



Bi-annual Program Progress Performance Report

Transportation Consortium of South Central States

Louisiana State University

Baton Rouge, LA 70803

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Dr. Marwa Hassan, Director

marwa@lsu.edu

(225) 578-9189

214B Old Forestry Bldg.
Louisiana State University
Baton Rouge, LA 70803

1. Achievements

What are the major goals of the program?

Research Goals

The research goals of Tran-SET are “Solving Emerging Transportation Resiliency, Sustainability, and Economic Challenges through the Use of Innovative Materials and Construction Methods: From Research to Implementation.” The Center’s mission will support all phases of research, technology transfer, workforce development, and outreach activities of emerging technologies that can solve transportation challenges in Region 6.

The Center’s scope falls within FAST Act Research Priority Area 4: Improving the Durability and Extending the Life of Transportation Infrastructure with a focus on the following non-exclusive topic areas: application of new materials and technologies, construction methodologies and management, and corrosion and aging infrastructure. While the focus of Trans-SET is primarily on FAST Research Priority 4 (Improving the durability, and extending the life of transportation infrastructure), the Center will address all transportation challenges throughout Region 6 related to transportation research, education, workforce development, and technology transfer.

Education and Workforce Development Goals

Tran-SET education and workforce development goals are to promote workforce development in transportation through training and continuous education. In addition, Tran-SET will aim at improving and supporting existing transportation-related programs at the 11 institutions of the Consortium. To achieve these objectives, educational and workforce development activities will go in parallel with the research projects funded through the Center. Furthermore, Tran-SET will educate future leaders on transportation-related concepts and will raise their awareness on the challenges facing our transportation infrastructure. Additional goals include introducing transportation engineering to all levels of education and increasing the number of graduates majoring and/or working in transportation fields.

Diversity

Since six out of 11 partner universities are minority serving institutes, Tran-SET aims to integrate diversity-related activities into research and education and to increase the number of underrepresented students’ enrollment in transportation programs. In addition, student veterans will be encouraged to participate in undergraduate and graduate research activities. Many schools including TAMU, UTA, UTSA, and LSU have sizeable student veteran populations, and the center will recruit this underrepresented group to participate in the research projects and outreach activities.

What was accomplished under these goals?

First Official Meeting

January 8, 2017

The first meeting with Consortium members was held in Washington, D.C. at the Transportation Research Board’s 97th Annual Meeting to plan the center’s activities, including the calls for problem statements, requests for proposals, and education and workforce development initiatives.

Call for Problem Statements

January 31, 2017

A call for problem statements was made in Region 6. All problem statements were received and subsequently ranked to select the most relevant projects and that address regional needs. A total of 59 problem statements were received, authored by principal investigators from 18 institutions. Request for proposals was solicited from the authors of the highest ranked problem statements.

Selected Research Projects

May 8, 2017

Proposals were received in mid-March and were reviewed by experts in academia, industry, and state agencies. Thirty-three projects were selected for funding and started on May 8th 2017. Of these selected projects, 14 projects focused on Enhancing Durability and Extending the Service Life of Infrastructure, two projects on Preserving the Environment, eight projects on Preserving Existing Transportation Systems, and eight projects on Other Regional Priorities (Table 1).

Table 1. Classification of Funded Research Project in the First Cycle

Research Focus Area	Number of Projects
Enhancing Durability & Service Life (#4)	14
Preserving the Environment (#5)	2
Preserving Existing Transportation Systems (#6)	8
Other Regional Priorities	8

From the 8 projects that were classified on other Regional Priorities, Table 2 illustrates the transportation challenges that were addressed.

Table 2. Details of Regional Challenges Addressed in the First Funding Cycle

Challenges to Address	Number of Projects
Metropolitan growth & congestion	2
Future Transportation Challenges	1
Declining Public Revenues	1
Underserved/underinvested communities	1
Safety	3

As proposed by Tran-SET, all projects have allocated at least 10% of the funding for a six-month implementation phase after the 12-months dedicated for the research phase. The full list of the 33 selected projects for funding is provided in Appendix A.

Transportation Research Internship Program

May 22, 2017

With the support of College of Engineering at LSU, Tran-SET will offer a summer undergraduate research assistantship for the summer of 2018, where LSU and Navajo Technical University will create a partnership to increase exposure to transportation careers for community colleges with high minority enrollment. The program will be named TRIP (Transportation Research Internship Program).

UTC Kickoff Meeting

June 6, 2017

The UTC kick-off meeting was held at LSU, where the Office of the Assistant Secretary for Research and Technology (OST-R) met with Tran-SET consortium representatives to discuss the center's goals, to take a tour of LSU's facilities, and to see an overview of the grant requirements.

CUTC Meeting

June 19, 2017

The Council of University Transportation Centers (CUTC) will hold the Annual Summer Meeting on June 19-21 in Buffalo, New York. The meeting will serve as a venue to exchange information and to enhance collaboration between university transportation centers, the US Department of Transportation, and other government agencies. Tran-SET representatives (i.e. the director and the program manager) will participate in this event.

Summer Camp Involvement

June 22, 2017

Tran-SET participated in the LSU REHAMS Residential Engineering Summer Camp by engaging students with a hands-on session to learn the basics of mortar mixing. The students learned how the proportioning affected the workability and strength of the mix, and placed the mortar into Star Wars and Leggo themed molds. The next day, the students were able to retrieve their samples, and take them as souvenirs. REHAMS, short for "Recruiting into Engineering High-Ability Multicultural Students," is an annual summer camp organized by LSU for rising 10th, 11th, and 12th-grade students.

What opportunities for training and professional development has the program provided?

Nothing to report.

How have the results been disseminated?

Nothing to report.

What do you plan to do during the next reporting period to accomplish the goals?

Research Projects

For the next reporting period, the research projects will on an ongoing status. Once the technical phase is completed (by May 8th, 2018), the results of the research studies will be highlighted through final reports, publications, webinars, and the website. Next, the implementation phase will begin, where researchers will focus on technology transfer initiatives, as well as education, outreach, and workforce development activities. An implementation report will be submitted by the PIs to summarize these activities by November 8th, 2018.

Future Center Activities

In addition to the research projects, the center management team is involved in the following activities to achieve the technology transfer, education, outreach, and workforce development goals for the next reporting cycle:

- Publish a bi-annual newsletter to highlight the center's activities and to promote the research and educational endeavors.
- Set-up grant competition program to be executed for the next funding cycle. The grant competition will fund one multidisciplinary research project needed to solve regional challenges in transportation.
- Plan the summer undergraduate research internship program with Navajo Technical University students for the summer of 2018, to expose the students to multiple state-of-the-art research projects funded by Tran-SET, and encourage them to pursue careers in transportation.

- Participate in XCITE, an existing LSU summer camp, to attract high school students to careers in transportation by offering interactive, educational demonstrations of traffic engineering on July 13th, 2017.
- Establish an Educational and Work Force Development Committee that will supervise educational and workforce development activities. This committee will review the outcomes of each research project and will coordinate with the PIs to ensure that educational and training materials are provided by the end of each project.
- Establish a working relationship with the LSU Veteran & Military Student Services and veteran student associations to attract and encourage students to pursue careers in transportation.

2. Products

Publications, conference papers, and presentations

Nothing to report.

Website(s) or other Internet site(s)

The Center website, Facebook page, and Twitter page have been developed and are operational. These online resources will be used to post presentations, videos of the Center activities, and educational materials to raise awareness among the public of the current transportation challenges, and the center's efforts to address them.

- [Tran-SET website](#);
- [Tran-SET Facebook page](#); and
- [Tran-SET Twitter page](#).

Technologies or techniques

Nothing to report.

Inventions, patent applications, and/or license

Nothing to report.

Other products

Nothing to report.

3. Participants & Collaborating Organizations

What organizations have been involved as partners?

A number of private companies and public agencies or institutions have collaborated with the PIs in the first funding cycle. Table 3 outlines the cost-sharing information from the external partnerships associated with the consortium’s research projects.

Table 1. Summary of Cost-Sharing from External Partnerships

University	Partner Institution(s)	Number of Collaborative Projects	Total Funding Matches
University of Texas at San Antonio	City of San Antonio	1	\$50,000
Arkansas State University	Ergon, Inc.	2	\$49,000
University of New Mexico	City of Albuquerque	1	\$6,000
University of New Mexico	NMDOT	1	\$94,000
Louisiana State University	LADOTD/LTRC	11	\$297,098
University of New Mexico	Transpo	1	\$50,000
University of New Mexico	Epoxy Chemical	1	\$50,000
University of New Mexico	Sewer Shields Composites	1	\$50,000
TOTAL	8	19	\$646,098

Ergon, Inc.

[Ergon, Inc.](#) from Jackson, Mississippi, has partnered with Arkansas State University on two funded projects, for a total of \$49,000 in matching funds (Project Nos. 17BASU03, 17BASU01). Ergon’s services include:

- Preparation of custom asphalt binders and chemical tests
- Handling and shipping of materials
- Testing supplies
- In-kind support from staff

City of San Antonio (COA)

The City of San Antonio partnered with the University of Texas at San Antonio (Project No. 17ITSTSA01). Services include \$50,000 in financial support.

Fort Wayne Metals

[Fort Wayne Metals](#), headquartered in Fort Wayne, Indiana, has partnered with Texas A&M University (Project No. 17STTAM04). Services include:

- Shape memory alloy supplies
- Shipping and handling of materials

Louisiana Department of Transportation and Development (LADOTD)

[LaDOTD](#), headquartered in Baton Rouge, Louisiana, has partnered with Tran-SET on 11 projects, providing a total of \$297,098 in matching funds. Services include:

- Financial support
- In-kind support
- Facilities (asphalt and concrete laboratories)
- Collaborative research, where staff members will be directly involved in several projects. In some cases, LADOTD staff members are also principal investigators.
- Supplies
- Student salaries

LaDOTD is involved in a number of research projects, which are presented in Appendix A.

New Mexico Department of Transportation (NMDOT)

[NMDOT](#) partnered with the University of New Mexico (Project No. 17STUNM03). A total of \$94,000 in matching funds, which will be distributed over two years, has been acquired from NMDOT. Services include:

- Financial support;
- Collaboration with NMDOT staff;
- Assistance with technology transfer, education, and workforce development;

City of Albuquerque

The [City of Albuquerque](#) partnered with the University of New Mexico (Project No. 17PPUNM01). UNM and the City are currently working on finalizing the contract, which will include a commitment of \$6,000 in financial support.

Transpo Industries

[Transpo](#) partnered with the University of New Mexico on one project (Project No. 17STUNM03). Transpo will provide a \$50,000 cost share for materials supplies and financial support.

Epoxy Chemicals, Inc.

[Epoxy Chemicals](#) partnered with the University of New Mexico on one project (Project No. 17STUNM03). Epoxy Chemical will provide a \$50,000 cost share for materials supplies and financial support.

Sewer Shields Composites LLC

[Sewer Shields Composites](#) partnered with the University of New Mexico on one project (Project No. 17STUNM03). The company will provide a \$50,000 cost share for materials supplies and financial support.

Arkansas Highway and Transportation Department (AHTD)

[AHTD](#) partnered with Arkansas State University (A-State) on three research projects: 17BASU01, 17BASU03, 17CASU02. AHTD will hold research council meetings in which A-State research projects will disseminate research findings.

Texas Department of Transportation (TxDOT)

[TxDOT](#) will participate in technology transfer, education and workforce development initiatives with Prairie View A&M University (Project No. 17PPLSU07).

Sandia National Laboratories UNM

[Sandia National Laboratories](#), located in Albuquerque, New Mexico, partnered with the University of New Mexico (Project No. 17STUNM02). Services include:

Canadian National (CN) Railway

The University of New Mexico partnered with the [Canadian National Railway](#), headquartered in Montreal, Canada (Project No. 17STUNM02).

The company is to provide:

- Access to CN bridges/railways for inspection
- Data sharing of inspection reports for data validation
- Assistance with Education & Workforce development

BNFS Railway

The University of New Mexico partnered with [BNSF railway](#) (Project No. 17STUNM02). The company is to provide:

- Access to their bridges for inspection
- Assistance with Education & Workforce development

Transplace, Inc.

[Transplace, Inc.](#), headquartered in Frisco, TX, partnered with Oklahoma State University (Project No. 17ITSOKS02). Transplace will provide 2 weeks' worth of sample data, including:

- Shipping demand
- Trucker's capacity information

Guiyang Truck Alliance Tech Com Ltd.

The Guiyang Truck Alliance Tech Com Ltd., headquartered in Chengdu, China, partnered with Oklahoma State University (Project No. 17ITSOKS02). Guiyang Truck Alliance will provide 1 weeks' worth of sample data, including:

- Shipping demand
- Trucker's capacity information

Transportation Technology Center, Inc. (TTCI)

Located in Pueblo, Colorado, [TTCI](#) will partner with the University of New Mexico (Project No. 17STUNM02). TCCI staff will assist with the development of bridge inspection methodology in the field for the project's implementation phase. In addition, full-scale railroad laboratory use will be granted to the research team.

Los Alamos National Laboratory (LANL)

[Los Alamos National Laboratory](#), located in Los Alamos, New Mexico, partnered with the University of New Mexico (Project No. 17STUNM02). The collaboration with LANL is expected to allow UNM students to work with a different institution throughout the project, and more specifically to conduct research outside of the state of New Mexico, broadening the exposure for regional students.

[Have other collaborators or contacts been involved?](#)

From the 33 funded projects, 11 collaborative studies will be conducted through a partnership between the consortium members. The list of the collaborative research projects is shown in Table 4.

Table 2. Summary of Cost-Sharing from External Partnerships

Project ID	Lead University	Collaborative University(ies) inside UTC	Collaborative University(ies) outside UTC
17GTL SU04	Louisiana State University	University of Texas at Arlington	
17PPL SU07	Louisiana State University	University of New Mexico, Prairie View A&M University	
17ITSL SU09	Oklahoma State University	Louisiana State University	
17CLS U08	Texas A&M University	Louisiana State University	
17STLS U03	Texas A&M University	University of New Mexico, Louisiana State University	
17GTL SU12	Tulane University		University of New Orleans; University of Louisiana at Lafayette
17STLS U11	University of Louisiana at Lafayette	Louisiana State University	
17GTTAM02	Texas A&M University	University of Texas at Arlington	
17PTAM03	Texas A&M University	University of Texas at San Antonio	
17PUTA01	University of Texas at Arlington	University of Texas at San Antonio	
17PUTA02	University of Texas at Arlington	University of Texas at San Antonio	University of Texas at Tyler

4. Impact

What is the impact on the development of the principal discipline(s) of the program?

The funded research projects span across all modes of surface transportation with a special focus on roads, ports, and bridges as critical components in the region as they are vulnerable to the conditions in Region 6.

The performance evaluation for this category will be developmental and outcome-based on participation, including the review panel, researchers, workshop and conference participants, and external partners. To date, the Center reports the following performance metrics:

- Number of Graduate Students supported: 50
 - Current number of graduate students hired/supported: 34
- Number of projects funded in each research focus area

- Research Focus Area 4: 14
- Research Focus Area 5: 2
- Research Focus Area 6: 8
- Other Regional Priorities: 8
- Number of proposals received in this funding cycle: 33
- Number of new or revised courses (including traditional and long-distance) to be delivered: 28
- Number of new educational modules to be delivered: 41

What is the impact on other disciplines?

Nothing to report.

What is the impact on the development of transportation workforce development?

The UTC team has the goal of ensuring that educational and workforce development activities go in parallel with the research projects funded through the Center. Based on the planned activities from this grant year's selected proposals, the Center presents the following performance metrics (to date):

- Number of new or revised courses (including traditional and long-distance) to be delivered: 28
- Number of new educational modules to be delivered: 41
- Number of conferences to be organized/sponsored: 2
- Number of seminars/workshops delivered from funded projects: 27
- Number of webinars presented from funded projects: 17
- Number of graduate students supported: 50
 - Current number of graduate students hired/supported: 34
- Number of planned summer internships or research opportunities for undergraduate students from under-represented groups: 6 out of 11 internship or research opportunities

What is the impact on physical, institutional, and information resources at the university or other partner institutions?

The proposed UTC Center represents a collaborative partnership between nine universities and two community colleges. This partnership will combine the unique characteristics and strengths of each institution to deliver a Center with unique capabilities to tackle regional transportation challenges. At the end of each grant year, data collection corresponding to the center's Collaboration goals will be reported. To date, the Center presents the following metrics:

- Number and description of partnerships with public and private entities: 14
- Number of multi-institution research projects between the 11 institutions: 11 (33%)

- Number of external participants in technology transfer and education activities from the 11 institutions: 10

What is the impact on technology transfer?

The Tran-SET team is committed to ensuring that the findings of projects funded through the Center will have a long-term research value and significantly impact the transportation industry. At the end of each grant year, data collection corresponding to the center's Technology Transfer goals will be reported. To date, the Center presents the following metrics:

- Number of conferences organized/sponsored: 2
 - International Congress of Polymers in Concrete (ICPIC 2018)
 - Construction Research Congress (CRC 2018)
- Number of seminars/workshops delivered from the funded projects: 27
- Number of webinars planned from the funded projects: 17
- Number of visitors from the Center's website: 2,887

What is the impact on society beyond science and technology?

The Center is committed to reaching out to underinvested and underrepresented groups and communities to have a significant impact on Region 6. Given that there are five minority serving institutions among the consortium members, a significant involvement of under-represented groups is expected in various activities that will lead to the production of a diverse group of future researchers and engineers. At the moment, the Center reports the following metrics for minorities in research:

- 49 Principal Investigators
 - 38.8% minority (by race/ethnicity)
 - 14% female
- 34 participating students (to date)
 - 58.8% (by race/ethnicity)
 - 32.4%

5. Changes/Problems

Changes in approach and reasons for change

Tran-SET proposes to change the duration of the research projects to allow flexibility to Principal Investigators engaged in studies that require longer technical or implementation efforts. Therefore, unless officially requested in a research proposal, Tran-SET will continue funding projects composed of a 1-year research phase, followed by a 6-month long implementation phase. For projects that require an extension, Tran-SET will guarantee funding for the first year, and will support the remainder of the project pending on the UTC grant's availability.

Actual or anticipated problems or delays and actions or plans to resolve them

Nothing to report.

Changes that have a significant impact on expenditures

Nothing to report.

Significant changes in use or care of human subjects, vertebrate animals, and/or biohazards

Nothing to report.

Change of primary performance site location from that originally proposed

Nothing to report.

Appendix A

Table 3. List of Funded Projects in the First Cycle

Project No.	PI	Title
17BASU03	Dr. Hossain	Impacts of Moisture on Asphalt Properties and Prediction of Compatible Aggregate-Binder Systems
17BASU01	Dr. Hossain	Use of Nanoclays as Alternatives of Polymers Toward Improving Performance of Asphalt Binders
17CASU02	Dr. Hossain	Use of Rice Hull Ash (RHA) as a Sustainable Source of Construction Material
17BLSU01	Dr. Wasiuddin	Development of a Standard Test Method for Characterization of Asphalt Modifiers and Aging-Related Degradation Using an Extensional Rheometer
17BLSU06	Dr. Hassan	Development of a self-healing and rejuvenating mechanisms for asphalt mixtures containing recycled asphalt shingles
17BLSU02	Dr. Hassan	Enhancing the Durability and the Service Life of Asphalt Pavements Through Innovative Light-Induced Self-Healing Material
17CLSU05	Dr. Arce	Evaluation of the performance and cost-effectiveness of engineered cementitious composites (ECC) produced from region 6 local materials
17GTLSU04	Dr. Jafari	Prediction and Rehabilitation of Highway Embankment Slope Failures in Changing Climate
17PPLSU07	Dr. Harper	Recruiting, Retaining, and Promoting for Careers at Transportation Agencies
17PPLSU13	Dr. Julius Codjoe	Research Incentive Programs for Closures of Public and Private Grade Crossings
17ITLSU09	Dr. Ahmed	Promoting Economic Development in the Baton Rouge Area, LA: Improving the Performance of the Transportation System through Supply-Oriented, Demand-Oriented and Economic Measures for Mitigating Traffic Congestion
17CLSU08	Dr. Castaneda	Self-healing microcapsules as concrete aggregates for corrosion inhibition in reinforced concrete
17STLSU03	Dr. Castaneda	A comprehensive reliability-based framework for corrosion damage monitoring and repair design of reinforced concrete structures
17GTLSU12	Dr. Nancy Dawers	Synthesis of Faults Traces in SE Louisiana Relative to Infrastructure
17SALSU10	Dr. Xiaoduan Sun	Investigating Problem of Distracted Drivers on Louisiana Roadways
17STLSU11	Dr. Paul Darby	Bridge Inspecting with Unmanned Aerial Vehicles R&D

Project No.	PI	Title
17CNMS01	Dr. Newton	Bridge Deck Overlays Using Ultra-High-Performance Concrete
17GTNMS02	Dr. Cortes	In-Situ mechanical characterization for compacted aggregates
17ITSOKS02	Dr. Tieming Liu	Study the Impacts of Freight Consolidation and Truck Sharing on Freight Mobility
17STOKS01	Dr. Soliman	Sustainability-based Long-term Management of Bridges under Multi-Hazard Exposure
17CTAM01	Dr. Grasley	Modeling sulfate attack in modern concrete for building sustainable and resilient infrastructure
17GTTAM02	Dr. Radovic	Development of environmentally Friendly Stabilization Method for transport Infrastructure based on geopolymers
17PTAM03	Dr. Karsilayan	Development of a self-powered structural health monitoring system for transportation infrastructure
17STTAM04	Dr. Karaman	Integrated Health Monitoring and Reinforcement of Transportation Structures with Optimized Low-Cost Multifunctional Braided Cables
17PPUNM01	Dr. Rowangould	Sustainable and Equitable Financing for Pedestrian Infrastructure Maintenance
17STUNM02	Dr. Moreu	Development, Training, Education, and Implementation of Low-cost Sensing Technologies for Bridge Structural Health Monitoring (SHM)
17STUNM03	Dr. Taha	Cost-effective methods to retrofit metal culverts using composites
17PUTA01	Dr. Romanoschi	Evaluation of Comparative Damaging Effects of Multiple Truck Axles for Flexible Pavements
17PUTA02	Dr. Romanoschi	Simplified Approach for Structural Evaluation of Flexible Pavements at the Network Level
17STUTA03	Dr. Chao	Use Ultra-High-Performance Fiber-Reinforced Concrete (UHP-FRC) for Fast and Sustainable Repair of Transportation Infrastructure
17ITSTSA01	Dr. Sharif	Relationship between Road Network Characteristics and Traffic Safety
17STTSA02	Dr. Matamoros	Coastal Bridges under Hurricane Stresses along the Texas and Louisiana Coast
17TTNTU01	Dr. Ehteshami	Educational and workforce development through creation of programs in transportation to generate future careers for our students in Navajo Nation region.

Table 4. List of Projects Funded through Collaboration with LADOTD

Project No.	PI	Title
17BLSU01	Dr. Wasiuddin	Development of a Standard Test Method for Characterization of Asphalt Modifiers and Aging-Related Degradation Using an Extensional Rheometer
17BLSU06	Dr. Hassan	Development of a self-healing and rejuvenating mechanisms for asphalt mixtures containing recycled asphalt shingles
17BLSU02	Dr. Hassan	Enhancing the Durability and the Service Life of Asphalt Pavements Through Innovative Light-Induced Self-Healing Material
17CLSU05	Dr. Arce	Evaluation of the performance and cost-effectiveness of engineered cementitious composites (ECC) produced from region 6 local materials
17GTLSU04	Dr. Jafari	Prediction and Rehabilitation of Highway Embankment Slope Failures in Changing Climate
17PPLSU07	Dr. Harper	Recruiting, Retaining, and Promoting for Careers at Transportation Agencies
17PPLSU13	Dr. Julius Codjoe	Research Incentive Programs for Closures of Public and Private Grade Crossings
17ITLSU09	Dr. Ahmed	Promoting Economic Development in the Baton Rouge Area, LA: Improving the Performance of the Transportation System through Supply-Oriented, Demand-Oriented and Economic Measures for Mitigating Traffic Congestion
17CLSU08	Dr. Castaneda	Self-healing microcapsules as concrete aggregates for corrosion inhibition in reinforced concrete
17STLSU03	Dr. Castaneda	A comprehensive reliability-based framework for corrosion damage monitoring and repair design of reinforced concrete structures
17STLSU11	Dr. Paul Darby	Bridge Inspecting with Unmanned Aerial Vehicles R&D