# 2020-Q2 Newsletter [Issue 11 | Summer 2020]

## About Tran-SET

Tran-SET is Region 6’s University Transportation Center. It is a collaborative partnership between 11 institutions (see below) across 5 states (AR, LA, NM, OK, and TX). Tran-SET is led by Louisiana State University. It was established in late-November 2016 “to address the accelerated deterioration of transportation infrastructure through the development, evaluation, and implementation of cutting-edge technologies, novel materials, and innovative construction management processes.”

## Letter from the Director

**Warm Summer Greetings from Tran-SET!**

I want to wish everyone a happy and safe Summer season. I would also like to take this opportunity to personally thank all Tran-SET staff, associate directors, program directors, and principal directors for their efforts in these unprecedented times. Your effort is much appreciated and is directly responsible for Tran-SET’s achievements throughout 2020.

In this newsletter, I am happy to report Tran-SET’s continued progress. I am especially excited for Tran-SET’s response to COVID-19 through hosting a webinar earlier this month highlighting the impacts of COVID-19 on transportation and logistics. However, I would like to dedicate my forward to inform everyone of two important announcements.

The 2020 Tran-SET Conference will be held in Albuquerque, NM on September 1-2, 2020. The Conference will include two keynote speakers, two additional guest speakers, 55 lectern presentations, 15 student posters, and more! It is a great opportunity to learn how Tran-SET-sponsored research is helping solve regional needs, as well as to network, collaborate and engage with other professionals in a variety of transportation-related fields. Registration is ending soon, so be sure to register now!

Tran-SET is currently soliciting research problem statements for its fifth cycle of funding. Principal Investigators/researchers, CAB members, and other community/agency leaders are encouraged to participate. Problem statements for the fifth cycle of funding are due by August 30, 2020. For more information please visit Tran-SET’s [**website**](https://transet.lsu.edu/research-in-progress/)**.**

I invite you to read through our Summer 2020 newsletter and learn more about our research, technology transfer, educational, and workforce development activities. If you haven’t done so already, I highly encourage everyone to follow us on [**LinkedIn**](https://www.linkedin.com/company/tran-set/) and [**Twitter**](https://twitter.com/utclsu). You may also subscribe to our mailing list [**here**](https://transet.lsu.edu/subscribe/).

**Enjoy!**

## Research Program Updates

### Call for Fifth-Cycle Problem Statements Now Open!

Tran-SET is currently soliciting research problem statements for its fifth-cycle of funding. Any and all Principal Investigators/researchers are welcomed to submit problem statements, including those not part of Tran-SET or not located within Region 6. However, problem statements selected after review/ranking that were submitted by institutions not part of Tran-SET (including those in Region 6), will move forward as an open request for proposal (RFP). Only institutions within Region 6 (including those not part of Tran-SET) will be able to apply to an open RFP. Any and all Center Advisory Board (CAB) members and other community/agency leaders are also welcomed to submit problem statements. Problem statements for the fifth cycle of funding are due by **August 30, 2020.** For more information please visit Tran-SET’s [**website**](https://transet.lsu.edu/research-in-progress/)**.**

### Update on Fourth-Cycle Proposals

Tran-SET issued a call for problem statements (July 2019) for their fourth-cycle of research projects. A total of 96 problem statements were received (August 2019), and the problem statements were reviewed and ranked by regional leaders (October 2019). Submitters of the chosen problem statements were contacted (November 2019) and 43 project proposals were received (February 2020). Proposals were reviewed by subject matter experts (April 2020) and revised accordingly by the submitted research teams (May 2020). Tran-SET is currently in the process of making award decisions and finalizing the fourth-cycle funding program. **All fourth-cycle projects are anticipated to start August, 2020.**

### Third-Cycle Projects Research Reports

Tran-SET’s third-cycle projects are in progress and their second progress reports and trackers were submitted on April 2020. Tran-SET’s third-cycle projects will end their technical phase on August 2020. Please “stay tuned” as Tran-SET will disseminate these reports when available. Don’t miss a report by subscribing to our mailing list [**here**](https://transet.lsu.edu/subscribe/)!

### Third-Cycle Technology Readiness Level (TRL) Assessments

### As part of our Technology Transfer (T2) Plan, within two months of the technical (research) phase ending, Tran-SET will organize and conduct TRL assessments for each project. This includes working with each Principal Investigator to define a panel comprised of the PRC and at least one other member considered to be a potential adopter. The assessment involves a webinar (or in-person) meeting where the panel assesses: (1) the level in which the research product (technology) is ready for implementation, (2) which elements the technology currently lacks regarding implementation, and (3) the next step(s) required to further ready the technology for implementation. Dr. Husam Sadek (Tran-SET Research and T2 Program Coordinator) is currently organizing and facilitating TRL assessments for each third-cycle project. The process has proven to be a tremendously useful experience: (1) providing an opportunity for the research team to directly communicate to stakeholders, (2) gathering critical feedback from the panel to better inform/improve activities during the implementation (technology transfer) phase, (3) more informed and engaged stakeholders, and (4) educating research teams and panel members on the use of the TRL scale and assessment processes.

## Research in Progress: Highlights

Please see below for a showcase of select, Tran-SET research projects. ***Is our research applicable to your technical area? Beneficial or a potential solution to your local transportation system? Can benefit from your efforts? Interesting?***Please contact us for ways to coordinate, be involved, and engaged! To learn more about the following projects (and the rest of our active research projects), please visit our [**website**](https://transet.lsu.edu/research-in-progress/).

### Corrosion Management System of Regional Reinforced Concrete (RC) Bridges

Dr. Homero Castaneda-Lopez – Texas A&M University, Dr. Ayman Okeil – Louisiana State University,

The deterioration of concrete infrastructure due to reinforcing steel corrosion has been recognized as a major technical and economic challenge in the United States. One aspect is the natural degradation of the materials forming the reinforced concrete element while in service and under natural conditions. This rebar/concrete system has been extensively studied in laboratory but has rarely been inspected in the field. The use of new, quantitative, meaningful parameters in the characterization and inspection of concrete bridges should inform the development of procedures for corrosion management of the concrete/rebar system.

This project aims to develop a comprehensive, effective management system of corrosion-damaged RC structural elements. The system will encompass many components like modeling, characterization and development of methodologies for conducting preliminary corrosion assessment as well as in-depth corrosion mechanism for both uniform and pitting corrosion, for selecting the most suitable repair/ inspection and corrosion control methods based on modeling to meet a qualitative/quantitative index, for monitoring component performance following repairs or control action, and finally for creating experiment-based and data-driven probabilistic models of corroding RC structures. The result will be an integrated tool that merges materials, structures and management system for corrosion management.

### Advanced Modeling and Design Methodology for Pavements using Plasticity-Based Shakedown Theory

Dr. Shengli Chen, Dr. Chao Sun– Louisiana State University.

Pavement design is a process intended to find the most economical combination of layer thickness and material type for the pavement, considering the properties of the subgrade soil and the traffic to be carried during the service life of the road. Current methods of pavement analysis and design are more or less empirical in U.S. (AASHTO, 1993), and have many shortcomings like the inability to effectively consider the accumulation of plastic/permanent deformations. This makes it hard to achieve accurate and economical pavement designs.

The goal of this research is to develop an advanced model for the pavement performance assessment, using the shakedown concept based on the plasticity theory, which will be a great improvement over the existing design methodologies such as the empirical method and mechanistic-empirical method. It will result in a vehicle-road coupling model for more accurately estimating the additional dynamic vehicle load induced by pavement roughness considering time-variant traveling speed, which will in turn help develop a design approach capable of preventing rutting failure, as well as some other types of plastic failure of flexible pavements. Furthermore, the outcomes of the proposed project will help evaluate the pavement damage development to make optimized maintenance plans during its lifespan, and has the potential to significantly reduce the huge costs of pavement maintenance in the U.S.

### Life Cycle Environmental Impact of Houston METRO System – Evaluation of Electric Alternatives

Dr. Raghava R. Kommalapati, Dr. Hongbo Du, Dr. Doeun Choe – Prairie View A&M University

Urban mass transit systems alleviate road traffic congestion and reduce the total greenhouse gas emissions (GHG) from the transportation sector. Houston METRO operates buses along 86 routes in the Greater Houston area, and three light rail lines that have an average daily ridership of 61,000 passengers as of June 2018. A comprehensive energy and environmental life cycle assessment (LCA) study is necessary to quantify the improvements and identify any potential systemic modifications that could further lower environmental impact.

The objective of this study is to estimate the energy and environmental impacts from the total life cycle of the Houston Metro System and provide cost-benefit analysis for an electrification alternative. The objectives that constitute in realizing the overall goal are estimating the total GHG and CAP emissions from the current operational routes of the bus and light-rail fleet of the Houston metro system, quantifying the total energy and environmental impact resulting from Houston metro, evaluating the net change in energy and environmental impact in transitioning from metro fleet to electric vehicle, determining the impact of electrification and expansion of Houston metro system on regional air quality and global warming potential, comparing the improvement in sustainability resulting from varying degrees of traffic migration/passenger adoption from automobiles, and finally, providing guidance to stakeholders, community leaders within Houston in the adoption of electric vehicles and expansion of metro ridership.

### Holistic Network-level Assessment of Pavement Flood Damages using the FEMA’s Hazus Flood Models and Maintenance Cost Prediction

Dr. Yong-Cheol Lee – Louisiana State University, Dr. Kunhee Choi – Texas A&M University

Due to catastrophic disasters, roadways in the South-Central Region suffer not only from flood inundation, but also from many long-term recovery processes that result in high maintenance costs. Current methods for evaluating roadway damages are inefficient and labor-intensive because they involve a large number of visits to damaged sites, as well as physical analyses. In addition, even though existing methods provide a detailed damage analysis of pavement in a particular location for a particular time, there is still a sizable knowledge gap in understanding network-level roadway functional/structural damages before-and-after historic flooding as well as assessing flooding effects on roadways over time. Also, a lack of long-term investigation on roadway damages caused by floods has resulted in the absence of accurate maintenance cost prediction.

The main objective of this study is to develop a holistic roadway damage assessment method using the FEMA’s Hazus flood models and the pavement condition data collected over many years. This research project aims to provide a means for Louisiana and Texas (eventually to all Region 6’s States) to intuitively identify roadway damage patterns at the network level caused by flooding over time as well as accurately predict roadway maintenance cost. The anticipated benefit is to predict the long-term maintenance cost by identifying flood impact on roadways over time.

### Investigating the Impacts of Truck Platooning on Transportation Infrastructure in the South-Central Region

Dr. Hany Hassan – Lousiana State University, Dr. Samer Dessouky – University of Texas at San Antonio, Dr. Alireza Talebpour – Texas A&M University

Freight and the efficient movement of freight is a critical component to the economy of the southern U.S., especially to states in Region 6 (AR, LA, NM, OK, and TX). Truck platooning is a connected and automated vehicle (CAV) application of interest to the freight industry due to its potential energy savings, safety benefits, and ability to reduce highway congestion. However, the short distances maintained between vehicles and more precise lane-keeping lead to a higher concentration of load being placed on the transportation infrastructure. Self-driving truck technology is continually being developed and will grow increasingly more available on public roadways. Even though this technology is not available to the public, it is envisioned to include short following distances and accurate lateral positioning.

The main goals of this study are to quantify the operational and environmental impacts of diverse truck platooning configurations at both the corridor- and network-level through a series of modeling case studies. Resulting impacts to the structural pavement from truck platooning implementations will be analyzed using finite element (FE) modeling. Finally, a feasibility study for implementation will be developed comparing the benefits of truck platooning with the potential costs associated with the increase in pavement loads. Results from the case studies may be taken into account for CAV-related policy, planning and integration strategies.

### Selecting the Most Feasible Construction Phasing Plans for Urban Highway Rehabilitation Projects

Dr. Kunhee Choi, Dr. David Jeong – Texas A & M University; Dr. Yong-Cheol Lee – Louisiana State University

Approximately 20% of the U.S. highway system is under construction, resulting in over 3,000 construction work zones (CWZ) across cities and states. Delays and rerouting due to U.S. highway rehabilitation projects account for the average driver wasting 67 hours on the road and 32 gallons of fuel annually, and 97,000 crashes each year due to sudden speed drops and mandatory lane changes. For this reason, daily commuters and businesses are facing a growing need to improve mobility around work zones. The main concern is the lack of methods to evaluate the level of mobility disruption caused by construction work zones.

This project aims to create a unified data-driven model for autonomously predicting the levels of mobility disruption caused by the presence of a critical work zone under arbitrary and user-defined rehabilitation scenarios. The proposed project will result in a significant step forward in the ability of DOT planners and engineers to efficiently assess the impacts of pursued highway rehabilitation alternatives, select the most feasible construction phasing/staging scenarios, and thus significantly improve mobility and reduce the amount of safety incidents involving work zones. This research will greatly benefit researchers and industry practitioners, the traveling public, and overall society by significantly improving mobility and safety in and between CWZs, and positively affecting regional development.

## Technology Transfer Activities

Tran-SET has two objectives that guide its technology transfer (T2) activities: to ensure that scientific and technological developments are: (1) accessible, disseminated, and transferred to a wide range of users including state agencies, universities, and industries and (2) have long-term research value and significant impact to the transportation industry.

Please see below for a showcase of select, T2 activities sponsored by or involving Tran-SET. Please stay up-to-date with our activities by following us on [**LinkedIn**](https://www.linkedin.com/company/tran-set/) and [**Twitter**](https://twitter.com/utclsu), visiting our [**website**](https://transet.lsu.edu/), and [**subscribing to our mailing list**](https://transet.lsu.edu/subscribe/)!

### 2020 Tran-SET Conference: Registration is still open!

The 2020 Tran-SET Conference will take place on **September 1-2, 2020** in Albuquerque, NM. The Conference will be hosted by the University of New Mexico and New Mexico State University, and co-sponsored by the ASCE Construction Institute. The Conference will include two keynote speakers, two additional guest speakers, 55 lectern presentations, 15 student posters, and more! It is a great opportunity to learn how TranSET-sponsored research is solving regional transportation challenges and to network, collaborate, and engage with professionals in a wide range of transportation fields. We hope to see you there!

To register for the event and to learn more about the venue, program, or how to become a sponsor, please visit the [Conference website](https://transet.lsu.edu/2020-conference/).

### Recording of Webinar on Impacts of COVID-19 on Transportation Now Available

The recording of Tran-SET’s Joint Webinar Series on “Impacts of COVID-19 on Transportation and Logistics” is now available online! In this Webinar, Laura Perrotta (American Highway Users Alliance), Brandon Orr (Stantec), and Herby Lissade (Caltrans, Haiti Engineering INC.) discussed how the transportation industry and its policies have adapted to the pandemic so far, as well as the main impacts of COVID-19 on the future of transportation and freight movement.

We invite you to view the recording of the webinar on Tran-SET’s [**website**](https://transet.lsu.edu/) or directly on [**Tran-SET’s YouTube page**](https://www.youtube.com/channel/UCorlSokLmYj4KAWSKEySlLg).

### Upcoming Joint Tran-SET Webinar

Our upcoming webinar in the Joint Tran-SET Webinar Series will be held on June 10th, 2020 on "Future Impacts of Connected and Automated Vehicle (CAV) Applications: Truck Platooning.". In this Webinar, Dr. Hany Hassan (Louisiana State University), Dr. Samer Dessouky (University of Texas at San Antonio), and Dr. Sabya Mishra (University of Memphis) will discuss the impacts of truck platooning on highway infrastructure, the role of platooning on vehicle electrification, and pros and cons of the adoption of highly automated vehicles as well as its anticipated implementation barriers and concerns.

We invite you to view the recording of the webinar on Tran-SET’s [**website**](https://transet.lsu.edu/) or directly on [**Tran-SET’s YouTube page**](https://www.youtube.com/channel/UCorlSokLmYj4KAWSKEySlLg).

### First Non-Proprietary Ultra-High Performance Concrete Overlay Implementation in the U.S.

Dr. [Craig Newtson](https://www.linkedin.com/in/ACoAAA_MAqUBd7YBLYgDOIgJb1LGkKDUESUHm8g/) is leading Tran-SET project 19CNMS01 in which the bridge off Exit 150 in Socorro, New Mexico will be overlaid with a non-proprietary ultra-high performance concrete (UHPC). This will be the first non-proprietary UHPC overlay constructed in the U.S. NMDOT has let the project and a contractor has been selected as well as the subcontractor that will actually perform the overlay work.

### Human Interaction with Automated Vehicles (AVs) using Virtual Reality (VR)

Autonomous vehicles are a promising solution to most of today’s transportation challenges, like efficiency, safety, equity and environmental impacts. Nevertheless, there will be a transition period in which both AVs and human-driven vehicles share the road, which means there is a need to study interaction between both. Dr. Nick Ferenchak, from the University of New Mexico, is leading a project that implements VR as a tool of interaction between AVs and humans. The bicycle and driving virtual reality simulators are now up and running. Stay tuned for interesting results!

## Educational and Workforce Development

Tran-SET has a firm initiative to advance the transportation workforce and to develop its next generation of leaders by: (1) attracting and supporting diverse, promising individuals to the transportation field through internships/research assistantships, (2) providing experiences through education and cutting-edge research to more properly prepare these individuals as they enter the workforce, and (3) incorporating and disseminating knowledge generated from sponsored research into educational and training products/activities.

Please see below a showcase of select, educational and workforce development activities sponsored by or involving Tran-SET.

### Tran-SET Transportation Veteran Scholarship

As a part of Tran-SET’s initiative to advance the transportation workforce and to develop its next generation of leaders, Tran-SET recently offered a scholarship to two veterans over a period of two years. One student has been acceptedand is currently working on Tran-SET-funded research projects. Please visit our [website](https://transet.lsu.edu/veteran-scholarship/) for further detail on the Internship and its activities.

### LSU High School Student Research (HSSR) Intern Program

Drs. Momen Mousa, Husam Sadek, Hai Lin and Yongcheol Lee (PIs) are participating in the LSU High School Student Research (HSSR) Intern program organized by LSU to involve 4 high school students to their Tran-SET research projects this summer. Due to COVID 19, all the meetings are online and the program might be extended through Fall 2020 if needed.

### U.S Road Assessment Program

Dr. Mousa (Tran-SET Program Manager) discussed with Laura Perrotta (President and CEO) possible future collaboration opportunities with the American Highway Users Alliance in May 2020. Tran-SET was also introduced to their sister foundation organization the Roadway Safety Foundation (RSF). As a part of this collaboration, RSF offered Tran-SET free online training to their U.S. ROAD ASSESSMENT PROGRAM (usRAP). The usRAP offers highway engineers, safety planners, and transportation officials unique and user-friendly tools for evaluating the safety of their road networks and directing limited resources for improvements to the areas where they will have the most impact. Future collaboration will also include Joint webinars, Tran-SET researchers participating in RSF’s regular broadcasts, site visits, etc. Please stay up-to-date with these activities by following us on [**LinkedIn**](https://www.linkedin.com/company/tran-set/) and [**Twitter**](https://twitter.com/utclsu), visiting our [**website**](https://transet.lsu.edu/), and [**subscribing to our mailing list**](https://transet.lsu.edu/subscribe/)!

### 2020 Create@State symposium

Five students from Dr. Zahid’s (Tran-SET PI) research team presented their research findings in the 2020 Create@State symposium held on April 22-24, 2020 in Jonesboro, Arkansas. The students virtually presented their posters and made oral presentations (via voice thread).  One of his five students received the first place prize in the graduate category of the College of Engineering and Computer Science.