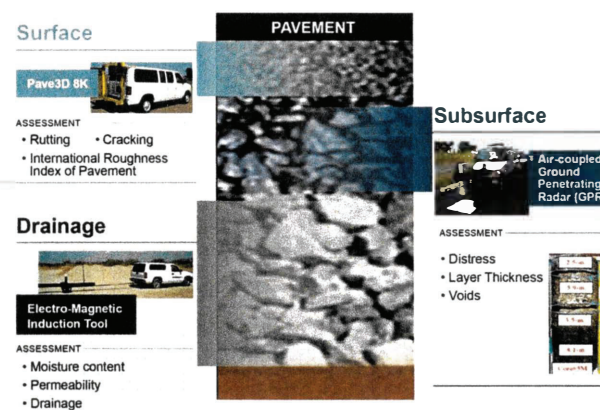
SPTC TLC Chapters competed at the Asphalt Road-eo competition.

Education and Workforce Development: SPTC is dedicated to creating workforce and educational development programs that will encourage new participants in the transportation sector. Success is defined as increasing access to higher education and job opportunities within the sector among traditionally underserved groups, including women, minorities, rural and tribal communities, individuals with disabilities, and incarcerated individuals. SPTC's programs target age ranges from K-12, college, and professional levels, and include in-person and online courses, workshops, webinars, on-the-job training, study materials, outreach efforts, and more.

Technology Transfer: SPTC will create a knowledge management (KM) program and leverage both its in-person and digital outreach platforms to enhance technology and data systems to support USDOT's strategic performance indicators. Specifically, SPTC will utilize KM best practices to transition research to practice, expand commercialization to increase equity, and build operational efficiency. Information will not be siloed, and results from projects and knowledge transfer programs will be shared, results disseminated, and duplication of effort reduced. The Center will also use the Oklahoma Transportation Library, National Transportation Knowledge Network, Research and Industry Advisory Committees, and partnerships across local state agencies and other sectors to share results and information from projects.

Products & Outcomes

With a track record of groundbreaking research and enhancing opportunities for members of its community, SPTC is poised to deliver implementable solutions that will improve durability and extend the life of transportation infrastructure. In Cycle 1, SPTC researchers will work on 26 exciting research



Novel tools will be integrated and deployed for rapid assessment of pavement conditions and remaining life.



SPTC projects will focus on improving durability of new and existing bridges using new and innovative materials.

projects, including novel and emerging technologies for tribal and rural communities, enhancing informed decision-making among a new generation of leaders, and offering expanded opportunities to underserved groups that will help reshape the region for a more equitable and sustainable future.

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CONSORTIUM MEMBERS:

University of Texas at El Paso
University of New Mexico
University of Arkansas
Texas Southern University
Texas A&M University
Oklahoma State University
Navajo Technical University
Louisiana Tech University
Louisiana State University El Paso
Paso Community College



Mid-America Transportation Center for Transportation Safety and Equity (MATC-TSE)

University of Nebraska-Lincoln

Center Type – Regional (Region VII)

Focus Area – Promoting Safety (primary goal), Economic Strength and Global Competitiveness, Equity, Climate and Sustainability, Transformation, Organizational Excellence

Center Vision and Objectives

Established in 1995 by the University of Nebraska Board of Regents, the Mid-America Transportation Center (MATC) first won the United States Department of Transportation's competition for the Region VII University Transportation Center (UTC) in 1995. Subsequent competitions were won in 2006, 2011, 2016, and 2023. Region VII includes Nebraska, Iowa, Kansas, and Missouri. The 2023 Region VII UTC is titled the Mid-America Transportation Center for Transportation Safety and Equity (MATC-TSE). The consortium members are University of Nebraska-Lincoln (UNL, lead), Nebraska Indian Community College (NICC), Missouri University of Science and Technology (MS&T), University of Iowa (UI), University of Kansas (KU), and the University of Missouri-St. Louis (UMSL). The focus of MATC-TSE is on the statutory research priority area of promoting safety while supporting the US DOT Strategic Plan goals of safety (primary goal), economic strength and global competitiveness, equity, climate and sustainability, transformation, and organizational excellence.

Center Initiatives

Research: Safety challenges in Region VII consist of two broad categories: natural and human made. Constituents of the first category include pandemics, climate change, and weather phenomena. The second category involves elements such as distracted driving, deteriorating transportation infrastructure, and an inadequate workforce, among others. Encompassing both categories are equity issues (e.g., gender justice, workforce equity) that span the breadth of transportation safety. The MATC-TSE research portfolio addresses both natural and human made challenges through wealth creation, invoking the power of community, and expanding access for Native Americans in Region VII. Its focus is to improve transportation safety by developing breakthrough ideas, innovations, and transformative research with a direct one-to-one mapping to vulnerable users, infrastructure, safety culture and behavior, vehicle and workforce safety, and automated and connected vehicles.

Education and Workforce Development: The MATC-TSE comprehensive education and workforce development programs are aimed at advancing career and technical education pathways to transportation jobs and supporting STEM and transportation-related academic and certification programs. While open to all, the emphasis is on recruiting, training, and retaining students from disadvantaged groups, particularly the Native American population.



Sovereign Native Youth STEM Leadership Academy participants



Intern Program participants

Technology Transfer: Each consortium member brings unique expertise and resources to MATC-TSE so that the collective MATC-TSE program is significantly larger than the sum of the individual programs. These resources include ITS laboratories and test beds (UNL), a roadside safety testing facility (UNL),

structural testing facilities (UNL, MS&T, KU), and hydroscience testing facilities (UI). UMSL has the Laboratory for Advanced Supply Chain Analytics (LASCA) and the Supply Chain Risk and Resilience Research Institute (SCR3), enabling innovative supply chain network design and configuration, climatesmart agribusiness supply chain, last-mile delivery with drones, and supply chain risk prediction and mitigation.

MATC-TSE consortium faculty members have conducted numerous short courses and workshops across the region over the last 15 years, as well as developed lasting partnerships across the private and public sectors. MATC-TSE has collaborated with Region VII state DOTs and LTAPs to create technology transfer activities. The courses include the Roadside Safety Short Course (UNL), Roadside Safety Workshop (UNL), Traffic Safety (KU), Structural Condition Assessment (MS&T), and LTAP Workshops. MATC-TSE faculty from UNL also provide specialty



Local Technical Assistance Program (LTAP) workshop

safety advice to transportation professionals in states belonging to the Midwest States Pooled Fund Program, under which any highway designer with a particularly difficult safety problem is encouraged to contact MATC-TSE faculty, who identify the most cost-effective solution.

Products & Outcomes

Collectively, MATC-TSE-affiliated faculty have 21 patents and 9 provisional patents granted for innovative safety. A conservative estimate is that these patents have been implemented in more than one billion dollars' worth of safety-related products worldwide. Given MATC-TSE's proposed research portfolio, it is expected that this success will continue in the future. Since 2006, MATC-TSE-affiliated faculty members have published over 2,500 transportation-related articles in peer-reviewed journals and peer-reviewed conference proceedings.

MATC-TSE has been designed as a true partnership among the Iowa Department of Transportation (IaDOT), the Kansas DOT (KDOT), the Missouri DOT (MoDOT), the Nebraska Department of Transportation (NDOT), the US DOT, private sector transportation representatives, and the member institutions of the Region VII UTC consortium.

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CONSORTIUM MEMBERS:

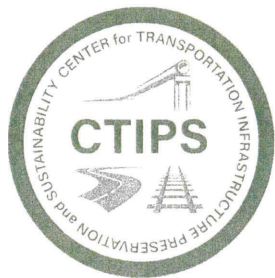
University of Nebraska-Lincoln (UNL)
Nebraska Indian Community College (NICC)
Missouri University of Science and Technology (MS&T)
University of Iowa (UI)
University of Kansas (KU)
University of Missouri-St. Louis (UMSL)

Website: <https://matc.unl.edu/>

Twitter: <https://twitter.com/MATCNews>

YouTube: <https://www.youtube.com/user/idAmericaTrans>

Facebook: <https://www.facebook.com/MidAmericaTransportationCenter/>



Center for Transformative Infrastructure Preservation and Sustainability (CTIPS)

North Dakota State University

Center Type – Regional

Focus Area – Preserving the Existing Transportation System

Center Vision and Objectives

CTIPS aims to revolutionize the preservation of existing transportation systems by integrating advanced sensing technologies and automation in data collection and analysis, while alleviating worker shortages in rural areas. CTIPS's research focuses on two primary areas: 1) autonomous inspection and artificial intelligence and 2) pavement resilience and bridge management.

In addition, CTIPS's research addresses systemic equity issues in the Upper Great Plains region with potential impacts nationwide, especially inequities stemming from the relatively poor quality of Tribal and rural roads. The Center's Tribal-focused programs emphasize education, technology transfer, workforce development, and technology deployment, with the goal of building internal capacities within Tribal nations for planning and managing transportation systems.

Center Initiatives

The urgent need to quantify the deterioration of the nation's aging transportation infrastructure by addressing the challenges associated with traditional inspections is a primary driver of CTIPS efforts. In particular, the research portfolio aims to transition from manual, inconsistent, and bias-prone methods to automated, consistent, and objective approaches. The integration of unmanned aerial systems, advanced sensors, automation, and artificial-intelligence technologies will revolutionize how agencies monitor and maintain the transportation infrastructure.

Research: CTIPS's research features multidisciplinary teams of experts from various fields (including civil, electrical, mechanical, and environmental engineering, computer science, and many others) collaborating on large-scale problems, ensuring a holistic approach to infrastructure preservation. Continuous engagement with private industry and transportation agencies grounds the research in real-world challenges and ensures resulting solutions are practical, implementable, and beneficial to a wide range of stakeholders.



Participating Universities in CTIPS

The Center's research portfolio reflects the unique transportation needs of the region, ensuring that low-income and Tribal communities benefit from technology applications, practitioner tools, workforce development, and community engagement. Through multi-university collaborations and client partnerships, CTIPS's researchers are investigating the use of advanced materials for infrastructure preservation, the development of climate-adaptive pavement materials, and the electrification of roadways and the dynamic charging of commercial trucks. In a region-wide effort, CTIPS's researchers are engaging Tribal transportation practitioners to address the unique administrative and jurisdictional environments under which Tribal programs operate.

Education and Workforce Development: CTIPS universities prepare students for a wide range of careers in transportation and work to increase graduation rates, especially among underrepresented groups, by mentoring and supporting students. In addition to well-established transportation degree programs, the consortium's universities offer online courses and training opportunities for transportation professionals, including state DOT staff requiring professional certifications. CTIPS faculty will also expose more students to transportation by enriching

non-transportation courses with transportation content. To advance the Center's theme, several CTIPS universities are collaboratively developing new courses in *Emerging Technologies for the Preservation of Transportation Infrastructure*, which include topics in artificial intelligence, machine learning, and advanced sensing technologies.

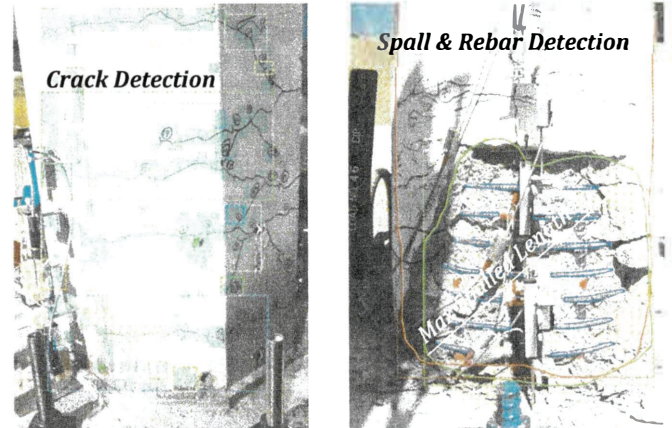
The CTIPS consortium includes two Tribal-serving institutions that are integrally involved in the Center's education and workforce-development programs. During its grant, CTIPS will pursue similar collaborations with other institutions.



Drone Inspection of Remote Railway Bridge

Technology Transfer: CTIPS emphasizes innovation and promotes the deployment and commercialization of new technologies and processes stemming from research and testing. The Center amplifies its capacity for technology transfer by leveraging historic connections with organizations such as the region's Local Technical Assistance Program (LTAP) and Tribal Technical Assistance Program (TTAP) centers and state departments of transportation to ensure the transfer of research results into practice. Through its two minority-serving institutions and a collaborative

agreement with the North Dakota Tribal College System, CTIPS has forged deep connections to Tribal communities, allowing the Center to reach more Native American Indian leaders and practitioners.



Computer Vision Based Bridge Damage Assessment

Products & Outcomes

CTIPS's initiatives represent a transformative approach to preserving the transportation system. By integrating advanced technologies, automation, the Internet of Things, and artificial intelligence, CTIPS's programs are revolutionizing infrastructure condition monitoring and assessment, leading to safer, more reliable, and more sustainable transportation infrastructure. In partnership with state departments of transportation, transportation companies, and technology firms, CTIPS research, technology transfer and workforce development programs are transforming asset management while preparing transportation workers to function in a dynamic highly-automated work environment. Some areas of early implementation include management of non-highway assets, fault detection of rail lines and yard infrastructure, more frequent and cost-effective monitoring of low-volume roads and remote highway facilities, and disaster assessment and response.

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CONSORTIUM MEMBERS:

Colorado State University
Colorado University Denver
Denver University
Fort Lewis College
South Dakota State University
United Tribes Technical College
University of North Dakota
University of Utah
University of Wyoming
Utah State University



Pacific Southwest Region University Transportation Center

University of Southern California

Center Type – Regional

Focus Area – Improving Mobility of People and Goods

Center Vision and Objectives

The Pacific Southwest Region University Transportation Center (PSR UTC) was formed in 2016 and is the Region 9 UTC, continued with an expanded consortium in 2023. Our vision is to serve Region 9 while advancing the US Department of Transportation's strategic goals of *Equity, Climate and Sustainability, and Economic Strength and Global Competitiveness*.

While Region 9 houses 11 metropolises with populations over one million, the largest port complex in the Western Hemisphere, and is the largest high-technology region in the world, it also contains concentrations of urban and rural poverty, sparsely populated rural areas, and large and growing levels of income inequality.

Our vision for the PSR UTC is to bring together the region's premier university transportation research institutions to deliver an integrated program of research, education and workforce development, and technology transfer that will close equity gaps, meet the region's and nation's ambitious climate and sustainability goals, and support a robust and sustainable goods movement system that anchors economic growth.

Center Initiatives

Research: The PSR UTC conducts a multi-modal, multi-disciplinary program of research organized around two themes and seven topics:

Research Theme 1: Accessibility and Mobility for All



Topic 1.1: Accessibility for Underserved and Isolated Communities



Topic 1.2: Improving the Efficiency of the Mobility System



Topic 1.3: Broadening Access to Low/Zero Carbon Transport

Research Theme 2: Sustainable and Resilient Supply Chains



Topic 2.1: Addressing Environmental Justice Problems in the Goods Movement System



Topic 2.2: Goods Movement System Efficiencies and Resilience



Topic 2.3: Decarbonizing the Goods Movement System



Cross-Cutting Research Topic: Access to Opportunity Through Strategic Workforce Development

A small sample of PSR research includes: Lidar detection of truck traffic at UC Irvine, advanced algorithms for vehicle routing at USC, research into new mobility at UC Berkeley, research into closing equity gaps at UCLA and USC, and work that supports the region's aggressive sustainability goals at every consortium member.

Education and Workforce Development: PSR supports education and training that produces the next generation of academic scholars, professionals, and skilled workers. PSR attracts large numbers of the best students from non-traditional transportation fields, especially those from underrepresented groups, into transportation careers through personal and targeted recruitment from high schools, community colleges, and universities. PSR supports undergraduate and graduate student fellowships and research assistantships, student professional development



Pima Community College student enrolled in the Commercial Driver's License (CDL) Certification program during a behind-the-wheel class in March of 2023.

programs, and conducts a comprehensive workforce development program.

Consortium members are leaders in non-degree education. Pima Community College has launched an Autonomous Vehicle Driver and Operations Specialist certificate, with PSR support and in partnership with the autonomous truck firm TuSimple. Cal State University Long Beach offers the award-winning Global Logistics Professional (GLP) Program, designed to meet the training needs of individuals at various stages of their careers in logistics. The University of Hawaii develops and delivers training courses on disaster preparedness, response, and recovery, certified by the Federal Emergency Management Agency and enrolling over 35,000 persons since 2016.

Technology Transfer: Transfers is the semi-annual digital magazine of PSR, produced and edited at UCLA and available at <https://transfersmagazine.org/>. Each PSR partner university participates in *Transfers*. *PSR News* is published as part of *METRANS News*, a monthly e-newsletter that features research, student awards and activities, new program initiatives, and summaries of PSR events. *METRANS News* content is available at <https://www.metrans.org/eblasts>.

PSR supports some of the highest-profile convenings in Region 9, including METRANS's bi-annual International Urban Freight (I-NUF) Conference, the 2023 International Association of Maritime Economists (IAME) Conference, and the CSULB Trade and Transportation Industry Town Hall. PSR supports



Attendees at the 2022 International Urban Freight (I-NUF) Conference hosted by METRANS, USC, and CSU Long Beach.

the UCLA Lake Arrowhead Symposium on Transportation, Land Use, and Environment and the UC Davis National Summit on Transportation and Environmental Sustainability. The PSR Annual Congress draws over 150 students and faculty and will be hosted by UNLV this upcoming Spring of 2024, followed by UC Berkeley in 2025.

Product & Outcomes

Community-Partnered Projects: PSR launched two community-partnered projects, which will pair PSR research teams with community organizations from the earliest stages of the research. This approach will center equity while accelerating technology transfer by involving community end-users from the earliest stages of the research.

Cal State Long Beach will lead research on “**Tribal Transportation Oral History of Mobility: Understanding the Past to Improve Future Collaborations and Innovations**,” with input from Northern Arizona University. The outcomes will include suggested best practices for transportation planning throughout Region 9 and an add-on presentation at the “Benchmarking Equity and Mobility Needs for Tribal Governments” summit hosted by TRB’s Standing Committee on Native American Transportation Issues in early Spring 2024.

UC Davis will lead research on “**Grassroots Shared Mobility in California’s San Joaquin Valley**” with collaboration from the University of Nevada, Las Vegas. This research will build on the experiences of the home-grown non-profit shared mobility provider Miocar to bring shared, electric vehicles to rural communities in Kings County, California. The research will partner with community-based organizations and affordable housing organizations including Self-Help Enterprises, the largest affordable housing developer in the San Joaquin Valley. Through interviews, focus groups, data analysis, and document review, this research will produce a detailed plan to expand accessibility that can be funded through existing local, state, and federal mechanisms.

LEAD UTC CONTACT:

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CONSORTIUM MEMBERS:

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California State University, Long Beach
Northern Arizona University
Pima Community College
University of California, Berkeley
University of California, Davis
University of California, Irvine
University of California, Los Angeles
University of Hawai'i, Manoa
University of Nevada, Las Vegas



Pacific Northwest Transportation Consortium (PacTrans)

University of Washington

Center Type – Regional
Focus Area – Improving the Mobility of People and Goods

Center Vision and Objectives

Region 10 (Alaska, Idaho, Oregon, and Washington) is characterized by a rapidly growing population with heavy freight movements through rural and urban corridors. The area is prone to earthquakes, tsunamis, wildfires, landslides, and sea level rising, all of which greatly impact the region's transportation network. Mountainous roadways and restricted waterways make it difficult to provide equitable, resilient, and reliable distribution of resources across the region. Region 10 has diverse mobility needs, particularly for those with physical, sensory, and cognitive impairments, and is limited in the transportation services currently accessible to underserved communities and underrepresented minorities. Specific to this region, there is a large proportion of Native Americans and Alaska Natives who tend to have higher distrust in policies implemented by institutions. The rapidly growing population in the Pacific Northwest has made the region one of the most expensive places to live in the US with disproportionately high real estate and food cost. The high cost of housing has driven people who need alternative transportation toward areas that do not have good transit and are not pedestrian friendly.

The goal of PacTrans is to create an environment where consortium universities and transportation agencies within Region 10 work together synergistically. We are dedicated to the development of human-centered and transformative multimodal mobility solutions for an equitable Pacific Northwest. We serve as the research engine, applied technology showcase, workforce development base, education leader, and collaboration platform of Region 10.

Center Initiatives

PacTrans strives to develop transformative solutions that are flexible and adaptive to anticipate and respond to the changing opportunities and challenges in transportation. PacTrans has a long history of collaboration and engagement with government, industry, and communities in addressing the mobility challenges faced by Region 10. The rapid growth in Region 10 has brought in many automotive, high tech, and startup companies. PacTrans leverages its local/regional connections to jointly address the existing and future transportation challenges.



PacTrans Research Focus

Research: PacTrans research topics support five research thrusts: (1) transportation equity and accessibility, (2) multimodal system and connectivity, (3) safety, reliability, and resiliency, (4) human-system integration, and (5) transformative solutions. These research thrusts provide insights on the mobility constraints of pedestrians, bicyclists, rail, and transit to operate seamlessly with cars and trucks in both rural and urban areas and for all weather conditions. Within the rural and urban corridors, the promise of a future with autonomous vehicles makes it imperative to understand the infrastructure needs for vehicles to communicate with other vehicles, non-motorists, the road infrastructure, and the traffic control devices, and the acceptance and trust of all road users.

Education and Workforce Development: The main focus of PacTrans workforce development efforts has been through the PacTrans Workforce Development Institute. This institute focuses on two key areas: (1) short-term continuing education and training courses for working professional (e.x., MUTCD refresher course, Human Factors in Transportation Engineering, Data Analysis and Tools, etc), and (2) a variety of K-12 STEM outreach activities (e.x., UW-WSU-WSDOT Summer High School Transportation Camp, National Summer Transportation Institute, and Middle School



PacTrans WSDOT Summer High School Transportation Camp

Course on Autonomous Vehicles). On the education side, PacTrans supports our transportation programs to update curriculums and supports students through fellowships, student team support, travel support to present accepted work, and internship programs in collaboration with external partners.

Technology Transfer: PacTrans PIs endeavors to engage with transportation practitioners at every step of the research process, beginning with project formulation. This increases the likelihood that research outcomes will be implemented in real-world scenarios. Further, PacTrans recognizes that the typical academic research is more familiar with academically-oriented research outputs. Thus, PacTrans offers small amounts of additional for projects called, "Success Stories," where we fund PIs to take meaningful research results and create practice-oriented outputs.

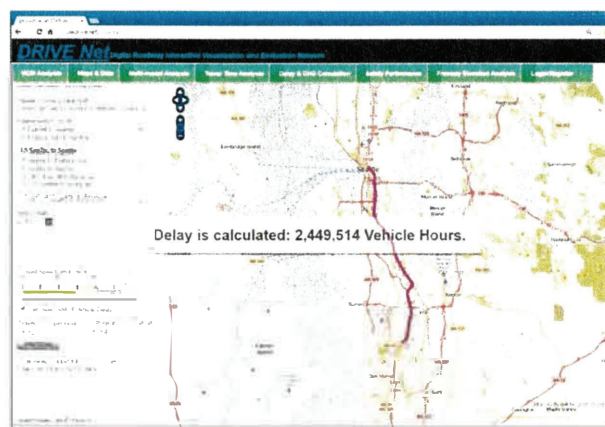
Products & Outcomes

PacTrans is committed to improving the mobility of people and goods in the Pacific Northwest. This is done by providing world class education for the future transportation workforce, training working professionals on new and emerging tools and techniques, through rigorous academic research that is formulated in collaboration with industry partners, and assisting PIs in moving their research outputs into practice.

Among the noteworthy products and outcomes, the STAR Lab at the University of Washington developed the Mobile Unit for Sensing Traffic (MUST) Technology. This technology began as a Bluetooth/WiFi MAC address sensor, and over time, has evolved into a connected vehicle technology that



Mobile Unit for Sensing Traffic (MUST) Technology



Digital Roadway Interactive Visualization and Evaluation Network Application

leverages AI and edge computing technologies. It integrates multiple sensors, including PTZ camera, Bluetooth and Wi-Fi sensor, and temperature and humidity sensors. The MUST has the capability to fuse all of the data from these various sensors, conduct in-device analysis (Edge Computing), and communication functions all in one unit.

This technology has been deployed in the field for many different applications in many different locations over the years. Several key examples include: SR-522 in Washington State, the City of Bellevue, Lakemont Boulevard (Bellevue), the E8 Corridor (Norway), and Yakima Nation. Recently, the MUST technology received the Innovative Project award from the Build a Better Mousetrap Program at FHWA. Over the past several years, the STAR Lab researchers have gone through the process of successfully applying for two patents related to the MUST technology, and established a spinoff company, AIWayson.

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YouTube: <https://www.youtube.com/user/PacTransUTC>

CONSORTIUM MEMBERS:

Northwest Indian College

Portland State University
University of Alaska Anchorage
University of Idaho
Washington State University

TIER 1 CENTERS



Rural Equitable and Accessible Transportation (REAT) Center

Center Type – Tier 1

Focus Area – Improving Mobility of People and Goods



Center Vision and Objectives

Established early in 2023 by the United States Department of Transportation, the Rural Equitable and Accessible Transportation (REAT) Center is a consortium of six institutions that aims to improve transportation access for people with disabilities, older adults, vulnerable road users, low-income populations, and underserved populations in rural areas. REAT Center's primary focus is on rural multimodal transportation, where issues of equitability and accessibility have lagged behind in planning, funding, safety, and operational considerations.

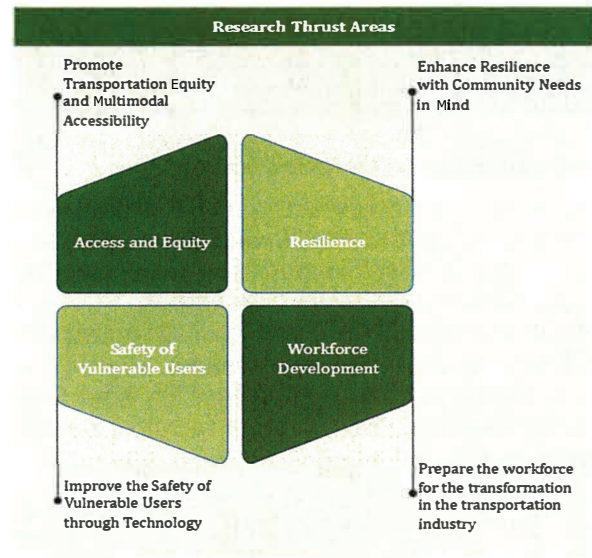
The REAT Center consortium is led by the Florida A&M University (FAMU), in cooperation with Tallahassee Community College (TCC), Florida State University (FSU), University of Washington Tacoma (UWT), Cleveland State University (CSU), and Stony Brook University (SBU). Faculty members of the REAT Center have achieved national and international recognition in the transportation research domain through their active participation and publications in various professional transportation organizations' committee work.

Center Initiatives

REAT Center is motivated by strategic thinking and planning of rural transportation in the United States. Given its paramount importance, the increasing diversity and expanding inequities within and across regions are notable trends in rural communities. It is worth emphasizing that 97% of the land mass in the U.S. falls under the rural category, encompassing 68% of the nation's total lane-miles. Thus, the desired transformation of the transportation sector requires robust research and strategies to overcome geographical challenges in access, connectivity, and modernization of the rural transportation system. The center majored in three initiatives.

Research: REAT Center's consortium members are conducting research across four primary thrust areas: access and equity, which serves as the main focus, and secondary thrust areas, including the safety of vulnerable users, resilience, and workforce development. These focus areas cover significant ground of multifaceted disciplines aimed at addressing diverse challenges within transportation systems and

facilities in rural areas, seeking comprehensive solutions.



REAT Center Research Thrust Areas and Objectives

Workshop training: REAT Center's thrust areas are impact-oriented, requiring physical involvement with the community. Through workshops, the consortium members are disseminating knowledge about transportation to the upcoming generation of transportation researchers and experts on the current state-of-the-art practices and challenges, encouraging an inquisitive mindset toward developing solutions. These workshops bring together transportation experts and junior aspirants from high school and university levels. Recently, Dr. Angela Kitali, REAT's



Dr. Angela Kitali presenting and engaging with students during the PacTrans-WSDOT summer camp.

associate director for education, participated in the high school summer camp program organized by the PacTrans Center and WSDOT.

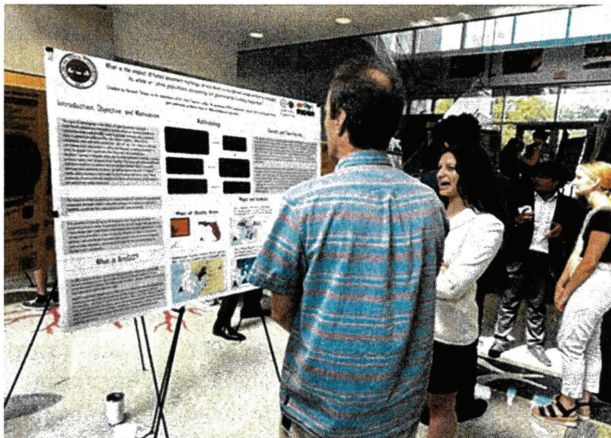
Dr. Josiah Owusu-Danquah, a REAT researcher, participated in the Hyland summer middle camp focused on training students on the design of



Dr. Josiah Owusu-Danquah with students during a workshop conducted as a part of the Hyland Summer Camp

intersections and the role of bridges in transportation. Most students came from different schools within and outside the Cleveland Metropolitan School District in Ohio, and one student came from Taiwan.

Scholar program: REAT Center recruits students from different levels, providing training aligned with research conduct and presentation. Dr. Eren Erman Ozguven and his Ph.D. students recruited two high



Hannah Flitman, a high-school student supervised by Dr. Ozguven and his team, presenting her poster at the end of the Young Scholars Program

school students who were trained in transportation data analysis using Geographic Information System (GIS) for six weeks through the Young Scholars Program of Florida State University in June 2023.

The center facilitates the practical application of the skills acquired through training by engaging students across diverse platforms. This initiative serves as an ongoing program for the REAT Center.

Products & Outcomes

REAT Center is focused on developing cutting-edge projects, ensuring that outcomes are translated into state-of-practice through robust technology transfer strategies. The Center's deliverables will contribute to U.S. DOT Key Performance Indicators, including reduction of the national transportation cost burden, reduction of motor vehicle fatalities of vulnerable populations in rural areas, increased employment of highly qualified workforce in the transportation sector, and significant increase in the number of research and deployment projects centered on breakthrough discoveries that introduce new technologies and approaches.

REAT Center takes on workforce development squarely, not as a derivative after-thought within other thrust activities. Currently, transportation agencies compete with more resourceful technology and start-up companies to recruit and employ a workforce well-versed in emerging topics such as autonomous systems, sensors, machine learning, and artificial intelligence. Thus, the center develops a workforce that:

1. Understand how to recruit and retain a skilled workforce,
2. Educate students from fields that DOTs traditionally recruit from (e.g., civil engineering, planning) with the necessary skills.
3. Train the existing workforce not to fall back on the technological advancement trend

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CONSORTIUM MEMBERS:

Florida State University
Cleveland State University
University of Washington Tacoma
Stony Brook University
Tallahassee Community College

Innovative Bridge Technologies/Accelerated Bridge Construction-University Transportation Center (IBT/ABC-UTC)

Florida International University



Improving the durability and extending the life of transportation infrastructure.

Center Vision and Objectives

The Accelerated Bridge Construction University Transportation Center (ABC-UTC) was established under the 2013 UTC competition, and re-selected in the 2016 competition. From 2013 to 2022, the ABC-UTC became the ABC centralizing organization for bridge professionals in the United States. Working in close collaboration with the AASHTO Committee on Bridges and Structures (COBS), FHWA, state DOTs and other bridge professionals, ABC was made a viable and valuable option to minimize traffic impacts and improve safety as the nation's aging bridge inventory is upgraded. The scope of ABC-UTC activities was expanded during the 2022 competition cycle. As a result, the newly established Innovative Bridge Technologies/Accelerated Bridge Construction University Transportation Center (IBT/ABC-UTC) will address the needs of all bridges and construction types.



Center Initiatives

IBT/ABC-UTC's objectives include: a) Development of the next generation of ABC technologies; b) Assisting in continuing to implement prior developed technologies; c) Development of advanced technologies to address pressing challenges related to existing bridges; d) Development and implementation of the innovative purpose-driven, transformative bridge engineering technologies and solutions that are resilient and socially equitable; e) Effectively transfer the developed knowledge to the profession; f) Train and develop a next-generation workforce that can implement the next generation of ABC and IBT and address the pressing challenges related to existing bridges; and g) Provide leadership in making contributions to solving national transportation issues.

Research

The IBT/ABC-UTC conducts cutting-edge research on a wide range of topics including advanced materials and construction techniques, seismic designs, decision-making tools, prefabrication methods, foundation connections, project specifications, and other innovations to enable accelerated project delivery with enhanced performance and reduced onsite duration.

In total IBT/ABC-UTC has funded 126 research projects, all related to various aspects of bridge engineering. The research categories of IBT/ABC-UTC can be divided into four major areas:

- A. Novel Approaches for Bridge Asset Management Systems
- B. Accelerated Repair and Upgrade of Existing Bridges
- C. Advanced Bridge Technologies
- D. Toward Next Generation of Bridge Design Specifications

On February 22, 2023, the USDOT designated FIU's IBT/ABC-UTC as the lead consortium to bring the latest technologies such as Artificial Intelligence, 3D Printing, Advanced Materials and Innovative Methodologies, Advanced Decision Making to bridge engineering to ultimately make the U.S. Bridge Industry the number one in the world.

Education and Workforce Development

The center has an established history of successful Education and Workforce Development activities. A total of 145 students participated in research activities during previous grant cycles, among which the numbers of Ph.D., M.S., and undergraduate students are 65, 39, and 41 respectively. A total of 24 quarterly research seminars have been provided for workforce development, with 9,973 participants in total.



In previous grant cycles, the IBT/ABC-UTC has successfully organized many education and workforce development activities including parent-child engineering camps, teacher and librarian workshops, online professor workshops, and educational material development, to name just a few.

Testimonials

"The establishment of and, more importantly, the performance of FIU's ABC-UTC has been the major reason that the use of ABC has increased throughout the Bridge Engineering Community. Its Research, Educational Efforts, Webinars, and Project Database have provided Bridge Engineers with the resources needed to consider the use of ABC for their projects. FIU's ABC-UTC is the 'Go-To Center' for ABC." - Malcolm T. Kerley, P.E., Former Chair, AASHTO SCOBs and Chief Engineer, VDOT (2022)

"Tennessee DOT's successful ABC Program can be directly tied to the exceptional resources provided by FIU's ABC-UTC. The information provided through the monthly webinars and the various ABC Guides that the FIU ABC-UTC have developed have been invaluable in the development and operation of our program." - Ted A. Kniazewycz, P.E., F.ASCE, State Bridge Engineer, TDOT

Products & Outcomes

Robotics and automation find extensive applications in the automotive, electronics, and aerospace sectors due to their suitability for mass manufacturing and standardized design.

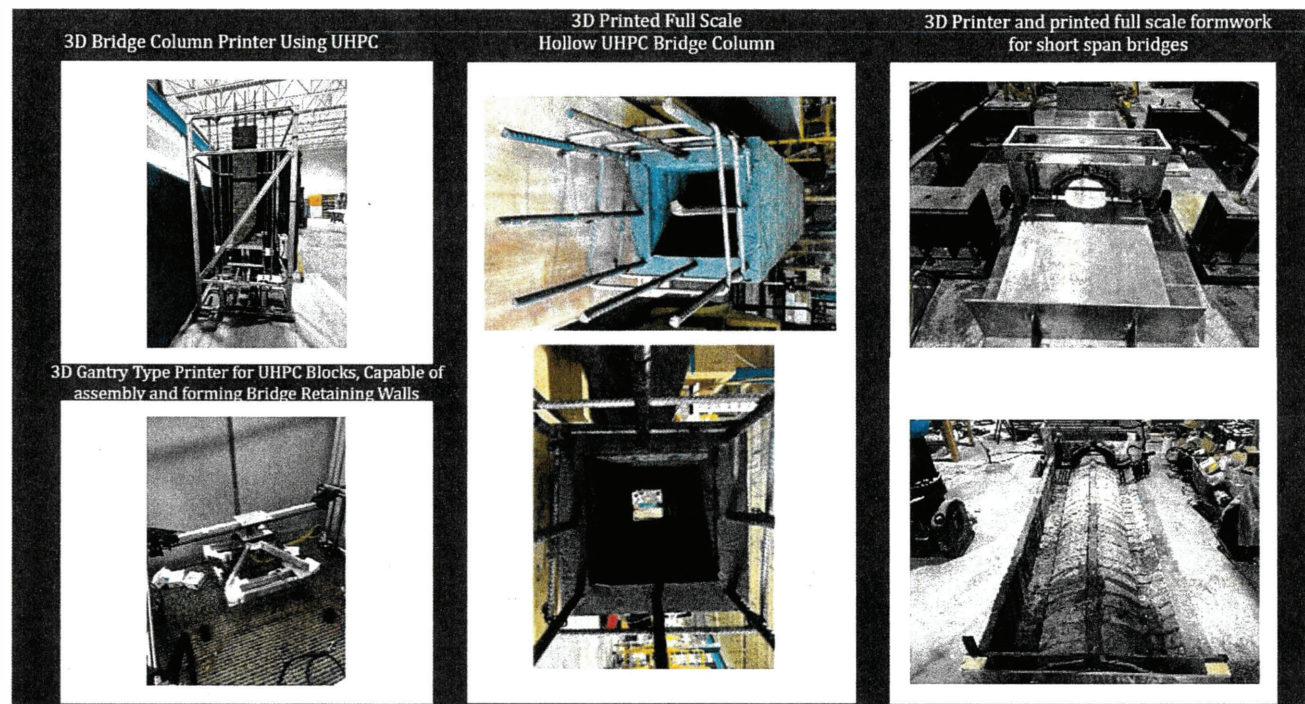
The construction industry, however, has been hesitant.

The IBT/ABC-UTC has developed open-source material called Ultra High-Performance Concrete (UHPC). UHPC is an advanced cementitious material known for its outstanding tensile strength, durability, and aesthetic adaptability, making it ideal for 3D printing in construction and bridge engineering. Using open source UHPC and concept of UHPC shell and customized 3D printers developed entirely by IBT/ABC-UTC, full scale bridge elements are being printed that are ready for commercialization. Figure below shows examples of 3D printers developed and full scale structural elements 3D printed.

Technology Transfer: We don't stop at research.



The IBT/ABC-UTC focuses extensive efforts on collaborating with the transportation agencies and rapidly transferring research results into practice through webinars, tailored guides, substantial presence at national conferences, distributing project information, forming partnerships across stakeholders, and providing direct technical assistance to State DOTs and other bridge owners to facilitate technology adoption.



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CONSORTIUM MEMBERS:

University of Oklahoma (OU)
University of Washington (UW)
University of Nevada, Reno (UNR)
Florida A&M University (FAMU)
University of Georgia (UGA)
Texas A&M University (TAMU)

RESEARCH AND EDUCATION PROMOTING SAFETY (REPS)

Howard University

Center Type - Tier-1 UTC

Focus Area - Promoting Transportation Safety

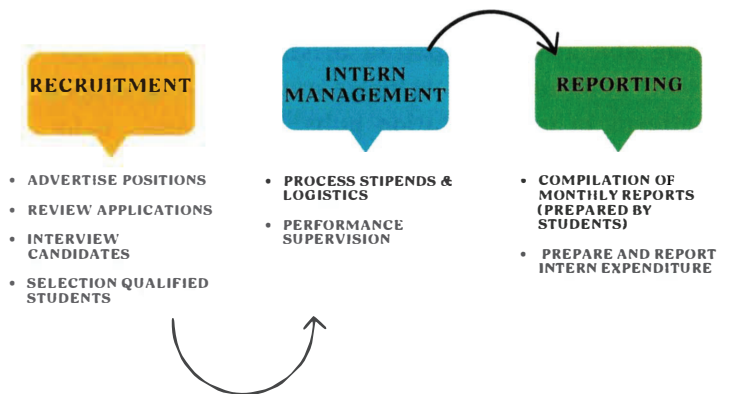
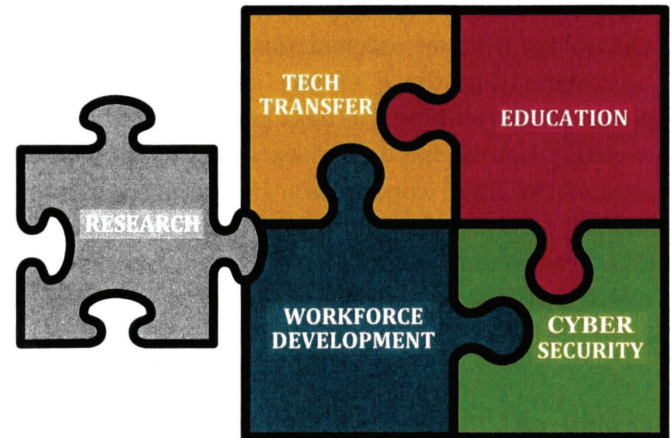
CENTER VISION & OBJECTIVES

The Research and Education in Promoting Safety (REPS) Tier-1 UTC Center was established in 2023 by the United States Department of Transportation (USDOT) as part of the University Transportation Center (UTC) Program. The research center has aimed at facilitating collaborative research to Promote Safety through enhancements in the areas of traffic operations, infrastructure resilience and transportation cybersecurity.

CENTER INITIATIVES

REPS Tier-1 University Transportation Center is focused on integrating state-of-the-art research across disciplines, particularly Civil Engineering and Computer Science to improve transportation safety and to address challenges related to infrastructure, traffic operations, and cybersecurity. While traditional engineering approaches to safety have yielded a significant reduction in fatalities, injuries, property damages, and other adverse effects on transportation infrastructure, safety continues to be a significant threat to the population in the U.S. and globally. The current approach to safety could yield better outcomes with enhanced multidisciplinary interactions among the key fields, potentially improving transportation safety even further by integrating the strengths in engineering, computer science, and other fields.

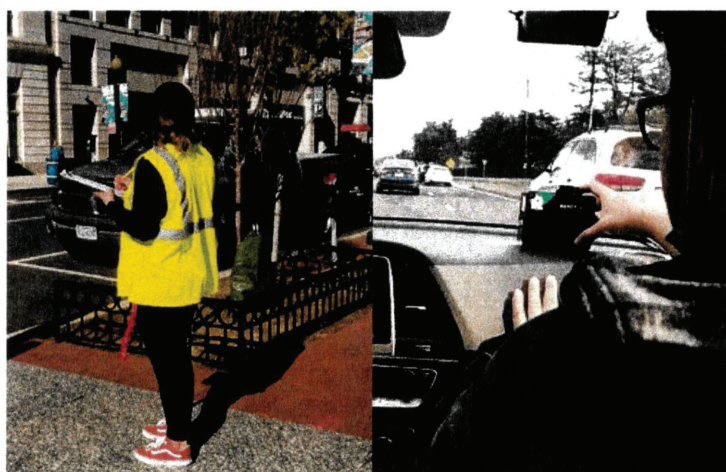
Research: REPS is a consortium of researchers and students who are dedicated to improving transportation safety. The consortium members are focused on studying a variety of factors, including the effectiveness of different education and enforcement strategies, the potential of emerging technologies like Artificial Intelligence (AI) and blockchain, and the trends and patterns that can be identified in crash and vehicle trajectory data. The consortium is also working to ensure that all road users, regardless of income, have access to safe and reliable transportation. To achieve this, the members are also working to protect low-income road users through community engagement and technology transfer.



Education and Workforce Development: REPS plans to support, increase, and improve academic programs using UTC by developing new transportation-related courses and curricula, providing scholarships and other financial aid to students in transportation programs, and hiring additional faculty and staff with expertise in transportation.

The UTC will also facilitate the organization of transportation-related certification programs, and provide funding to students to complete those certifications. Furthermore, the program will conduct workshops and internship opportunities to increase interest in the transportation and engineering field. The UTC program is committed to providing high-quality transportation education and workforce development programs that meet the needs of the transportation industry and the workforce. The university's use of UTC will help to support, increase, and improve these programs and ensure that they are preparing students for successful careers in transportation.

Technology Transfer: REPS will utilize a diverse array of dissemination methods and media to ensure research results and conference proceedings reach those responsible for managing change. These methods include publication, seminars, workshops, websites, social media, webinars, and other technology transfer mechanisms. Howard University is coordinating these efforts with its consortium partners. Developing the next generation of leaders in safety knowledge and research methods is a key goal of the REPS consortium. Dissemination media such as seminars, symposia, web-based discussions, and other communications opportunities open to interested public will help the UTC program to facilitate technology transfer.



Product and Outcomes: REPS aims to develop and implement innovative tools to address critical transportation safety concerns, including preventing drug and alcohol impaired driving, enhancing the safety of autonomous vehicles, and predicting crime patterns in transportation hubs. The findings hold the potential to positively influence transportation safety by empowering authorities with real-time insights, enabling proactive risk management strategies, and informing policy decisions at all levels. The insights to inform policy decisions will advocate for standardized safety designs in future transportation projects and shaping the future of secure and accessible transportation systems. The broader impact of the combined research projects extend beyond immediate safety concerns.

For instance, by discerning recurring crime patterns, transport planners and urban designers can embed effective security measures directly into transportation hub designs, be it strategic surveillance, improved lighting, or other safety feature. The research projects will make significant progress in tackling critical transportation safety issues. By developing innovative tools and methods, the projects will transform transportation safety, give authorities more power, improve human-AV interactions, and create a safer and more secure future for everyone.

LEAD UTC CONTACT

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CONSORTIUM MEMBERS

- Howard University
- University of Maryland, College Park
- University of Nevada, Las Vegas
- San Jose State University



Illinois Institute of Technology

Center Type — Tier 1

Focus Area — Reducing Transportation Cybersecurity Risks

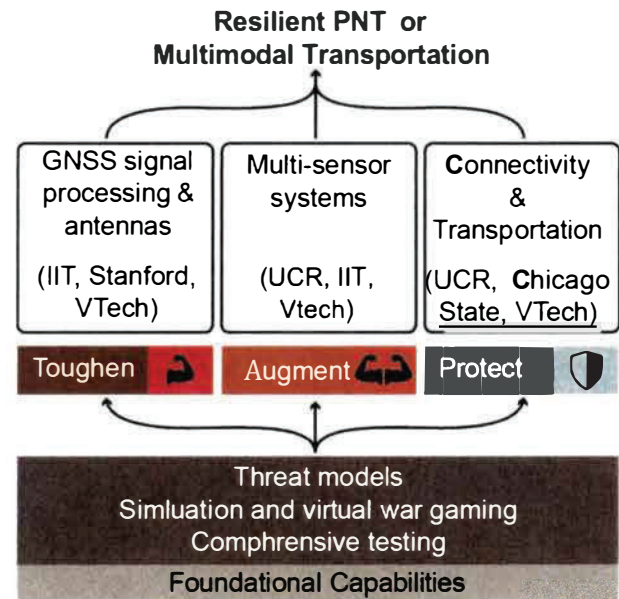
Center Vision and Objectives

The Center for Assured and Resilient Navigation in Advanced Transportation Systems (CARNATIONS) is a new U.S. Department of Transportation (USDOT) Tier-1 University Transportation Center (UTC) confronting cyber-physical risks affecting Positioning, Navigation, and Timing (PNT). The Center is explicitly focused on Resilient PNT (R-PNT) and relevant vehicle-to-everything (V2X) communications for all modes of surface transportation.

R-PNT is at a crucial juncture for transportation. Transportation systems have become heavily reliant upon PNT, and the number of occurrences of PNT interference is rising. Jamming and spoofing have caused major disturbances at civilian ports and airports. Interference events can instigate delays and traffic jams on roadways, railways, and waterways, and create dangerous situations for all modes of transport. CARNATIONS is designed to enable the fundamental transformations to infrastructure and technology that will make the U.S. surface transportation systems resilient to existing and impending interference and cyber threats, including those affecting future automated systems.

Today's growing threat of PNT and V2X interference must be addressed. Only then will it be possible to create opportunities for tomorrow's transformation towards a safer, more energy-efficient and cost-effective transportation system. CARNATIONS pursues this goal while also providing support for underserved communities through outreach and education, and restoring trust in government through evidence-based policy-making by developing standards and best practices that promote the responsible use of PNT in transportation.

CARNATIONS' primary research goals are to develop technologies to toughen, augment, and protect transportation PNT against cyber-physical disruption and manipulation. The Center provides resources for transferring these emerging technologies to public agencies and industry through partnerships, dissemination, and leadership in standardization bodies. CARNATIONS also runs a multi-university curriculum to help prepare current and future transportation professionals to tackle R-PNT challenges in transportation.



CARNATIONS pillars for resilient PNT

Center Initiatives

Research: The CARNATIONS research vision is founded on three research pillars for multi-modal surface transportation: (1) Toughen PNT through advanced global navigation satellite systems (GNSS) receiver and antenna technology; (2) Augment PNT with non-GNSS sensors (e.g., inertial navigation systems (INS), odometry, vision, LiDAR) and signals from multiple GNSS providers, communication satellites, and terrestrial RF including V2X; and (3) Protect PNT through RFI detection, tracking, and mitigation by leveraging V2X connectivity, community information, and crowdsourcing.

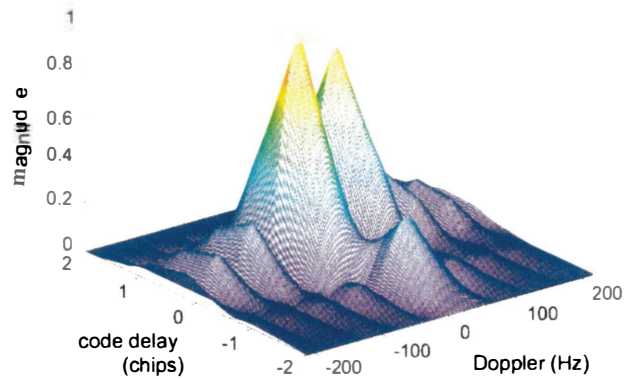
Education and Workforce Development: Resilient PNT systems and technologies are not traditional areas of expertise in transportation professions; however, they have rapidly emerged as critical to the design of future transportation systems. CARNATIONS offers a unique concentration program training future talent to support R-PNT for transportation. The Center especially values outreach to first-generation college students, female, and underrepresented minorities (URM). CARNATIONS' Engineering Research Toolkit (ERT) is a framework organizing inter-university URM student exchanges and hands-on R-PNT

research with experienced faculty mentors from all CARNATIONS institutions.

Technology Transfer: CARNATIONS' five institutions have long-established records of R-PNT solutions adopted by industry, public agencies, and other transportation practitioners. Coordination and standardization with stakeholders are key to the development of consensus technology that is accepted worldwide. CARNATIONS researchers lead and contribute heavily to numerous international PNT committees for all modes of transportation.

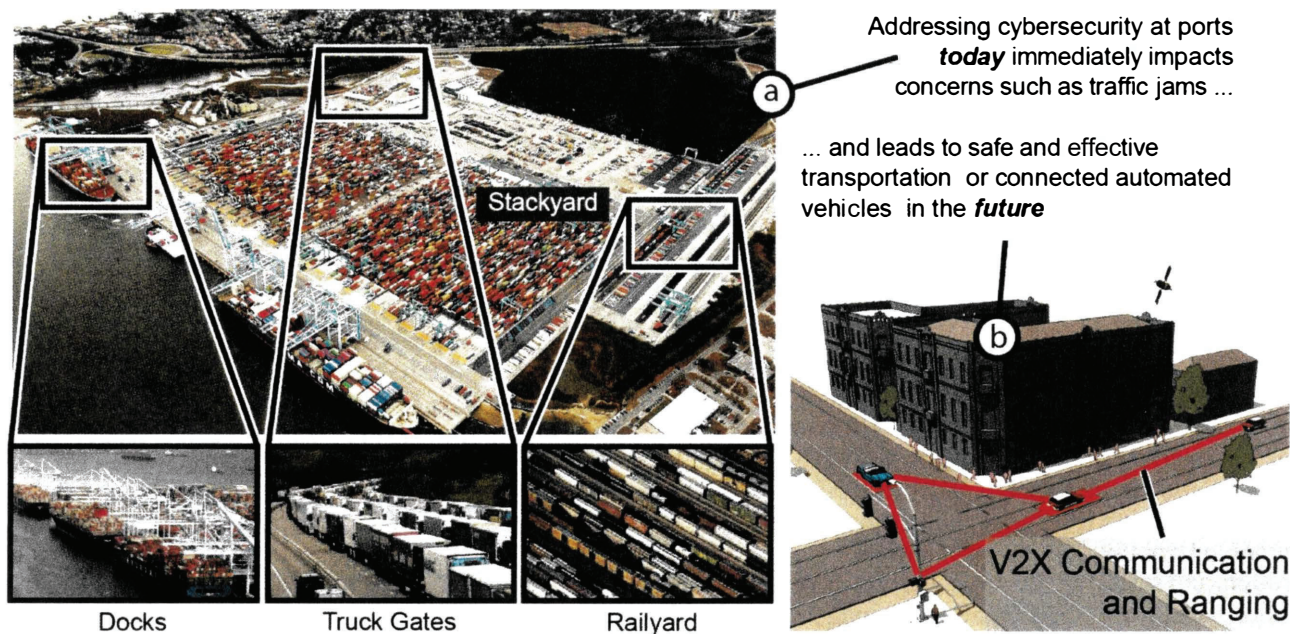
Products & Outcomes

The products of CARNATIONS research follow from its mission to toughen, augment, and protect PNT for all modes of surface transportation. Research projects aim to develop advanced anti-jamming and anti-spoofing GNSS antenna and receiver signal processing technology, jam/spoof resistance using integrated multi-sensor and radio-frequency augmentation, resilient V2X communications over 5G/6G networks, multi-vehicle jam/spoof detection and localization, threat models for multimodal transportation, and R-PNT virtual "war-gaming" simulators.



Spoofing detection using GNSS complex correlation function

CARNATIONS is training the next generation of transportation engineers, planners, and policymakers on R-PNT. The Center's cutting-edge research program is tightly integrated with education and stakeholder engagement. Researchers, students, and industry stakeholders are involved in all aspects of the Center. Our engagement efforts place knowledge and tools into the hands of stakeholders and create opportunities for them to shape CARNATIONS' research agenda and educational activities.



CARNATIONS addresses today's PNT threats in (a) to enable tomorrow's safe transportation systems in (b).

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CONSORTIUM MEMBERS:

Chicago State University
Stanford University
University of California – Riverside
Virginia Polytechnic Institute and State University

Center for Climate-Smart Transportation (CCST) Johns Hopkins University

*Center Type – Tier 1
Focus Area – Preserving the Environment*

Center Vision and Objectives

Transportation is the largest contributor to climate change than any other sector in the U.S. and without an aggressive and comprehensive set of mitigation and resiliency strategies at all levels of government, the GHG emissions and the associated health and quality-of-life impacts of climate change from transportation will only increase at a faster rate in the next two decades.

The Center for Climate-Smart Transportation (CCST) inspired by urgent call for an evidence-based research agenda that goes beyond scientific merits, focuses on solutions and is practice-ready and would result in changes in transportation policy and practice, making climate change the center of transportation decisions as emphasized in the USDOT Strategic Plan Goals and the USDOT Climate Adaptation and Resilience Plan.

CCST is in a unique position to address climate challenges with a distinctive consortium of the top 10 best transportation, planning, data science, energy, environment and health educators in the U.S. including Johns Hopkins University (JHU), Massachusetts Institute of Technology (MIT), University of Texas at Austin (UT), University of Utah (UU) and two minority serving institutions including Morgan State University (serving African Americans) and Dine College (serving American Indians).



Center for Climate-Smart Transportation Consortium

Center Initiatives

CCST contributes to this vision by focusing in following research areas:

Focus Area 1: Promoting Climate Culture in All Levels of Transportation Decisions

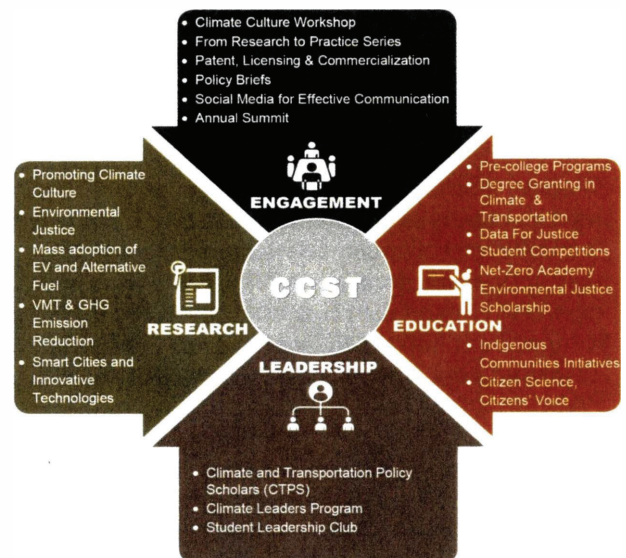
Focus Area 2: Community-Centered Solutions to Environmental Justice

Focus Area 3: Accelerating the Mass Market Adoption of EVs & Alternative Fuels

Focus Area 4: VMT & GHG Reduction via Modal Shift and Changes in Travel Behavior

Focus Area 5: Smart Cities & Innovative Adaptation and Mitigation Technologies.

CCST leads several transformative initiatives including practice-ready research projects, educational and workforce training programs, leadership training, technology transfer and engagement programs.



CCST Programs: Research, Leadership, Education & Engagement

Research: CCST research focuses on an urgent need for solution-based and community-centered research that incorporates new data and advanced technologies to drive change in climate-focused transportation policy and practice. CCST research contributes to reduction in GHG emission from transportation sector as the main source of emission.

CCST has initiated 14 transformative research projects related to our focus areas for the first year. Examples of CCST 1st year projects include:

- A Census of the U.S Climate-High Risk Area Population: Transportation and Environmental Justice Considerations (Lead: JHU)
- National Investigation on the Environmental, Safety and Livability Impacts of Travel Lane Width: Evidence from 10 American Cities (JHU)
- The 15-minute City Quantified Using Mobility Data (lead: MIT)
- A Granular Characterization of Mobility-Related Air Pollution Exposure Disparity (lead: MIT)
- Climate change Adaptation for Active Transportation (lead: Utah)
- Digital Twins as a Catalyst for Sustainable and Smart Cities (lead: UT)
- Charging forward: Crafting an Inclusive Smart Roadmap for Electric Vehicle Infrastructure in Navajo Nation, AZ (lead: Dine' and UT)
- Factors Affecting Electric Vehicle and Public Charging Infrastructure Adoption in Baltimore, MD (lead: MSU)

Education and Workforce Development: CCST is dedicated to training climate-smart leaders and future workforce in transportation. Our leadership and educational programs address four key goals: *Goal 1:* Incorporating clean energy and net-zero principles in transportation curriculum through our Sustainable Energy Program, Energy Minor and CCST Net-Zero Emission Academy; *Goal 2:* Educating students, professionals and public on innovative methods of citizen science and community-owned research to achieve environmental justice through Graduate Track in Citizen Science & Environmental Justice (for students), Data For Environmental Justice Workshop (for professionals), and Citizen Science, Citizens' Voice series (for public); *Goal 3:* Fostering future Indigenous transportation workforce through our Indigenous Communities Educational Initiative; *Goal 4:* Fostering transportation leaders who are equipped to build the climate culture in the U.S through our Climate Leaders Program, Climate and Transportation Policy Scholars and Climate and Transportation Leaders Certificate among other programs. CCST offers several scholarships and awards to support student-led activities. Every CCST leadership and educational program includes active partnerships with our minority institution members and prioritize underrepresented students and transportation workforce.

Technology Transfer: CCST is actively involved in technology transfer activities to facilitate and ensure our research routinely moves into practice. CCST also supports the researchers to generate higher impact from research projects by presenting the findings in conferences and generate publications. In addition, each CCST project establishes partnership with local communities and agencies as well as regional and national organizations to implement the results of research projects. Each projects provides a policy brief and a non-technical presentation to support the partners and facilitate the policy implementation. CCST has established collaborations with several organizations including Bloomberg American Health Initiatives, MIT Senseable City Lab, Urban Informatics lab, Wasatch Front Regional Council, City of Baltimore, California Air Resources Board, Navajo Nation Chapters, Navajo Nation Division of Transportation, Maryland Environmental Service, VW Group of America, City of Boston and City of Austin.



CCST Technology Transfer and Engagement

Products & Outcomes

CCST products range from technical reports, policy briefs, journal publications and presentations, CCST blog series (for public audience) and CCST newsletter to interactive maps, websites, database warehouse and R packages, Interactive web visualizations, and simulation tools.

CCST also organizes a series of educational and engagement events including an annual summit, Climate Change & Transportation webinar series (for academic and practitioners) and Climate Culture workshop (for government leaders and staff), briefings, seminars, and testimonies (for elected officials and policymakers).

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CCST Website: <https://publichealth.jhu.edu/center-for-climate-smart-transportation>

CONSORTIUM MEMBERS:

Massachusetts Institute of Technology

University of Texas at Austin

University of Utah

Morgan State University

Diné College

Connected Communities for Smart Mobility towards Accessible and Resilient Transportation for Equitably Reducing Congestion (C2SMARTER Center)

New York University

Center Type – Tier I

Focus Area – Reducing Congestion

Center Vision and Objectives

C2SMARTER's goal is to solve two key problems related to *Reducing Congestion*: (1) untangling the broad system-of-systems interdependencies facing congested urban systems that not only include multiple modes, but many interrelated sectors, and (2) understanding the system-wide impacts of congestion, in particular those that exacerbate inequities on different population segments. The center's themes follow the principles of the US DOT strategic goal of *transformation* heavily relying on experimentation, to employ evidence-based decision making to turn research into transformative and equitable solutions that take advantage of emerging technologies such as artificial intelligence (AI)/ machine learning (ML) and connected and automated vehicles.

The mission of C2SMARTER is to build a solution-oriented research center that uses resources from its consortium members' cities as a decentralized but comprehensive living laboratory. The research approach of the Center follows US DOT innovation principles of experimentation, collaboration, and flexibility/adaptation through a system-of-systems perspective that integrates transportation

infrastructure, motorized and non-motorized travelers from diverse backgrounds, emerging services and modes, and interrelated urban networks such as energy grids and communication networks.

The center's community-oriented technology transfer will further ensure that issues of equity are not studied from a behind-the-glass perspective, and that tools and technologies developed by the center reach those who need them the most.

Center Initiatives

Research: C2SMARTER studies challenging transportation problems and field tests novel solutions in close collaboration with end-users, city agencies, policy makers, private companies, and entrepreneurs. Its consortium members are focused on developing innovative solutions based on emerging disruptive technologies and their impacts on transportation systems. C2SMARTER faculty's strong connections to stakeholders have enabled them to build state-of-the-art and operational real-world testbeds and other implementable solutions applicable to congestion problems. These unique facilities are designed to test transformative research ideas with the ultimate goal of large-scale deployment.

THRUST AREA 1 INNOVATIVE TECHNOLOGIES

TRANSFORMATION EQUITY
CLIMATE/SUSTAINABILITY

- Expanding Access
- Match Research to Policy
- Economy-wide Net-Zero Emissions by 2050

THRUST AREA 2 SYSTEM CONTROL & DESIGN

TRANSFORMATION EQUITY
CLIMATE/SUSTAINABILITY SAFETY

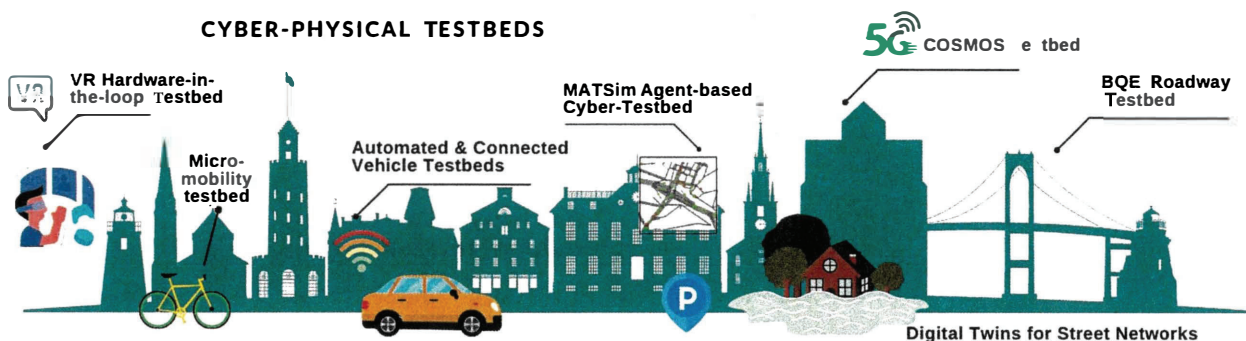
- Proactive Intervention, Planning
- Safe Design & Workers
- Infrastructure Resilience
- Experimentation

THRUST AREA 3 EVIDENCE-BASED POLICY

TRANSFORMATION EQUITY
ECONOMIC STRENGTH

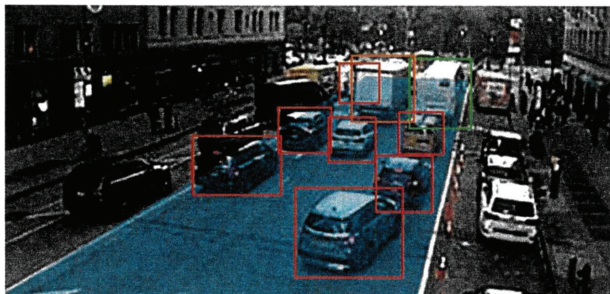
- Flexibility and Adaptability
- System Reliability and Connectivity
- Expanding Access

CYBER-PHYSICAL TESTBEDS



C2SMARTER's research thrust areas and cyber-physical testbeds

The center's three research thrust areas produce efforts designed to be tested, validated, and deployed in virtual and/or physical testbeds, with attention to how interventions contribute to real-world problems with quantifiable impacts on communities. Research is designed to transform existing practices through close collaboration with a built network of partner agencies and companies, ensuring proposed solutions result in transformative products.



Example of queue length detection from traffic cameras

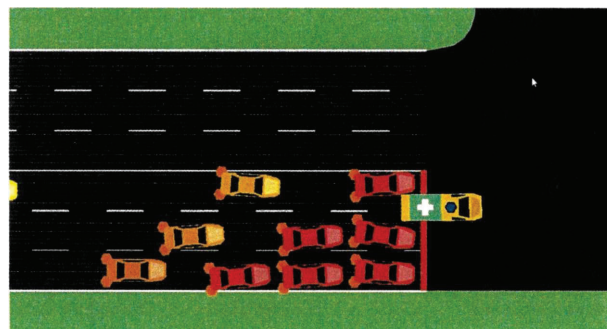
Education and Workforce Development: Proposed programs are designed with two goals in mind: (1) to equip students with the foundational knowledge needed to begin their careers, as well as instilling soft skills like adaptability and willingness to learn and experiment; and (2) helping current professionals upskill to master new technologies and keep up with rapid technological change. Initiatives include funding for student research, supplementary student learning courses outside of the classroom, innovative capstone programs across member institutions, cross-school student links with chapters of transportation professional groups, a bridge program designed to draw new and diverse talent into the transportation field, and training sprints for upskilling agency and industry professionals in ITS technologies.

Technology Transfer: C2SMARTER is broadening its *Network of Living Labs* into a national portfolio of community deployments, with a focus on using them to conduct outreach. They are being deployed as support tools to engage with communities, in particular with disadvantaged communities, to help them grapple with issues ranging from street flooding and its associated congestion effects; to pollution due to highway congestion; to the community-level impacts of new modes and investments.

Workshops and symposia are planned with academia, industry, and agencies to explore the ways in which specific C2SMARTER research can be most impactful towards congestion reduction, focusing on what opportunities exist to address those impacts immediately, and how participants can work together for long-term congestion mitigation. New tools to expand both research results' reach and idea generation beyond the consortium are being created; for example, leveraging advanced machine learning to develop a recommender system to connect research to stakeholder interests, and to amplify impact and direct technology transfer.

Products & Outcomes

C2SMARTER is providing transformative, multi-modal, solutions to reduce congestion, expand access to economic opportunities, address climate concerns, and connect communities to one another. Researchers are launching collaborative, interdisciplinary, initiatives which enable readily transferrable multimodal technologies and solutions. Projects take advantage of infrastructure deployed by major pilots, which are generating transportation and behavior data at a scale not easy to replicate.



Simulation of emergency vehicle bypassing traffic congestion

C2SMARTER's cyber-physical testbeds, in addition to others that the team has access to, are generating data that is breaking new ground in the understanding of congestion reduction systems, while maximizing the US DOT's investments and ongoing initiatives. Models and real-world data are being leveraged into the development and deployment of data-driven tools, centered around fairness and equity in long-term decision-making where they are deployed.

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Center for Automated Vehicles Research with Multimodal Assured Navigation (CARMEN+)

The Ohio State University

Center Type – Tier 1
Focus Area – Reducing Transportation Cybersecurity Risks

Center Vision and Objectives

Human transportation participants depend on vehicles and infrastructure that fuse data from a host of external sources. Many of the vital links to these sources lack authentication or resilience. The CARMEN+ UTC identifies, develops and validates PNT sensing techniques for highly automated transportation systems (HATS) that are both resilient to unusual natural or accidental events and secure against deliberate attack.

The CARMEN+ UTC will thoroughly address the following four objectives:

- Gather and systematize existing knowledge and identify gaps in knowledge/practice related to GNSS/PNT threats to HATS.
- Carryout risk identification studies to understand the impact of PNT threats on Highly Automated Vehicles (HAVs).
- Develop new PNT lapse mitigation strategies for HATS, which are robust in the face of unusual natural or accidental events and secure against deliberate attacks.
- Complement existing methods for cyber resilient PNT receiver testing, develop new mitigation methods and propose standards and create "best practices" documents and guidelines.

Center Initiatives

CARMEN+ is made up of world-renowned experts in PNT, automotive and transportation and will study PNT risks to HAVs, offer concrete solutions and make recommendations for future standards and guidelines for cyber-resilient PNT systems.

CARMEN+ assembled a comprehensive advisory board composed of advisors and collaborators from industry, academia and government, including local, state and federal DOTs.

Research: The promises of HATS are clear and compelling: a path to zero roadway fatalities, low-cost mobility of people and goods, widening



Cybersecurity Research Vehicle

transportation accessibility and equity and reduced environmental impacts. But HATS will fail to gain the public's trust if they are seen as uniquely vulnerable to cyberattacks. These include jamming or spoofing GNSS, V2X, or radar signals; injecting false data into a network of cooperating vehicles; and compromising the timing or sensing of a smart intersection. If any such attacks successfully snarl traffic, ground air taxi fleets, or endanger lives, public trust in HATS will be eroded, and the promise of HATS will be delayed.

Our research is organized around four thrusts:

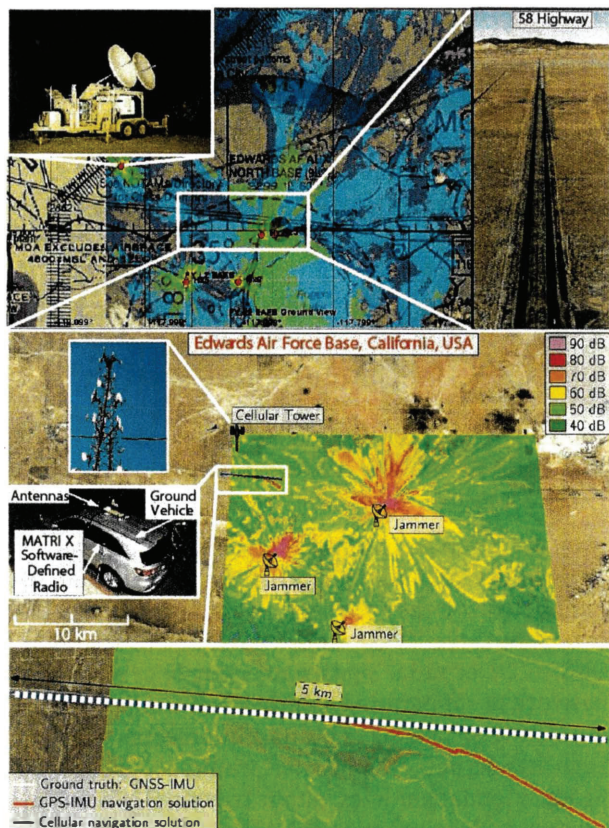
1. Identify Existing and Emerging Cybersecurity Threats to HATS.
2. Analyze Threat Scenarios and Cybersecurity Risks to HATS.
3. Develop Cyber-resilient Mitigation Methods.
4. Testing and Validation in Real-world Jammed Spoofed and Cyber-compromised Environments.

Education and Workforce Development:

CARMEN+ PIs have introduced new courses to their schools' curricula to train a diverse next generation of transportation experts who are aware of PNT cybersecurity risks and how to mitigate them.



Student collaboration in cybersecurity research vehicle



Technology Transfer: Drawing on an extensive advisory board from our current CARMEN UTC, CARMEN+ is well positioned to continue meaningful collaborations. Our comprehensive advisory board is

composed of advisors and collaborators from industry/nonprofits (PNT, vehicle automation, standards); academia; and government, including local, state, and federal DOTs. Technical and policy feedback from the board, and technology transfer to it, will ensure that our research products are widely disseminated and maximally useful. Cost-sharing with our partners will be key to funding our aggressive tasking and validation objectives.

Products & Outcomes

Composed of pioneers and leading researchers in PNT, transportation and automated vehicles, the CARMEN+ team produced an impressive stream of high-impact research, documented in dozens of conference and journal articles, some receiving popular media coverage. We have done this under the guidance of the 40+ industrial, governmental and academic affiliates of our extensive advisory board (AB). Consider a few recent highlights .

We were the first to demonstrate that signals received opportunistically from SpaceX's Starlink mega constellation of low Earth orbit (LEO) satellites could be used as a positioning backup to GNSS. These results were greeted with significant positive media attention (Science, BBC, Forbes, IEEE Spectrum, Ars Technica, among others). We also developed and demonstrated a low-cost GNSS spoofing detection technique that is extremely difficult to fool and is universally applicable to ground and lightweight aerial vehicles.

For the new UTC, our core group of PNT, automated vehicles, and transportation researchers from Ohio State, UT and UCI remains intact. But we now add significant strength by including North Carolina Agricultural and Technical University (NCAT), a Minority Institution and an HBCU, as a fourth research institution, with NCAT's Prof. Abdollah Homaifar, lead PI of NASA's "Secure and Safe Assured Autonomy" project, joining our leadership team. NCAT will play a crucial role in the core research of the new UTC and in advancing our Nation's goals of (1) recruiting and training underserved and underrepresented students and (2) diversifying the Nation's workforce.

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University of California Irvine

University of Texas at Austin

North Carolina A&T State University



Mineta Consortium for Equitable, Efficient, and Sustainable Transportation (MCEEST)

San José State University (SJSU)

Center Type – Tier 1

Focus Area – Improving the Mobility of People and Goods

Center Vision and Objectives

The Mineta Consortium for Equitable, Efficient, and Sustainable Transportation (MCEEST), led by the Mineta Transportation Institute (MTI) at San José State University, conducts research, education, workforce development, and technology transfer activities to improve the mobility of people and goods. MCEEST unifies and focuses the efforts of four outstanding institutions that represent and support the geographical, cultural, racial, and socioeconomic diversity that makes our nation strong: Howard University; Navajo Technical University (NTU); San José State University (SJSU); and the University of South Florida (USF).

Evidence-based, people-focused research paves the way for transformative solutions to our nation's most pressing mobility challenges, including expanding the inclusivity of the transportation workforce. MCEEST conducts research to achieve the following goals and objectives aligned with improving the mobility of people and goods:

Goal: Lead the nation in data-driven, human-centered research that delivers equitable, efficient, and sustainable transportation solutions that increase the mobility of people and goods and strengthen the nation's economy and global competitiveness.

Objective 1: Create a safer, more reliable, and more resilient transportation system that improves equity through increased access to jobs, housing, services, and other opportunities for historically underserved communities.

Objective 2: Reduce transportation's impact on climate change by identifying feasible alternative modes and effective ways to reduce vehicle miles traveled.

Center Initiatives

MCEEST's research agenda focuses on advancing the United States Department of Transportation (USDOT) Strategic Plan goals of **Equity**; MCEEST efforts prioritize research and workforce development efforts that reach all communities, especially those that have been historically underserved. Through multidisciplinary research, the Consortium addresses **Climate and Sustainability** and **Economic Strength**

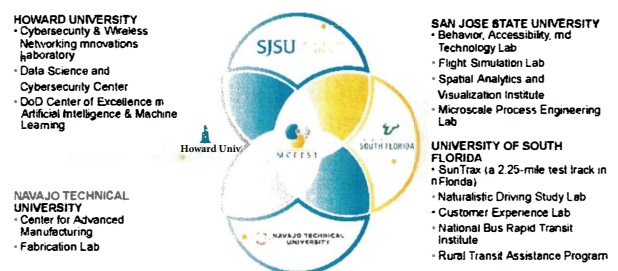
and **Global Competitiveness** as secondary strategic goals.

Research: MCEEST works closely with USDOT modal administrations and state DOTs to identify research projects that meet the needs of the geographically, economically, and socially diverse MCEEST partner regions and align with the statutory research priority to improve the mobility of people and goods. The following chart identifies the comprehensive process MCEEST uses to identify specific research projects for funding.



MCEEST's Research Selection Process

MCEEST partners engage in transformative research through specialized facilities, including a geospatial informatics studio, a naturalistic driving laboratory, a facility for instrumenting and maintaining test vehicles, dedicated encrypted servers, a STEM/tutoring lab, and one of the largest adaptive computing centers in the U.S. There are also several affiliated research centers at partner universities for additional expertise and research capabilities.



MCEEST's Research Resources

MCEEST's Emerging Leader Seed Grant Program seeks to engage and develop leadership capacity among tenure-track faculty. This program supports faculty in the first five years of an academic tenure-track position across the Consortium who are interested in exploring transportation research problems aligned with MCEEST's research goals and objectives.

Education and Workforce Development: For more than a decade, MTI has hosted a three-week, non-residential Summer Transportation Institute (MTI) program that provides high school students with an

academically challenging, engaging summer experience. The program has an emphasis on recruiting from underserved communities and Title 1 schools. Enrolled students earn three-units of transferable college credit at no cost and attend guest lectures and field trips introducing them to various career pathways in the transportation industry. In 2023, 32 students graduated from the program and at least 50 transportation professionals were engaged in helping deliver the program.

NTU's signature MCEEST program is the Summer STEM & Skills Dual Credit program. This program introduces Navajo Nation high school students to transportation careers and key technical skills through STEM-focused diverse subjects, such as welding, construction, business and entrepreneurship, culinary arts, computer programming, and engineering. Students enrolled in the program experience college life for five weeks either as a commuter or resident student, where they participate in project-based learning activities and a series of academic lectures from professors, visiting scholars, and program alumni.



(Photos 1, 2, 3 clockwise) MSTI hosted at San José State University; (Photo 4) Summer STEM & Skills Dual Credit program hosted at Navajo Technical University

Technology Transfer: MCEEST utilizes a diverse array of dissemination methods and media to ensure research results, conference proceedings, and expert interviews reach those responsible for managing change. These methods include publication, seminars, workshops, websites, social media, webinars, and

other technology transfer mechanisms. MCEEST regularly partners with diverse organizations, such as WTS and COMTO, on outreach efforts to broaden access to training.

Products & Outcomes

MCEEST's initiatives place equity, safety, and sustainability at the forefront and operate with a primary focus on advancing the USDOT Strategic Plan goals of **Equity**, with **Climate and Sustainability** and **Economic Strength and Global Competitiveness** as secondary strategic goals. To that end, this Consortium is designed to foster synergies between leaders in transportation planning, policy, and engineering, each with a long and distinguished track record of innovative, multimodal, and transformative solutions that meet our nation's mobility challenges and promote connections between local and national communities.

Many of MCEEST's planned research projects focus on efforts to expand access and broaden participation in our nation's transportation systems and workforce by improving understanding and facilitating connections, especially with traditionally underserved communities. Projects use data and public opinion to inform policy, infrastructure, and technology benefiting diverse communities, including bicyclists and pedestrians, urban and rural regions, women and gender-nonconforming people, and others, to **address equity and barriers to opportunity**. These projects explore some of the most pressing, and sometimes painful issues, in our communities—including mental health and human trafficking—to find solutions that will make transportation more accessible, effective, and safer, thereby increasing access to jobs, housing, and services for all.

MCEEST projects incorporate research findings into workforce development curricula and provide opportunities for students to move beyond theoretical and traditional classroom instruction. MCEEST partners emphasize project-based, hands-on, experiential learning designed to engage students and provide opportunities for educational and professional development.

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YouTube: <https://www.youtube.com/@minetatrans>



Center for Advancing Research in Transportation Emissions, Energy, and Health (CARTEEH)

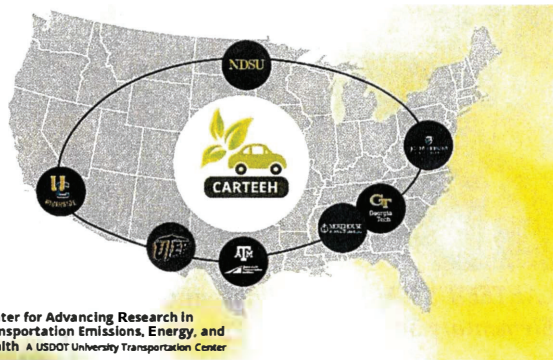
The Texas A&M University System/Texas A&M Transportation Institute

*Center Type – Tier 1 UTC
Focus Area – Preserving the Environment*

Center Vision and Objectives

The Center for Advancing Research in Transportation Emissions, Energy, and Health (CARTEEH) is a Tier 1 University Transportation Center with a unique perspective that brings together experts from the fields of transportation and public health.

CARTEEH is comprised of seven universities spanning the United States, each with unique and complementary research capabilities. The consortium is led by the Texas A&M Transportation Institute, a part of the Texas A&M University System, and the members include Johns Hopkins University, Morehouse School of Medicine, North Dakota State University, Georgia Institute of Technology, University of California, Riverside, and The University of Texas at El Paso.



CARTEEH Consortium Members

CARTEEH was first funded under the Fixing America's Surface Transportation (FAST) Act in 2016. In this grant, our research focused on moving forward interdisciplinary research on the impact of transportation emissions on human health, placed in the broader context of health and transportation. CARTEEH conducted impactful research, supported higher education and workforce development, and promoted meaningful technology transfer.

CARTEEH was renewed for funding in 2023 under the Bipartisan Infrastructure Law (BIL) program. In this grant, we plan to continue our work, and expand on

the areas of health equity and impacts on underserved communities. We will continue to focus our research on the “full chain” between transportation emissions and health, while also looking at broader health and transportation connections and impacts of a rapidly changing transportation sector.



Full Chain from Air Pollution Sources to Health Impacts

Center Initiatives

CARTEEH has several ongoing and planned initiatives relating to research, education and workforce development and technology transfer and collaboration.

On the **research** front, we are initiating a set of projects that address critical topics, produce usable results, and utilize the synergistic capabilities of the consortium members. Topics addressed by the initial research projects include:

- Understanding the life cycle emissions and health impacts of electric vehicles;
- Developing an integrated transportation-health modeling platform for decision support;
- Incorporating health equity into transportation planning;
- Mitigating freight emissions in and around ports;
- Addressing health risks for transit users;
- Performing air monitoring for high-traffic areas with high-risk communities; and
- Evaluating low-emissions technologies for tribal and rural communities.

Under **technology transfer and collaboration**, one of our major initiatives is the Clean Transportation Collaborative (CTC), a stakeholder engagement and advisory organization established to advance real-

world clean transportation. We will also establish a Clean Transportation Innovation Hub to focus on commercialization opportunities.

In terms of **education and workforce development**, we will continue to mentor the future transportation workforce and train and inform practitioners. Our programs include research assistantships and summer internships for university students and programs for high schoolers and community health workers. CARTEEH's highly regarded Summer Undergraduate Internship Program pairs TTI research mentors with undergraduate students from around the country interested in transportation emissions, energy, and health. The interns take on a chosen research topic under the guidance of their mentor and participate in professional development activities, technical tours, and research presentations throughout the summer.



CARTEEH's third annual Summer Internship program concluded on August 4, 2023, with interns presenting their research at TTI's Hall of Honor Conference room.

Products & Outcomes

CARTEEH's initiatives are dedicated to developing a platform that focuses on (a) the transportation system, (b) emissions and energy, and (c) exposures and health impacts. Equity will serve as a cross-cutting theme for all center activities. All our research will focus on the integration of data to support policy and decision-making. CARTEEH recognizes the importance of effective technology transfer,

collaboration, and outreach to ensure that our research results are available to potential users and translated into products that have an impact on the transportation sector and society.

Some of CARTEEH's key outcomes in the past include a university-level curriculum on transportation emissions and health as well as science kits and learning modules for elementary school students developed in collaboration with the Department of Teaching, Learning, and Culture at Texas A&M University. This partnership created impactful STEM-based educational materials that were disseminated to schools across the nation and at science camps.

Another major product was the "Pathways Between Transportation and Health" framework which articulated several pathways and linkages between health and transportation going beyond air quality. This work resulted in a highly cited paper, as well as a basis for several other projects and initiatives taking an interdisciplinary view of transportation issues and the development of tools such as CARTEEH's framework and toolkit for practitioners to advance health and health equity considerations in transportation planning.



CARTEEH STEM Family Nights at Greens Prairie Elementary School

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CONSORTIUM MEMBERS:

Georgia Institute of Technology

Johns Hopkins University

Morehouse School of Medicine

North Dakota State University

The University of Texas at El Paso

University of California Riverside

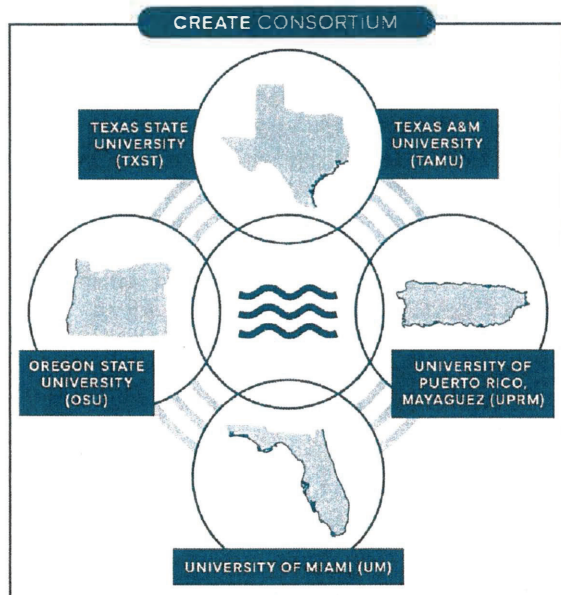


Coastal Research and Education Actions or Transportation Equity (CREATE)

Texas State University

Center Type – Tier 1

Focus Area – Improving the Durability and Extending the Life of Transportation Infrastructure



Center Vision and Objectives

CREATE's mission is to enhance coastal transportation infrastructure durability to ensure lasting impacts on society and the environment.

We will do this through transformational research and workforce development actions. Coastal infrastructure faces unique challenges compared to inland infrastructure. From a durability perspective they must be designed, constructed, and maintained to withstand highly varied climatic conditions and multiple hazards including hurricanes, tsunamis, and earthquakes. Coastal areas also have very high population density, which result in highly constrained transportation networks that are often multimodal and intersectional between waterways, ports and harbors, rail, transit, ferries, and highways, and embraces urban, suburban, and rural communities. These high-density regions have significant inequity gaps of infrastructure conditions in historically underserved communities. The CREATE consortium was formed in 2023 to address these coastal infrastructure durability challenges and support the US DOT's mission of safe, efficient, sustainable, and equitable movement of people and goods.

Center Initiatives

CREATE will advance transformative knowledge and embrace disruptive technologies, to offer economic,

sustainable, and societal benefits to coastal communities. In addition, the center's research on new technologies, technology transfer, and professional preparation will offer workforce upskill to grow our nation's organizational excellence and increase the number of safer, higher-paying jobs in the coastal transportation infrastructure industry.

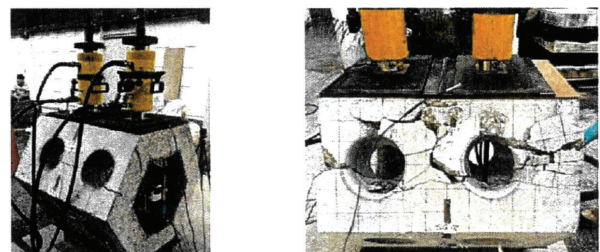
Research: CREATE will conduct research in four targeted thrusts as follows:

(1) Transformational coastal infrastructure design and construction: CREATE will offer innovative, sustainable methods for enhancing coastal infrastructure durability using nature-based, advanced material-based, and modeling solutions. For example, researchers at TAMU are evaluating synthetic composite materials to mimic mangroves to reduce soil erosion around pavements, bridge piers, MSE walls, and other coastal infrastructure.



Mangrove mimicry for reducing erosion

(2) Coastal transportation infrastructure evaluation, prediction, and prevention: There are significant cost-savings to transportation agencies through restoring or maintaining existing assets. The ability to extend the service life of in-service structures safely and reliably will also alleviate a large backlog of projected replacements and their associated costs, including carbon costs. For example, UM and TXST have partnered to show a proof-of-concept of using innovative hydraulic load dissipating elements, known as SEAHIVE® for mitigating and remediating coastal bridge scour.



Structural testing of SEAHIVEs® for mitigating and remediating coastal bridge scour

(3) Equitable response to unprecedented hazards:

Research in this thrust will explore new technologies to enable safety, efficiency, effectiveness, and equity of multimodal transportation systems before, during, and after coastal hazard events. To date, multiple research efforts have been made to address coastal resiliency. However, there is a need to integrate these existing efforts in durability studies to identify the critical links, spots, or zones in coastal areas where failure of one link will lead to cascading failures and collapse of the entire system.

(4) Pathways to blue economy transportation careers:

The previous thrusts require a diverse community with more equitable representation to successfully address coastal infrastructure durability challenges. This thrust will develop practical, evidence-based frameworks to promote equity in all levels of blue economy transportation careers. This thrust will shape diverse careers, workplace, and stakeholder experiences that nurture growth and build wealth.

Education and Workforce; Development: CREATE will support targeted activities for our students and stakeholders including K-12 outreach, student research fellowships, student organizations, and the annual symposium. We will leverage existing programs where possible, such as the National Summer Transportation Institutes (NSTI) hosted at OSU, TXST, UM, and UPRM. CREATE is primarily a



2023 NSTI at Texas State University

consortium of minority-serving institutions, and we value the unique perspectives afforded by diverse participants. The rigorous, progressive, and inclusive character of the programs at our member universities provide a natural environment to validate existing experiences, understand emerging challenges, and develop new skills for our blue economy workforce.

Technology Transfer: CREATE will serve as a hub for technology transfer, commercialization, and collaboration of coastal multimodal transportation infrastructure research. All CREATE funded research projects are required to include technology transfer as a task. CREATE members will share facility resources and build prototype specimens to confirm that new technologies and products derived from the laboratory will work in the real world. CREATE faculty will also work closely with regulatory agencies to implement code and specification changes. CREATE will collaborate with programs at our institutions. For example, UPRM operates the Puerto Rico Local Technical Assistance Program, which provides CREATE a direct relationship with an established technology transfer and workforce development organization. The center has various primary mechanisms to exchange information with the public.

Products & Outcomes

CREATE products and outcomes will support US DOT Strategic Goals and Key Performance Indicators. CREATE will advance transformative knowledge and embrace disruptive technologies, to offer economic, sustainable, and societal benefits to coastal communities. The center will revolutionize coastal transportation infrastructure with enhanced efficiency, safety, and durability, particularly more equitable infrastructure solutions for disadvantaged communities. CREATE will address current and impending challenges related to climate change and accelerate the transition to net-zero carbon emissions of our nation. Overall, CREATE activities will boost our nation's global competitiveness and enhance national coastal security.

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Texas A&M University
The University of Miami
University of Puerto Rico at Mayagüez

MarTREC

Maritime Transportation Research & Education Center

Center Vision and Objectives

As a Tier 1 University Transportation Center, the Maritime Transportation Research and Education Center (MarTREC) is **Preserving the Nation's Transportation System through Sustainable and Resilient Maritime and Multimodal Supply Chains and Infrastructure**. Our consortium consists of the University of Arkansas, Jackson State University, Louisiana State University, Texas A&M University / Texas A&M Transportation Institute, University of New Orleans, and Vanderbilt University. Our vision is to be **the nation's premier source for expertise on maritime and related multimodal transportation research and education**. Through the MarTREC consortium, we can transform the efficiency, resiliency, and sustainability of our maritime and multimodal transportation system of systems when our nation's supply chain needs it most.

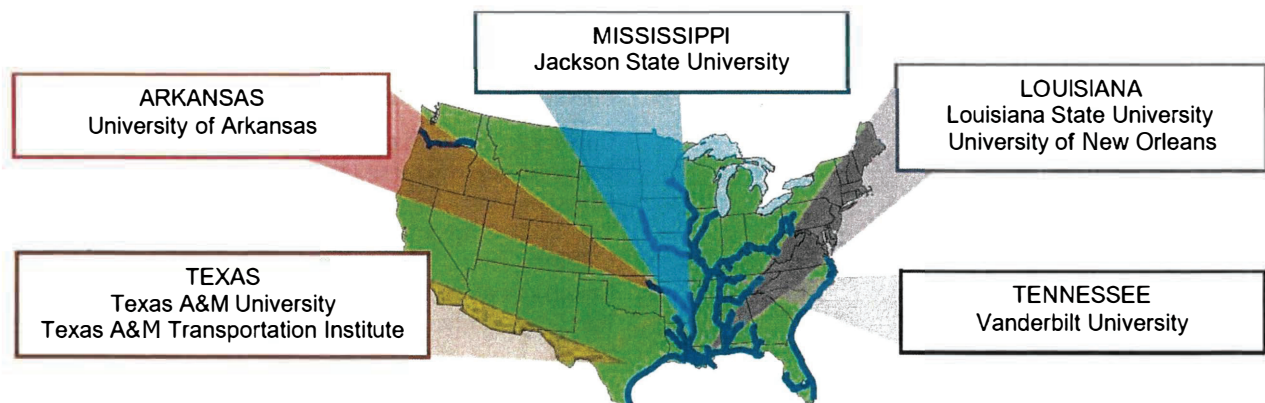
MarTREC contributes primarily to four U.S. Department of Transportation Strategic Goals:

- 1) **Economic Strength and Global Competitiveness** by addressing resilient supply chains and system reliability and connectivity
- 2) **Climate and Sustainability** by increasing the safety, effectiveness, equity, and sustainability of our nation's transportation infrastructure and the communities it serves
- 3) **Safety** by supporting system response and recovery plans and protocols to minimize the effects of system disruptions and hasten system recovery
- 4) **Equity** by expanding transportation options in underserved rural and urban communities.

Center Initiatives

Research: MarTREC's research is conducted in three research topic areas within the field of maritime and multimodal transportation:

- 1) **Maritime and Multimodal Supply Chain Management:** Advance current understanding and facilitate improved operations to improve freight and supply chain reliability, reduce congestion, connect underserved and underinvested communities, and support economic vitality
- 2) **Maritime Sustainable and Resilient Infrastructure:** Support state-of-the-art resilient and sustainable multimodal transportation infrastructure preservation, repair, design, and construction
- 3) **Disaster Response and Transportation Planning for Coastal and River Valley Communities:** Enable the resilience, safety, efficiency, and effectiveness of multimodal transportation systems during disruption response or other major events.

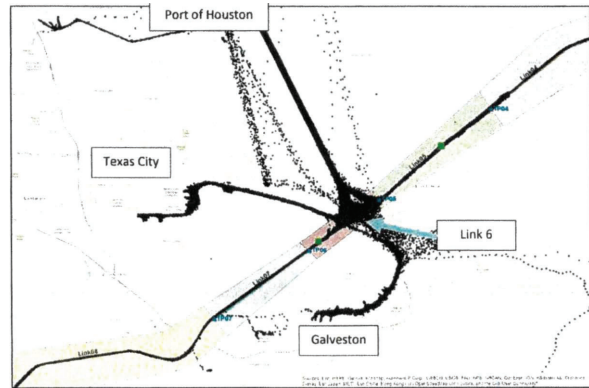


Education and Workforce Development: To support the nation's critical need for a well-prepared, fully trained, and technically skilled transportation workforce, MarTREC will develop educational resources to elucidate scientific and engineering practices involved in maritime and multimodal transportation systems and practices. Our Center for Training Transportation Professionals (cttp.uark.edu) supports MarTREC professional development and training programs through onsite and web-based training. MarTREC's K-12 outreach programs provide affordable experiential programs to K-12 students to impact their short- and long-term education and career choices. MarTREC consortium members have strong academic programs and actively engage in transportation professional development activities.



GirlTREC – GirlsTransportation Engineering Camp

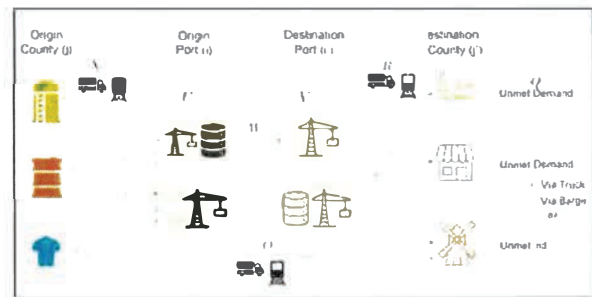
Technology Transfer: The MarTREC consortium is extensively networked through existing collaborative partnerships and leverages this network to ensure our research results are made widely available to researchers, adopters, and the public. MarTREC collaboration and technology transfer efforts translate our research to inventors and entrepreneurs who can commercialize our research and development work into practice. Technology transfer activities are a requirement of all MarTREC projects.



Gulf Intracoastal Waterway & AIS Trajectories

Products & Outcomes

Research projects conducted in Maritime and Multimodal Supply Chain Management will disseminate open data sources, case studies, freight models, sensor technologies, and decision support tools. The projects in Maritime Sustainable and Resilient Infrastructure will develop advanced material design specifications and procedures and new technologies relevant to infrastructure health monitoring and automation. Research outcomes resulting from Disaster Response and Transportation Planning for Coastal and River Valley Communities will create case studies, emergency planning techniques, and disruption response decision support tools and technologies, and catastrophic extremal threats will be better quantified.



Network Representation of Maritime Supply Chain

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CONSORTIUM MEMBERS:

University of Arkansas
Jackson State University
Louisiana State University
Texas A&M University/Texas A&M Transportation Institute
University of New Orleans
Vanderbilt University



Transportation Cybersecurity Center for Advanced Research and Education (CYBER-CARE)

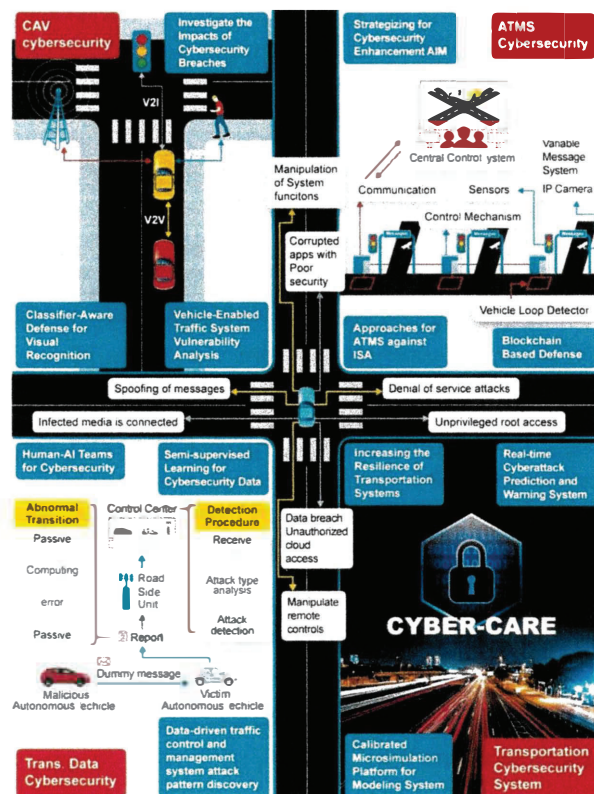
University of Houston

Center Type – Tier 1

Focus Area – Reducing Transportation Cybersecurity Risks

Center Vision and Objectives

As modern transportation infrastructure, including intelligent transportation systems (ITS) and advanced traffic management systems (ATMS), continues to advance, the threat of cyberattacks grows. In response to this need, the Transportation Cybersecurity Center for Advanced Research and Education (CYBER-CARE) was funded in 2023 by the U.S. Department of Transportation (USDOT) as part of the University Transportation Centers (UTC) program.



CYBER-CARE's Research Thrusts & Cyberattack Scenarios

CYBER-CARE facilitates interdisciplinary research and education in both transportation and cybersecurity domains. Its aim is to build foundational knowledge and advance theories to address the challenges posed by large-scale cyberattacks on transportation infrastructure and connected and automated vehicle (CAV) systems. CYBER-CARE's projects will create conceptual frameworks, generate extensive datasets, employ innovative analytical approaches, aid in the

implementation of public policies and infrastructure investments, and cultivate a high-quality industry workforce through education.

Center Initiatives

The vision of CYBER-CARE is to develop the world's leading innovative, healthy, sustainable, and intelligent transportation cybersecurity system and protect the American people, supply chains, public transit systems, and the economy through the safe, resilient, and sustainable movement of people and goods. CYBER-CARE focuses on investigating new security risks and increased threats to sensitive information and public safety. Collaboration between transportation cybersecurity and physical security professionals will be crucial for effectively managing risk in this hybrid-threat environment. The center develops and implements methods for disseminating intelligence and information across industries to inform the development and adoption of industrywide best practices.

Research: CYBER-CARE consortium employs a comprehensive, multilayered strategy to bolster transportation cybersecurity, focusing on both wireless and wired access points in infrastructure and vehicles. This layered approach not only lessens the potential fallout from intrusions but also diminishes the likelihood of cyberattacks. The consortium, with extensive expertise in advancing transportation cybersecurity research, collaboratively addresses urgent policy and technical challenges. The increasing prevalence of embedded technologies in vehicles



Vehicle-driver Complex Behaviors under Cyberattacks and Model the Consequences to the Urban Traffic Systems



Classifier-Aware Defense for Visual Recognition

heightens the susceptibility to cyberattacks. Hackers without a network connection require physical access to exploit vulnerabilities in non-internet-connected cars, limiting attacks to individual vehicles. Highly dynamic, wide-area traffic scenarios (e.g., CAVs, ATMS, and cloud computing) enable cyberattacks over wireless and wired networks, compromising transportation systems and weaponizing them to infect other vehicles. By addressing the research thrusts mentioned above, CYBER-CARE will support transportation decision-making processes to identify vulnerabilities and develop effective countermeasures to protect against cyber threats. CYBER-CARE will also raise cybersecurity awareness among stakeholders in the transportation industry.

Education and Workforce Development: Aiming at people of all ages and socioeconomic statuses

nationwide, CYBER-CARE consortium universities will continue to prepare leaders for decades through the following activities: 1) develop K-12 summer camp programs, 2) create internship programs to connect students with industry employers, 3) incorporate transportation cybersecurity courses into the current curriculum, 4) organize a national competition to inspire middle school students to pursue math and science in high school, and 5) coordinate seminars and workshops to share critical research and educational developments with external researchers and community partners. In addition, CYBER-CARE will offer e-learning opportunities to surpass geographic barriers and provide quality education statewide and nationally without requiring physical infrastructure, reaching a larger audience at a lower cost.

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CONSORTIUM MEMBERS:

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Rice University
Texas A&M University-Corpus Christi
University of Cincinnati
University of Hawai'i at Manoa

Website: <https://uh.edu/cybercare/>



Twitter: CYBER CARE @CareCaybe70185



Technology Transfer Strategy "Discover-Evaluate-Market-Operate" (DEMO)

Technology Transfer: Technology transfer activities will address cybersecurity concerns in transportation, spanning the implementation of CAV systems, advanced ATMS operations, and the planning, design, and evaluation of multimodal transportation. These activities leverage research-derived knowledge, skills, and tools in real-world scenarios, fostering improved knowledge sharing and collaboration among stakeholders. This collaborative approach establishes a community dedicated to transportation cybersecurity, yielding research outcomes that contribute to the creation of innovative tools, methods, and technologies safeguarding transportation systems from cyber threats.

Products & Outcomes

Presented transportation cybersecurity research project results at an estimated 75 (15 year × 5 years) academic and professional conferences
Provided 60 (12 year × 5 years) media interviews related to CYBER-CARE activities and projects
Sponsored 15 (3 year × 5 years) regional transportation and cybersecurity forums and national summits that will reach 4,500 attendees (15 × average participation of 300)
Served in transportation and cybersecurity committees with an estimated membership and leadership of 100 (20 year × 5 years)
Organized an estimated 10 conferences, workshops, or webinars (2 year × 5 years)
Applied for more than 30+ Patents, licenses, and etc.

CYBER-CARE's Outcomes and Performance Metrics

CYBER-CARE addresses immediate and long-term transportation cybersecurity challenges through rigorous scientific research. Researchers from the consortium will disseminate their findings at academic conferences and in peer-reviewed journals, and organize forums to share insights with key transportation professionals. Emphasizing practical application, CYBER-CARE anticipates product development, implementation, and policy formulation.



University of Illinois at Urbana-Champaign



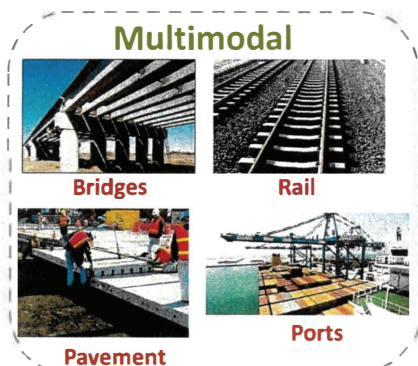
Center Type – Tier 1

Research Priority – Improving Durability and Extending the Life of Transportation Infrastructure

Center Vision and Objectives:

The Transportation Infrastructure Precast Innovation Center (TRANS-IPIC) is the first consortium to address the U.S.'s transportation infrastructure durability and sustainability challenges by focusing on Precast Concrete (PC)-related technologies. The center conducts practical and cutting-edge research from a wide range of disciplines to impact multiple modes of transportation. Our research seeks to advance the holistic infrastructure PC construction, implementation, and maintenance process. TRANS-IPIC's vision aligns with the U.S. Department of Transportation's FY 2022-2026 Strategic Plan goals, including transformation, climate & sustainability, and safety.

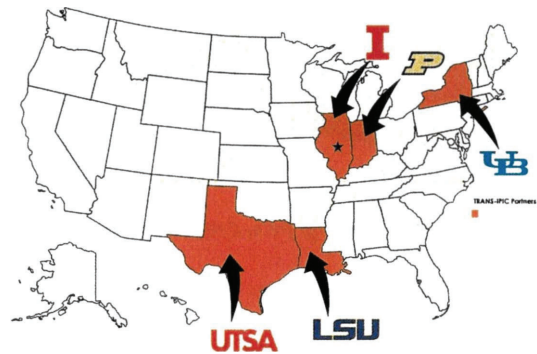
TRANS-IPIC's mission is to leverage research innovation and strong industry support to foster research and education that focus on utilizing PC-related technologies as an economical approach for providing a quick boost for the durability, safety, and climate-adaptability of various transportation modes in the U.S. through infrastructure repair or reconstruction. We envision durability, adaptability, efficiency, self-assessment, and healing capabilities in the new and repaired transportation infrastructure. Emerging technologies such as nanomaterials and robotics offer these features but can be difficult and expensive to incorporate into construction processes. On the other hand, PC is manufactured in a controlled environment, allowing for the efficient introduction and implementation of these delicate technologies.



TRANS-IPIC focuses on PC technologies across all transportation modes

Center Initiatives:

TRANS-IPIC researchers study the use of PC-related solutions based on innovative and smart materials and novel emerging manufacturing schemes involving robotics and automated manufacturing guided by big data analytics and Artificial Intelligence (AI).



TRANS-IPIC partner universities

Research Themes: Our five-university consortium focuses on the following three key research topic areas:

A) Application of New Materials and Technologies:

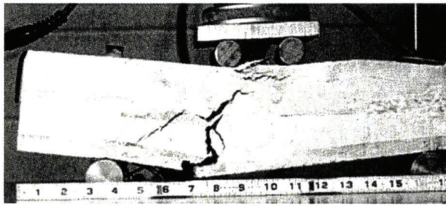
A primary research focus for TRANS-IPIC is incorporating new materials and technologies used in repairing or reconstructing infrastructure into the PC design and production framework. This research theme's ultimate goal is to improve the durability and sustainability of newly constructed or repaired infrastructure using PC.

Theme A -Research Topics:

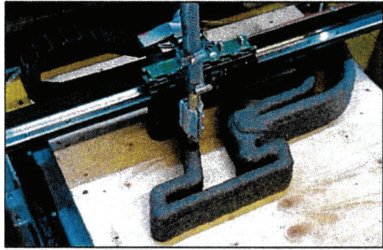
- Climate adaptation strategies of PC
- PC using ultra-high performance concrete
- Smart metallic reinforcement
- Smart composite reinforcement
- Self-stressing repair PC plates
- Innovative railroad reinforcement
- Image-based modeling
- Topology optimization of PC

B) Construction Methodologies and Management

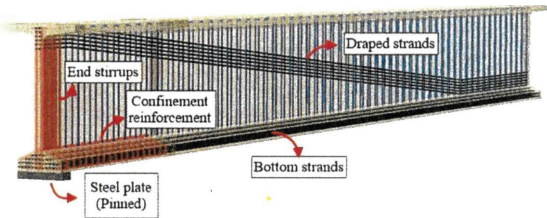
PC technology has seen little innovation in its manufacturing process over several decades, resulting in little flexibility in production time and cost and inefficient designs.



Durability and resilience of PC cross-ties



3D printing of concrete



Smart material technology for end region damage mitigation

This research theme aims to change this by advancing the manufacturing methods of PC through automation, improving durability, and reducing cost and carbon emissions.

Theme B - Research Topics

- 3D printing of concrete
- 3D printing of stay-in-place forms
- Automation of PC installation
- Material price volatility risk mitigation
- PC construction management optimization

C) Condition Monitoring and Remote Sensing

Monitoring the construction process and condition of existing and new infrastructure is critical for ensuring longevity and durability. In new constructions and repairs that involve PC components, this is much more feasible due to the controlled environment, which also allows for embedded elements with health monitoring capabilities.

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X / Twitter: <https://twitter.com/TRANSIPIC>

Theme C - Research topics

- Built-in satellite-sensing system
- PC assessment using digital twinning
- Machine learning for early problem detection through UAV drones
- AI image-based monitoring of infrastructure
- Smartphone PC pavement monitoring

Education and Workforce Development: TRANS-IPIC

universities have a strong record in establishing science and engineering programs. Since the topic of infrastructure durability is quite diverse, it is highly unrealistic to think that this issue will be addressed through the knowledge offered by traditional transportation programs in the U.S. Rather, we firmly believe that new educational framework needs to be established to develop unique and diverse generation of transportation professionals capable of tackling the many complex problems that different communities in the U.S. are facing. The fact that TRANS-IPIC comprises universities in various U.S. regions (Midwest, south, and Northeast) helps engage and impact diverse students from different communities, races, ethnicities, cultures, abilities, and beliefs. The consortium includes UTSA, one of the nation's largest minority-serving institutions (MSI), and UIUC, PU, UB, and LSU, all considered flagship universities in their respective States that offer transportation-related education. It facilitates the planning of K-12 outreach programs in under-served communities in diverse geographic regions and cities.

Technology Transfer: An essential factor for the success of TRANS-IPIC is the ability to transfer the technologies produced through the center to the professional community and stakeholders. The best and most effective method to promote this transfer of technology is through genuine collaboration between the researchers who develop the technology and the end users of the technology. To encourage such collaboration, we established: (1) External Advisory Board (EAB): The EAB is formed primarily from State DOT representatives and professional organizations (e.g., ACI, PCI, ASBI). (2) Industry Partnership Committee (IPC): The IPC is mainly formed of experts from different sectors of the transportation industry who specialize in the application of PC technology in transportation infrastructure.

CONSORTIUM MEMBERS:

Louisiana State University
Purdue University
University at Buffalo
University of Texas at San Antonio



Center for Multi-Modal Mobility in Urban, Rural and Tribal Areas (CMMM)

University of Maryland

Center Type – Tier 1

Focus Area – Improving the Mobility of People and Goods

Center Vision and Objectives

Mobility is a defining feature of American society, shaping everything from patterns of urban development to economic trends. However, the predominant modes of transportation exact a steep environmental cost and there are problems of equity services linked directly to transportation options. In response to this critical concern, the Center for Multi-Modal Mobility in Urban, Rural and Tribal Areas (CMMM) was established in 2023 by the U.S. Department of Transportation (USDOT) as a part of the University Transportation Centers (UTC) program.

With a team that comprises four major universities and one tribal community college, the consortium provides broad geographic and demographic representation, bringing exceptional credibility and high levels of visibility. The new center will leverage several unique capabilities, including unparalleled experience in the gathering and analysis of location-based data, as well as an in-house lab that hosts the world's largest transportation databases.

Center Initiatives

CMMM's objectives are to maintain existing multi-disciplinary efforts, reinforce them, and create new ones in the light of the common objectives of providing innovative solutions to congestion reduction, creating equitable and accessible transportation systems, reducing emissions, and increasing the nation's economic competitiveness. All funded projects must seek to develop implementation-ready solutions with established partnerships for real-world deployment.

Research: All research proposals for both core and competitive projects will be peer-reviewed by well-balanced panels composed of academics, transportation agencies, and professionals in the transportation industry. Proposals will be expected to be collaborative among the consortium members and multi-disciplinary. In particular, colleagues from other departments will be invited to participate in competitive projects and provide their unique expertise. The team members collaborate in the departments of business, computer science, economics, geography, public health, statistics and survey methodology, and urban planning.

Multi-Disciplinary, Multi-University Research Thrusts

-  Multimodal and Equitable Transportation Systems
-  Mobility Innovation – innovative personal mobility services and technologies
-  Rural Transportation Infrastructure – safety, efficiency, reliability and resiliency
-  Equity
-  Sustainable Transportation
-  Economic Competitiveness

Technologically Advanced Solutions

-  Modeling & Simulation
-  Driving Automation
-  Knowledge Network
-  Electrification
-  Autonomous Systems
-  Energy Charging
-  Vehicle to Infrastructure

Specialized facilities at the lead institution (UMD) include the Maryland Transportation Institute (MTI) which is a multi-disciplinary hub for research in transportation. Faculties and students at MTI develop state-of-the art methods for transportation modeling and planning, data collection and data analytics, large scale simulation and digital twins, traffic operation and optimization, AI and machine learning. MTI supports local, State and Federal agencies to develop informed policies towards more sustainable and equitable transportation.

Education and Workforce Development: CMMM will: (1) support graduate students with fellowships and GRA, especially those at the last stage of their dissertation and supervised by junior faculty; (2) promote exchanges and internships with the stakeholders participating in this project (USDOT, State and Local Agencies, private companies); (3) promote multi-disciplinary collaboration among scientists with different backgrounds and research abilities. (4) disseminate the results through center

CMMM center will support new avenues of research within the context of three USDOT Strategic Goals: economic strength and global competitiveness, equity, and climate sustainability. In particular, we anticipate being able to add significantly to the pool of knowledge concerning societal and equity-related issues arising from transportation infrastructure and travel behavior.

Performance Outcomes



Multi-modal solutions for improved mobility of people and goods (micro-transit, shared mobility, complete-streets)



Measures that improve the integration of transport modes and promote a shift to sustainable transport modes



Quantitative metrics of improved mobility of people and goods based on real time big data and advanced modeling



Increased accessibility and equity in urban and rural areas through technological advanced



Enhanced diversity in the transportation engineering and policy arenas



Training of a new generation of transportation engineers and policy experts who will become the change agents of the future

tribal regions.

Moreover, as part of the Technology Transfer program, we intend to expand our portfolio of corporate partners who might be interested in supporting additional applied research projects and developing strategies to deploy the products developed under the CMMM nationally and internationally.

Products & Outcomes

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University of Maryland

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CMMM Director

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Email: ccirillo@umd.edu

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CONSORTIUM MEMBERS

Morgan State University

North Dakota State University

San Jose State University

White Earth Tribal and Community College

Environmentally Responsible Transportation Center for Communities of Concern (ERTC³)



University of Missouri-Kansas City

*Center Type – Tier 1
Focus Area – Preserving the Environment*

Center Vision and Objectives

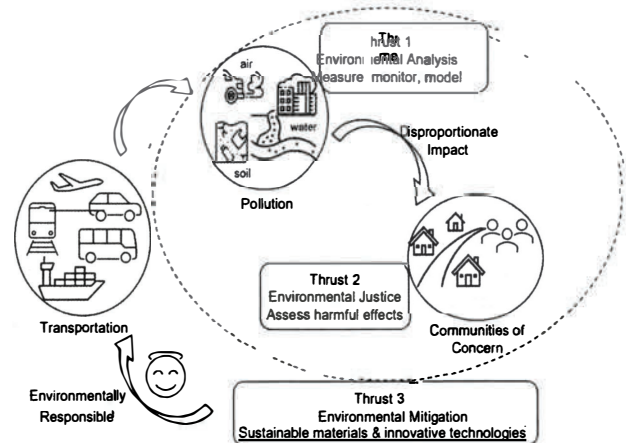
Our transportation system provides substantial socioeconomic benefits but at the same time impacts the environment. The Environmentally Responsible Transportation Center for Communities of Concern (ERTC³) was established in June 2023 as part of the University Transportation Centers (UTC) program to preserve the environment and reduce the negative environmental impacts of the transportation system. Sponsored by the US Department of Transportation, ERTC³ is specifically focused on reducing the environmental impacts of the transportation system on minority (communities of color, elderly, people with disabilities) and low-income communities using novel and cutting edge technologies.

In addition to research in environmental analysis, justice, and mitigation, ERTC³ carries out its mission with education, workforce development, and technology transfer activities. The new UTC is rapidly expanding its advancement and integration of pragmatic and economically feasible technologies to address the transportation related environmental challenges facing our nation.

Center Initiatives

ERTC³ research relates to multiple modes of transportation including highways, aviation, public transportation systems, walking surfaces, biking trails, and others. The consortium aims to analyze, model, and address pollution in water, air, land, and subsurface areas. ERTC³ also places an emphasis on the deployment of newer technologies such as artificial intelligence, nanotechnology, alternative renewable energy sources, and electric vehicles to face the environmental challenges. Additionally understanding and modeling the health effects of transportation related environmental pollution in communities of concern is a big part of the center's mission. The center is also cultivating relationships with many local and national organizations to address these challenges more effectively.

Research: Currently ERTC³ supports 17 different research projects across five university campuses to improve the sustainability, resilience, and equity of our transportation infrastructure. Research is performed in three main thrust areas. The first thrust area, Environmental Analysis, focuses on



ERTC³'s Research Thrust Areas

measurement and monitoring of transportation related pollution in air, water, and soil. This effort is aimed at developing tools and models that will support evidence-based decision-making at transportation agencies regarding the environmental impacts of projects. The second thrust area, Environmental Justice, focuses on the assessment of environmental and health impacts of transportation activities on minority and low-income populations, which are called "communities of concern." The third thrust area, Environmental Mitigation, focuses on the reduction of exposure to transportation-related pollution through sustainable and resilient construction materials and practices and innovative technologies.

Education and Workforce Development: ERTC³ projects collectively employ undergraduate, graduate, and doctoral students to conduct research while developing their transportation workforce skills. These projects pave the way for consortium members to improve their academic programs for the next generation of diverse students. A new graduate student organization established among the consortium member campuses will also allow exchange of ideas, networking, and development of camaraderie among the future decision makers of the transportation industry.

The new UTC collaborates with schools in Kansas, Missouri, Washington, Kentucky, Tennessee, and Texas to inspire younger students to get involved and



www.pedbikesafety.org

Center for Pedestrian and Bicyclist Safety

University of New Mexico

Tier 1 Center

Focus Area – Promoting Safety

Center Vision and Objectives

The Center for Pedestrian and Bicyclist Safety (CPBS) was established in 2023 by the U.S. Department of Transportation (USDOT) as part of the University Transportation Centers (UTC) program. The goal of CPBS is to eliminate pedestrian and bicyclist fatalities and serious injuries.

In addition to its direct focus on safety, CPBS also advances secondary strategic goals of Transformation, Equity, and Climate and Sustainability. CPBS advances these goals through the promotion of safe, comfortable, and accessible pedestrian and bicycle networks that improve the resilience of the overall transportation system, advance sustainability, and are fair and equitable for all road users.

Center Initiatives

CPBS's efforts are led by experts in engineering, planning, policy, and public health. In addition to performing research, CPBS also ensures that their research is impactful and transformative by collaborating with a wide set of stakeholders including industry, academia, government, and advocacy organizations through technology transfer, workforce development, and education activities.

Research: CPBS's research approach is guided by the USDOT's Safety Research Priorities and Objectives from their RD&T Strategic Plan. Research under the Safety Data objective may focus on delivering enhanced crash reporting, surrogate safety data, and methodologies for measuring exposure in low-count locations. Research under the Safety Design objective may focus on arterials, freeways, speed management, and nighttime safety. Research under the Safety Culture and Behavior objective may explore Safe Systems and Vision Zero, how to best fund road safety, tribal and rural safety, and applying international lessons to a US context. Research under the Human-Technology Interaction objective may investigate e-bikes and micromobility and the role of motor vehicle design and connected and autonomous vehicles in vulnerable road user safety.



CPBS strives to identify effective ways of developing safe and convenient pedestrian and bicycle networks.

Education and Workforce Development: CPBS attracts students to the field of transportation through their involvement with K-12 educational programs. CPBS supports university students by mentoring students in the TRB Minority Student Fellows Program and the Eisenhower Transportation Fellowship Program. CPBS also integrates pedestrian and bicyclist safety topics into their coursework and UNM developed a study abroad course over summer 2023 that allows students to explore transportation systems from a European perspective.



UNM students tour the largest bicycle parking facility in the world during their study abroad course.

CPBS's workforce development efforts will center around their collaboration with local technical assistance programs (LTAP). Both UNM and UTK house their state's LTAPs and this will provide a platform to disseminate findings into the existing transportation workforce. For instance, CPBS assisted with a pedestrian safety training workshop in summer 2023 that was attended by transportation professionals from across New Mexico (see figure below). CPBS is also pursuing coordination with existing professional certification programs to update course content with the latest pedestrian and bicyclist safety strategies.



CPBS participates in a pedestrian safety training program in summer 2023 attended by transportation professionals from regional/local government.

Technology Transfer: CPBS regularly updates their website (www.pedbikesafety.org) with activities occurring across the consortium. You can also follow CPBS on LinkedIn or sign up for the CPBS newsletter on their website. CPBS will also disseminate research through participation at and organization of conferences, webinars, and workshops.

Products & Outcomes

In addition to traditional products such as research reports and academic papers, CPBS seeks to ensure that

their work is transformational by maximizing impact on communities and the transportation industry. CPBS will ensure a broad impact by focusing on underserved communities and because their consortium members and work span a wide geographic area.



CPBS will explore solutions across USDOT's objectives of safety culture, data, design, and technology.

Among other avenues, CPBS will seek broad impact through policy. For example, UCB's research influenced two recent state laws – AB 43 and AB 1938 – and UCB will develop a related Safe Speeds Toolkit to establish evidence-based, online educational resources to support Safe Speeds decision making in California. UCB will also conduct two pilot workshops on Safe Speeds and provide targeted technical assistance to enhance vulnerable road user safety and mobility.

CPBS will also accomplish broad impact by building collaborations across academia, industry, and government. For example, SDSU recently created a "Declaration of Interdependence" that was signed by officials from San Diego and Tijuana and which outlines the sustainability goals of the international region.

By improving pedestrian and bicyclist safety, CPBS seeks to eliminate a primary barrier to realizing healthier, more sustainable, and more just transportation systems.

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CONSORTIUM MEMBERS:

San Diego State University

University of California, Berkeley

University of New Mexico

University of Tennessee, Knoxville

University of Wisconsin-Milwaukee

SDSU

Berkeley
UNIVERSITY OF CALIFORNIA

NM THE UNIVERSITY OF
NEW MEXICO

T THE UNIVERSITY OF
TENNESSEE
KNOXVILLE

UNIVERSITY OF WISCONSIN
MILWAUKEE



Center for Equitable Transit Oriented Communities (CETOC)

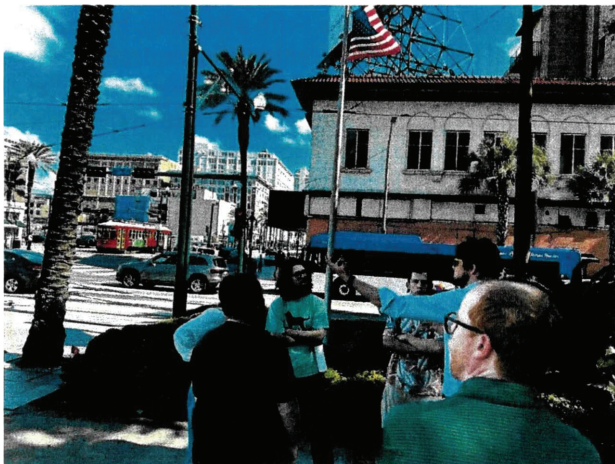
University of New Orleans

Center Type – Tier 1
Focus Area – Preserving the Environment

Center Overview

The Center for Equitable Transit-Oriented Communities (CETOC) is a U.S. Department of Transportation, designated Tier 1 University Transportation Center. It focuses on preserving the environment by promoting transit access, multimodal infrastructure, compact and efficient land use patterns, as well as resilience and climate adaptation.

"Transit plays a critical role in addressing the biggest issues we are facing today-climate and equity," says Dr. Guang Tian, the Director of CETOC and principal investigator at the University of New Orleans. "Not only is transit a more efficient and sustainable mode of transporting people, but it may also be the only option for some people to meet their daily needs and depend on during disasters or other climate-related events." A transit-oriented community creates and supports transit-dependent and resilient communities with multimodal transportation options, affordable and equitable housing options, and economic security.



Dwight Norton of the New Orleans RTA shows CETOC students the site of NORTA's planned downtown transit hub and discusses transit network design and planning.

Motivations and Alignment with Priority Areas

Transit-oriented development (TOD) has generated a number of benefits for communities. Transit is safer than driving on a per mile basis, and active modes lead to better health for our planet and its population. Quality transit can increase access to economic opportunities, social networks, and healthcare. Yet, despite transit's importance, access to its benefits is



CETOC's Focus and Conceptual Model

not shared equitably. Differences persist across the urban-suburban-rural spectrum. Even when controlling for density, disparities in transit access exist based on race, ethnicity, and income. While the promotion of transit-oriented communities remains worthwhile, better access to transit and other amenities can drive up the cost of housing and increase gentrification and displacement pressures. One outcome may be higher-income transit-oriented communities may feature transit as an amenity as opposed to a fundamental mode and the associated high rates of driving may fall short of aspired environmental and social benefits. Remedying these problems is thorny and under-researched. Universities have also failed to train professionals adept at handling the complexity of these challenges. CETOC's research objectives align with the goals for climate sustainability and equity by promoting net-zero emissions, infrastructure resilience, and equitable access to transportation while addressing TOD benefits and drawbacks, including gentrification

and displacement of minority and low-income communities.



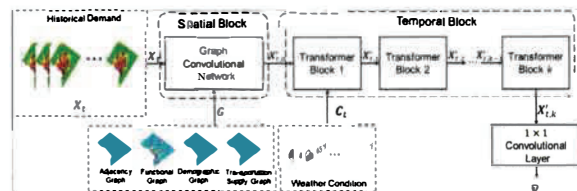
Dr. Xilei Zhao of CETOC discusses Hurricane Idalia preparation and evacuation on Fox 35 Orlando.

Preserving the Environment: The US DOT aims to achieve net-zero emissions by 2050 by reducing vehicle miles travelled (VMT) and shifting trips to sustainable vehicles and modes, which requires close coordination among state and local agencies engaged in land use and transportation planning, as well as addressing induced demand. Research on transit and shared-mobility will promote the shift from single-occupancy driving to multimodal travel, aiming for a reduction in greenhouse gas (GHG) emissions. Products generated from the resilient infrastructure and communities research can inform decision-making in transportation agencies on resilience improvement plans and infrastructure investments. CETOC's research, technology transfer, and workforce development efforts advance infrastructure resilience through identification of opportunities to improve emergency preparedness and response across the transportation sector. CETOC's work supports climate justice by enhancing availability and access to clean transportation options and by mitigating impacts on communities and ecosystems such as noise pollution and criteria air pollutants.

Equity: Transportation investments have the potential to connect or divide communities, to mitigate or exacerbate inequality. Moreover, when climate disasters such as hurricanes and wildfires hit, residents often need to evacuate—but carless and vulnerable populations such as older and low-income people often lack the means to evacuate on their own. For these populations, public transit and multimodal options can provide vital and life-saving support. Addressing issues of equitable access to opportunity requires strengthening the coordination of land use

and transportation, improving the affordability of transportation and housing, and encouraging equitable TOD, particularly in disadvantaged communities.

Transformation: CETOC develops novel data and technology approaches related to artificial intelligence, machine learning, cybersecurity, and infrastructure resilience that advance technological transformation in the transportation sector. CETOC researchers leverage existing partnerships with transportation agencies and communities to pilot demonstration projects regarding mobility-on-demand innovations, micromobility, and resilience digital platforms.



AI model architecture for real-time forecasting of dockless scooter-sharing demand (Xu, Y., Zhao, X., Zhang, X., & Paliwal, M. 2023. Real-Time Forecasting of Dockless Scooter-Sharing Demand: A Spatio-Temporal Multi-Graph Transformer Approach)

Impacts on Transportation System and Users

CETOC research activities promote equitable multimodal transportation systems in two ways: 1) CETOC researchers directly engage disadvantaged and underserved communities to deliver results that address their essential transportation needs; and 2) CETOC research activities enhance access and reduce transportation costs for disadvantaged and underserved communities, with a focus on increasing multimodal travel options, enhancing multimodal experiences, and preparing communities for climate disaster. In addition, by focusing on equity, CETOC's outreach and educational efforts support diversity among the next generation of transportation professionals across the public, private, and nonprofit sectors. CETOC team activities promote equitable wealth creation by expanding access to housing and transportation affordability. Moreover, CETOC projects support safety and the economic strength and global competitiveness of our urban and rural communities through transportation system investments in sustainable and carbon-minimizing approaches.

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Center for Freight Transportation for Efficient & Resilient Supply Chains (FERSC)

University of Tennessee, Knoxville

Center Type – Tier 1

Focus Area – Improving Mobility of People and Goods

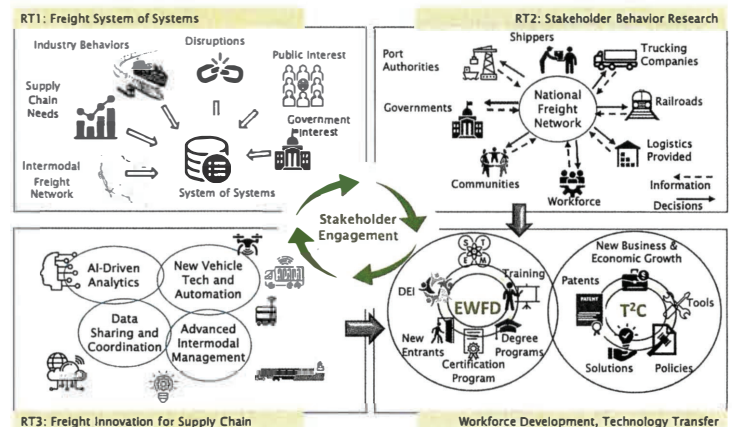
FERSC is a Tier 1 University Transportation Center consortium led by the University of Tennessee, Knoxville. Its focus is the Infrastructure Investment and Jobs Act (IIJA)'s research priority, **Improving Mobility of People and Goods** as its primary area. The consortium supports the DOT Strategic Goals of Economic Strength and Global Competitiveness as the primary focus and Equity and Transformation as the secondaries.

Overview

Our nation's freight transportation challenges are immense. The already congested transportation system faces fast-growing freight demands. The annual freight volume is expected to grow from 19 billion tons in 2022 to at least 29 billion tons in 2050, according to the US Bureau of Statistics. In particular, imports and exports account for over 13% of the total freight volume and will grow at a much faster rate than domestic freight. The growth occurs in an environment of often disrupted supply chains.

Today's supply chains are increasingly interconnected, both domestically and internationally. Supply chain disruptions such as the complete lockout of Shanghai, a major global supply location, due to its COVID-19 policy profoundly challenge the operational efficiency of the US domestic freight system, particularly in coastal areas. Supply chain irregularities caused by natural disasters and political instabilities take a toll on the U.S. economy and even threaten national security (White House Report 14017, 2021).

When COVID-19 disrupted the supply chain, commodity prices within the PPI indexed group rose by 19% from May 2020 to May 2021 (Whitehouse Report, 2021). A 2021 U.S. Census Bureau survey illustrates the devastating cost to the nation: Businesses—over 60% in manufacturing, 58% in construction, 55% in retail, etc.—experienced domestic supplier delay caused by freight issues and the disrupted supply chain. Motivated and obligated by this situation, our work addresses freight mobility in view of supply chain efficiency and resiliency.



FERSC's Three Research Thrusts, EWFD, and T2

Research Focus

Under FERSC, we propose a series of activities organized around three research thrusts:

Freight System of Systems (RT1): RT1 addresses freight as a system and treats freight as part of the larger supply chain system by developing system-level methodologies for optimal performance in the short, medium, and long runs.

Stakeholder Behavior Research (RT2): RT2 recognizes that the behavior of shippers and other stakeholders is critical to freight movement, and it studies behavioral interactions between freight and the supply chain through shipper behavior, considering the best interests of shippers, carriers, and other stakeholders and how the behavioral interactions can be guided and shaped from the system perspective.

Freight Innovations for Supply Chain (RT3): RT3 aims to exploit the maximum potential technological innovations can achieve in helping freight and supply chains, particularly for under-represented populations and under-served regions.



Project Management

FERSC will use four principles to guide a rigorous project selection and management process. Projects must be:

1. stakeholder-centric
2. outcome-oriented
3. peer-reviewed
4. continuously improving

Stakeholders will be involved throughout the lifecycle of research activities, from project statement preparation, through project selection and project report review. FERSC will form three boards: executive board (EB), research advisory board (RAB), and industry advisory board (IAB). These will be involved throughout the entire process.

Education & Workforce Development

Surface Transportation Workforce Development, Training, and Education regulation (23 USC 504(e)) defines “surface transportation workforce development, training, and education” as activities associated with surface transportation career awareness, student transportation career preparation, and training and professional development for surface transportation workers, including activities for women and minorities. The transportation work force ranges from truck drivers to information technology experts. They are critical to the efficient and reliable functioning of the transportation system, which is key to a robust supply chain for the U.S. Our EWFD plan builds on a full educational resource within the consortium members and comprehensively covers an array of elements from early career outreach, mainly K-12 outreach, professional development and education programs, to regular workshop and seminars.

Technology Transfer

We expect the impact of the proposed research to be transformative and long lasting: First, in our view, the proposed research aligns freight research with supply chain efficiency and resiliency to better support the economy and serve a wide range of stakeholders. Secondly, the proposed research treats the system as inherently multimodal, seeking new and better methodologies to design, operate, and assess the multimodal transportation system. Third, recognizing that transformative changes in transportation history almost always started with new, innovative technologies, FERSC proposes to examine, promote, and operate new technologies such as drones and automated vehicles in freight for improved mobility and better societal benefits.

Our innovation on first and last mile of supply chain addresses access expansion to all groups, especially underserved populations. Attracting underrepresented population into transportation and logistics industries helps to generate wealth for them.

The research results and technology transfer activities will transform U.S. freight transportation into a more integrated system powered by innovative technologies. The theories and methodologies behind the proposed studies are also multidisciplinary, involving operations research, information technologies, data sciences, economics, human behavior, social science, simulation, urban planning, and statistics as imbedded in the proposed topics of network modeling, optimization, shipper studies, and innovations. In addition to the primary focus on Improving Mobility of People and Goods, we expect FERSC research to address the challenges of Reducing Congestion and Preserving the Environment.

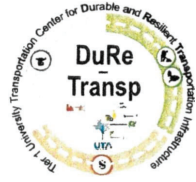
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North Carolina Agricultural & Technical State University
Texas Agricultural & Mechanical University





Center for Durable and Resilient Transportation Infrastructure (DuRe-Transp)

The University of Texas at Arlington

Center Type – Tier 1

Focus Area – Improving the Durability and Extending the Life of Transportation Infrastructure

Center Vision and Objectives

The Tier 1 University Transportation Center for **Durable and Resilient Transportation Infrastructure (DuRe-Transp)**, headquartered at The University of Texas at Arlington (UTA), was established in 2023 by the Office of the Assistant Secretary for Research and Technology (OST-R) of the U.S. Department of Transportation (DOT). DuRe-Transp focuses on the statutory research priority area “Improving the durability and extending the life of transportation infrastructure”.

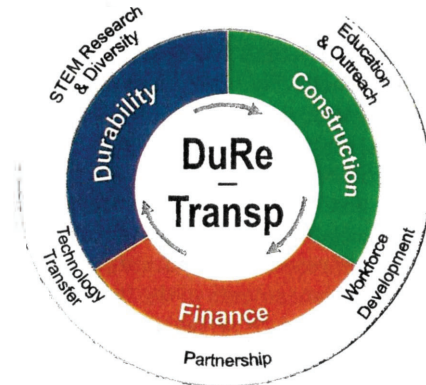
Center Initiatives

DuRe-Transp’s overall goal is premised on Innovation, Durability, Life-cycle performance, Climate Change mitigation initiatives and Performance-based standards for revitalization of the nation’s infrastructure. DuRe-Transp addresses critical areas of national importance in the strategic topics of Durability, Construction, and Finance with 7 research themes (RT).

Research: Under the designated research themes, DuRe-Transp leads cross-disciplinary research projects to develop and deploy the next generation of durable and sustainable concrete-based materials, with emphasis on mitigation of greenhouse gas (GHG) emissions in Transportation Infrastructure and degradation mechanisms liable for diminishing the service life of transportation constructions. The performance of these materials is rigorously tested in both laboratory and field conditions, evaluating the materials’ exposure to various environments (e.g., marine and frost). The Center also dedicates

“DuRe-Transp’s research themes identify and prioritize scientific and technological advancements that support U.S. DOT’s goals for inspecting, repairing, and rebuilding the transportation infrastructure, improving roadway safety for all users, and charting innovative cost-effective pathways for transition to net-zero emissions and climate change mitigation.”

MARIA KONSTA-GDOUTOS
DIRECTOR, UTC DuRe-Transp



Durability

RT-I: Inspection, Maintenance and Preservation
RT-II: Sustainability and Longevity
RT-III: Health Monitoring

Construction

RT-IV: Sustainable Materials and Structures for Climate Change Mitigation
RT-V: Construction Methods and Management
RT-VI: Advanced Materials and Technologies for Construction and Retrofit

Finance

RT-VII: Innovative Revenue and Finance

resources for comprehensive research on advanced structural retrofitting and repair solutions for existing infrastructure. Innovative sensing technologies for structural health monitoring (SHM) are developed and implemented. DuRe-Transp also deploys data-fusion frameworks to advance revenue and finance in transportation sector, with an emphasis on the design and implementation of data-driven blockchain-based smart contracts and commercial vehicle user models.

Education and Workforce Development: The educational and professional development activities are closely integrated with the research objectives with the aim to contribute to the successful training of graduate, undergraduate and pre-college/K-12 students, focused on women and underrepresented groups. The Center also contributes to enhancing the potential of young scholars and faculty to become the nation’s front-line engineers, allowing them to acquire new scientific knowledge and technological know-how in engineering practices that can extend the service life of our Transportation Infrastructure.



STEM Research & Diversity

- 8 STEM disciplines in transportation engineering
- Scholarships/internships for community college students



Workforce Development

- Technical Sessions and Workshops offering PDHs
- Training modules for engineers and practitioners



Education & Outreach

- New certificate program about Carbon Negative Construction Materials and Structures
- Educational seminars, webinars and course modules



Technology transfer

- DuRe-Transp annual conference and Academia - Industry meetings
- Technology acceleration program



Technology Transfer: DuRe-Transp is committed to developing activities for a successful transition of research into practice by utilizing partnerships with Technical Societies, and Standard Developing Organizations, Local Technical Assistant Programs (LTAPs) and other local and state resources in the consortium's institutions. Annual conferences and meetings are organized to facilitate broad dissemination of research outputs and showcase technological advancements in the industrial and transportation sectors. A series of technical sessions, webinars/seminars, and hands-on workshops are designed year-round to advance technological know-how and skills in engineering practices for transportation engineers, professionals, and practitioners.

Products & Outcomes

The Center will develop carbon negative construction materials and renewable energy-related technologies for mitigating the GHG emissions in Transportation Infrastructure. Functional concrete materials and novel composites will be developed to extend the service life of PCC infrastructure. Based on such development and characterization procedures, comprehensible guidelines for formulation and deployment of the durable materials will be designed. It is expected that such efforts will expedite the transfer of technology from research to industry, leading to rapid practical adoption and commercialization of new technologies.

Focus will be given to the development of cost-efficient retrofitting methodologies for existing infrastructure that are easy-to-learn and easy-to-deploy to minimize the costs associated with training personnel in the field. SHM technologies coupled with artificial intelligence (AI) and machine learning (ML) will provide the ability to sense and signal damage at its onset or at very early stages in infrastructure elements (e.g., pavements and bridges). Such tools will be supplemented with advanced data-driven models to perform life-cycle cost analysis (LCCA) and quantitative risk assessment techniques. Data-driven block chain based smart contracts will be developed to provide intelligent forecast of maintenance costs and automatically allocate funds for their execution. Such finance systems will also provide actionable managerial data that will ultimately increase return on investment while reducing project risks.

DuRe-Transp's initiatives are dedicated to advancing the durability, longevity, sustainability, and resilience of Portland cement concrete (PCC) infrastructure through cutting edge research in 8 STEM disciplines in transportation engineering.



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Purdue University





University Transportation Center for Railway Safety (UTCRS)

The University of Texas Rio Grande Valley

UTRGV

Center Type – Tier I
Focus Area – Railway Safety

Background

The University Transportation Center for Railway Safety (UTCRS) was established in fall of 2013 through a grant from the U.S. Department of Transportation (USDOT) Office of the Assistant Secretary for Research and Technology (OST-R). In spring of 2023, the UTCRS was one of the centers selected for funding through the IIJA UTC competition. The UTCRS is a Tier I center and operates as a consortium of six institutions, namely, The University of Texas Rio Grande Valley (UTRGV) Lead Institution, Texas A&M University (TAMU), The University of South Carolina (UofSC), The University of Nebraska-Lincoln (UNL), The University of California-Riverside (UCR), and South Texas College (STC). The lead institution is one of the fastest-growing universities in the UT System, and one of the nation's premier Hispanic-Serving Institutions, with over 90% Hispanic enrollment. It is 2nd in the nation in the number of bachelor's degrees and 3rd in the nation in the number of master's degrees awarded to Hispanics.

Mission and Goals

As a Tier 1 University Transportation Center, the UTCRS and its team of educational institutions have a primary strategic goal of promoting the safety of railway transportation systems, with secondary goals of economic strength and global competitiveness, as well as climate and sustainability. The UTCRS consortium research thrust focuses on the development, testing, implementation, deployment, and technology transfer of smart technologies for safer railways in collaboration with rail industry partners.

Initiatives

The strategic goals of the UTCRS aim to fundamentally improve railway safety outcomes through *Research, Education, Workforce Development, Technology Transfer, and Community Outreach* as follows:

Research: The research conducted by the UTCRS can be subdivided into three focus areas, namely,

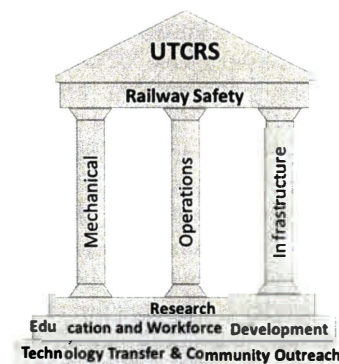
- [1] Railway Mechanical Systems, which include mechanical components condition monitoring techniques, performance characterization and failure mitigation, and predictive maintenance protocols of rolling stock.
- [2] Railway Operation Systems, which include at-grade railway crossing safety, railway operations safety, and smart technologies for highway-rail grade crossing monitoring and analysis.

- [3] Railway Infrastructure Systems, which include durable materials and systems, innovative safety assessments, and advanced technologies for infrastructure monitoring.

All projects are approved by an industrial Advisory Board, and currently the UTCRS is working with nine different rail industry collaborators.

Education and Workforce Development: Since its inception in fall of 2013, the UTCRS has engaged over 850 undergraduate and graduate students in its research, education, professional development, technology transfer, and community outreach activities. These students are mentored by a team of highly qualified and dedicated faculty who are committed to providing a well-rounded education and research experience in the transportation

engineering field. Students develop valuable skill sets through hands-on projects relevant to the railroad industry, research internships at partner institutions, co-authorship of journal and conference papers, presentations at local and national symposiums and conferences, and writing theses and dissertations.



Faculty, staff, students, teachers, and high school interns that participated in the various education and workforce development programs in Summer 2023.

Many UTCRS alumni are now in the transportation engineering workforce and the rail industry.



UTRGV-UTCRS students in the Research Experience for Undergraduates (REU) program at consortium partner University of Nebraska-Lincoln. UTRGV-UTCRS students are primarily Hispanic and over a third have been women, which is double the average for transportation occupations.

Technology Transfer and Community Outreach: As part of the strong commitment to technology transfer and community outreach, the UTCRS has partnered with many rail industries, Class I railroads, and community partners to disseminate the technologies developed at the center. The UTCRS team has helped the rail industry implement and deploy several advanced technologies that improve condition monitoring of rail components and infrastructure, and positively impact the efficacy and safety of rail operations. In terms of community outreach, the UTCRS faculty and staff offer year-round and summer STEM education programs in support of teachers and students alike. The UTCRS provides K-12 teachers the opportunity to participate in the Research Experience for Teachers (RET) program. Selected applicants for this research-intensive five-week program work closely with faculty, students, and staff on current educational research projects, prepare professional presentations, participate in workforce development workshops, and submit a final report on the results of their research. Teachers participating in this program are expected to bring the knowledge they gained to their classrooms in the form of class activities that are appropriate and beneficial for their students. In partnership with 26 local school districts, the UTCRS runs the largest transportation-related summer camps in the nation, hosting more than 1,100 students and 100 teachers

annually. The camps promote science, technology, engineering, and mathematics (STEM) education, with a focus on railway safety. The UTCRS faculty and staff aided by teachers participating in the RET program develop innovative K-12 curricula with the goal of introducing students to STEM concepts through transportation engineering applications. The UTCRS outreach activities have greatly impacted and benefited the region and increased Hispanic student participation in transportation-related activities.



High school students participating in the UTCRS summer camp activities. Camp participants have included hundreds of female U.S. citizen Hispanics interested in STEM careers.

Products and Outcomes

UTCRS continues its timely delivery of comprehensive research, education, workforce development, technology transfer, and community outreach programs in support of the USDOT mission to train and develop the next generation of transportation professionals who are prepared to design, deploy, operate, and maintain the complex transportation systems of the future. The UTCRS is taking a leadership role in organizing the 2024 ASME Joint Rail Conference which will host major rail industries, Class I railroads, federal agencies, and academic partners working on research and development efforts of rail systems. The UTCRS is also engaged with several rail industries and Class I railroads to deploy and implement advanced onboard condition monitoring technologies to assess the health of railroad rolling stock. These technologies are expected to hasten the adoption of wireless onboard sensors with the ultimate goal of revolutionizing condition monitoring and predictive maintenance practices in the rail industry.

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The University of California-Riverside (UCR)
South Texas College (STC)

