



Center for Safety Equity in Transportation

If you have a right to get there, you have a right to get there safely.

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## Semi-Annual Progress Report for University Transportation Centers

**Submitted to:** Office of the Assistant Secretary for Research and Technology  
U.S. Department of Transportation  
1200 New Jersey Avenue, SE  
Washington, DC 20590

**Project Title:** **Tier 1 University Transportation Center for Safety Equity in Transportation (CSET)**

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**Signature:**

Billy Connor  
CSET, Director

## Abbreviations

- AKDOT&PF – Alaska Department of Transportation and Public Facilities
- ANTHC – Alaska Native Tribal Health Consortium
- AUTC – Alaska University Transportation Center
- CSET – Center for Safety Equity in Transportation
- GIS – Geographic Information System
- ORCID – Open Researcher and Contributor ID
- PI – Principle Investigator
- PPPR – Program Progress Performance Report
- RiP – Research in Progress
- RITI – Rural, Isolated, Tribal, Indigenous
- UAF – University of Alaska Fairbanks
- UHM – University of Hawai'i Manoa
- UI – University of Idaho
- UW – University of Washington

## 1. Accomplishments

### **What are the major goals and objectives of the program?**

The goal of CSET is to develop context-sensitive transportation solutions that address the safety needs of RITI communities. The Center will develop safety approaches that are sensitive to heritage, traditional ways of knowing and learning, and the preservation of culture. The mission of the Center for Safety Equity in Transportation (CSET) is to provide everyone with fair and equitable access to a safe transportation system.

### **What was accomplished under these goals?**

During the past six months of the project:

- *Email list, website, and social media*

The official CSET email, [cset.utc@alaska.edu](mailto:cset.utc@alaska.edu), has been used to communicate with Executive and Advisory Board members as well as project PIs. A contact list is being maintained for the duration of the project. Center announcements are distributed through emails and social media posts to various audiences and stakeholders. Activities are posted to the website in a timely fashion.

- *Communication*

Zoom functionality for meetings and webinars will replace gotomeeting and gotowebinar once current subscriptions end. The access to Zoom is provided by the University of Alaska Fairbanks at no cost to the Center.

- *E-newsletters*

The Center distributed its ninth and tenth quarterly newsletters in May and August 2020. The newsletter is available under the *Publications* section of the website. <http://cset.uaf.edu/publications/>

- *Research projects*

Eighteen projects continued during this reporting period under three primary areas: knowledge gathering, outreach, and baseline data collection. Five reports were submitted to TRID during the reporting period. Ten new projects were approved from submissions to the year 4 request for proposals. The project information is posted on the CSET website, and logged in the RiP database. Annual project update meetings are held each summer, and quarterly reports are collected in a timely manner.

- *Training programs*

Training in dust management was provided to tribal representatives from the Lower Kuskowim River tribes in Bethel Alaska on March 3, 2020. There were about 50 people in attendance.

- *Active student internships*

None developed during this period.

- *Teacher training and curriculum development activities*  
None developed during this period.

- *Data collection tools developed*

- The University of Hawai'i Manoa CSET project, *Assessing the Transportation Adaptation Options to Sea Level Rise for Safety Enhancement in RITI Communities through a Structured Decision Making Framework*, completed 28 stakeholder interviews to collect data for the project.
- The CSET project at UAF, *Enabling Data-driven Transportation Safety Improvements in Rural Alaska*, completed development of a traffic counting application. The design effort was successful and the complete app is ready for field-testing in a rural setting. The app, UAF Traffic, was developed to obtain traffic counts for all types of conveyances in rural Alaska, as well as monitoring turning movements. The app was designed to work on an iPad or similar device. The final product supports non-traditional vehicles common in Alaska, allows data collection on up to five vehicles at a time, ease-of-use to support future STEM/STEAM education efforts, can handle 2-, 3-, and 4- way traffic intersections. The app is available for free download through the Apple Store. <https://apps.apple.com/us/app/uaf-traffic/id1477376858>

- *Sponsorship*

Nothing to report for this period.

### **How have the results been disseminated?**

CSET staff and researchers have been actively seeking out opportunities to interact with the public, stakeholders and the transportation community.

#### *Professional Meetings*

During this reporting period in-person meetings were canceled or turned into virtual meetings via online tools due to COVID-19. CSET representatives participated in the following professional events:

The research progress of the CSET project, *Extracting Rural Crash Injury and Fatality Patterns Due to Changing Climates in RITI Communities Based on Enhanced Data Analysis and Visualization Tools*, was reported during the Hawaii Traffic Records Coordinating Committee (TRCC) meeting on Tuesday, July 21, 9:00 a.m.-11:00 a.m., 2020. The traffic engineers at HDOT and local experts provided valuable comments to guide this research to maximize its practical values.

*Outreach* -Outreach activities have been impacted by COVID-19 restrictions on gatherings. The outreach activities that have taken place have occurred online via webinars and are reported elsewhere in this report.

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

We will follow the implementation plan to ensure that all the CSET’s funded research, education, and outreach activities move forward as scheduled.

- The Center website, social media presence, and emailing contact lists will be regularly updated and used to promote the Center and its activities.
- CSET’s eleventh and twelfth quarterly newsletters will be distributed during the months of November and February. The newsletters will highlight Center progress, such as projects starting/concluding, new calls for proposals, STIs, etc.
- Steps will be taken to continue bringing students on as research assistants.
- Steps will be taken to develop training programs, curriculum development activities, outreach, and sponsorship opportunities.
- Center researchers and staff will continue participation and involvement with seminars, workshops and conferences.
- Year 5 request for proposals will be reviewed and approved.
- Efforts to provide community training will be increased based on CSET research. Specifically, there are plans in place for conducting safety training and dust mitigation training for rural Alaska communities pending lifting of COVID-19 social distancing and travel restrictions. We will look at alternate means of training.

**2. Participants & Collaborating Organizations**

**What organizations have been involved as partners?**

- *Collaborative research and financial support*  
Newtok Village Council, Newtok Alaska, Alaska Native Tribal Health Consortium

Northern Arizona University Tribal Technical Environmental Program for efforts related to dust management training for Alaskan Villages.

- *Technology Transfer Expert Task Groups*  
CSET projects have established advisory groups for improving technology transfer from the project to interested stakeholders. Each project has met with members of the groups either individually or in a group during the period covered by this report.

**Have other collaborators or contacts been involved?**

Email correspondence has been exchanged during the reporting period to discuss research ideas and broad collaborations on research, education, workforce development, and outreach activities between CSET and various collaborators.

### 3. Outputs

#### **Publications, conference papers, presentations, websites, lectures, seminars, workshops, invited talks**

##### *Publications*

- *Journal Publications*

- Pu, Z., Liu, C., Shi, X., Cui, Z. and Wang, Y., 2020. Road surface friction prediction using long short-term memory neural network based on historical data. *Journal of Intelligent Transportation Systems*, pp.1-12.
- Pu Z, Ke R, Li Z, Wang Y\*. "Evaluating the Non-Linear Correlation between Vertical Curve Features and Crash Rates on Highways using Random Forests." *Journal of Transportation Engineering, Part A: Systems*. (<https://trid.trb.org/view/1439692>)

- *Reports*

- Ibrahim, Ahmed, Sharma, Sunil, Kassem, Emad, Nielsen, Richard, and Nasrin, Sabreena. *Operational Safety of Gravel Roads in Rural and Tribal Communities: Vulnerability to Structural Failures and Geo-Hazards*. CSET Project Reports, April 2020.
- Sorour, Sameh, Abdel-Rahim, Ahmed, Swoboda-Colberg, Skye and Hassan, Mohammed. *Transportation Equity for RITI Communities in Autonomous and Connected Vehicle Environment: Opportunities and Barriers*. CSET Project Report, August 2020.
- Abdel-Rahim, Ahmed, Swoboda-Colberg, Skye, Mohamed, Mohamed, and Gonzalez, Angel. *Documenting the Characteristics of Traffic Crashes for RITI Communities in Idaho*. CSET Project Report, July 2020.
- Prevedouros, Panos, Miah, M. Mintu, and Nathanail, Eftihia. *Effects of Reading Text While Driving: A Driving Simulator Study*. CSET Project Report, May 2020.
- Prevedouros P. D., with Flavia Medeiros and Rafaela Melo, *Study of Traffic Safety Equity Perceptions*, CSET Project Report, August 2020.
- Ban, Xuegang (Jeff), Abramson, Daniel, and Zhang, Yiran. *Drones for Improving Traffic Safety in RITI Communities in Washington State*. CSET Project Report, May 2020.

- *Conference papers*

- *Presentations*

- De Melo Barros, Rafaela, Panos D. Prevedouros, Eftichia Nathanail, PhD and Guohui Zhang, *Emergency Response and Other Traffic Safety Equity Perceptions in Hawaii*, ASCE ICTD 2020, Forthcoming in archival proceedings, Conference cancelled due to Covid-19, Seattle, WA, May 26-29, 2020.
- Chong, Braxton, Panos D. Prevedouros and Luana Carneiro Pereira, *Analysis of Speed Profiles of Near-Miss Events from On-Board Cameras in Taxicabs*, Paper 21-01590, 100th Annual Meeting of TRB, 2021.

- *Other Products*
  
- *Website Updates*
  - The CSET website is live at [cset.uaf.edu](http://cset.uaf.edu).
  - Year 4 project information is available on the website.
  - Events deemed noteworthy have a brief summary and photo displayed on the website.
  
- *Lectures/Seminars/Workshops/Invited Talks*
  - UAF in collaboration with the Institute of Tribal Environmental Professionals at the Northern Arizona University developed and presented the first 3 in a series of 4 webinars on dust management in tribal communities on May 28, June 18, and August 5, 2020. The webinars covered topics including assessment of current roads, improvements in road designs, creation of dust management plans and community engagement. The webinars were recorded and are available at [https://www7.nau.edu/itep/main/training/Webinars\\_air2020](https://www7.nau.edu/itep/main/training/Webinars_air2020).
  
- *New methodologies, technologies or techniques*
  - A project at the University of Hawai'i, *Extracting Rural Crash Injury and Fatality Patterns Due to Changing Climates in RITI Communities Based on Enhanced Data Analysis and Visualization Tools*, developed 3D rural crash data visualization modules to dynamically interpret and visualize the rural crash data. The project also developed a new Bayesian vector autoregression-based data analytics approach to enable mixed-frequency rural crash data interpretations with missing values and developed a finite mixture random parameters model to explore driver injury severity patterns in low-visibility-related crashes
  - Students at UAF, as part of the CSET project *Developing a Safe and Sustainable Transportation System in Mertarvik – Phase II CSET Outreach and Partnership with the Newtok Relocation Project*, developed templates and plans to produce 3D printed models of roads that include the various layers of materials that go into road construction in the arctic. The models also depict deformation that occurs in roads because of melting permafrost and other temperature related changes to the substrate. The team is currently working on developing handouts and informational cards to accompany the models as mass production of the basic models is just beginning. Materials were received to manufacture the boxes and the padding for the 3D models. However, the COVID19 restrictions continue to make it impossible to allow students access to the lab to work on them.
  - A CSET project at the University of Idaho, *Documenting the Characteristics of Traffic Crashes for RITI Communities in Idaho*, developed a new set of Geographic Information System (GIS) safety analysis tools. The GIS tools can be used by state DOTs to document crash data and prioritize safety improvement projects. The tools perform Network Screening, the first step in the Roadway Safety Management Process (RSMP) outlined in the Highway Safety Manual (HSM). The project conducted two case studies to demonstrate how the tools can be used. The first case study was for screening intersections. The analysis was conducted for all intersections on the Idaho State Highway System. In practice, the analysis would

likely be done for only a subset of intersections defined as a certain type, such as signalized intersections on urban arterials. The case study included all intersections for illustration purposes. The result was a ranking of intersections that would most likely benefit from safety improvement efforts. Three performance measures were used for ranking the intersections: Crash Frequency, Crash Rate, and Equivalent Cost. The second case study was for screening roadway segments. Again, the entire Idaho State Highway System was included for illustration. The HSM describes two key methods for segment network screening: Simple Ranking and Sliding Window. Both methods are available in the new tools. The case study demonstrates the advantage of the Sliding Window, which would be impractical to accomplish on a large scale without the assistance of a GIS tool.

- *Inventions, patents and/or licenses*
  - Four STL files for 3D printing of road models have been generated and are available for distribution on request. The 3D model work was presented at the 2019 PacTrans Conference by undergraduate research assistants Jordan Zellhuber and Monroe Morris.

#### 4. Outcomes

- *What outcomes has the program produced? How are the research outputs described in section 3 being used to create outcomes?*

The researchers involved in the CSET Project, Drones for Improving Traffic Safety of the RITI Communities in Washington State, aided the community of Westport, Washington in drafting the "Transportation, Circulation, and Telecommunication Element" (Chapter 5) for Westport Community Comprehensive Plan which is now pending approval by Westport's City Council. They also recommended drone application into the draft Comprehensive Plan Update: In Policy #15, p.28:"The City should review applicable regulations to allow use of drones for emergency preparedness and management, including as enhancements to situational awareness (e.g.detecting and reporting traffic conditions, condition of roads and bridges, people in need of assistance, and aids in finding and following optimal evacuation routes), delivery of emergency supplies, telecommunication, etc."

#### 5. Impact

- *What is the impact on the development of the principal discipline(s) of the program?*
- *Other Disciplines –*

CSET is a multidisciplinary Center, and will therefore have an impact in fields outside of the traditional areas of transportation research. In future reports, this section will serve to answer the following questions.
- *What is the impact on the development of transportation workforce development?*



- *What is the impact on safety in RITI communities?*

The researchers involved in the CSET Project, *Drones for Improving Traffic Safety of the RITI Communities in Washington State*, indicated that the adoption of the drone related language to the updated Comprehensive Plan of the Westport community (pending approval) will help improve safety of the residents during normal and emergency situations.

The CSET Project, Initial Assessment of Transportation Safety Equity for Hawaiians, part-Hawaiians and Pacific Islanders in RITI Communities, released a report Driver Testing and Distraction that was circulated widely in Hawaii's taxi industry, bus operators (tour and transit operators) and selected politicians. This was done in late February, about one week before the Covid-19 crisis started in the US. They plan to repeat this effort when attention returns to regular subjects as impact was limited as a result of the crisis.

- *What is the impact on physical, institutional, and information resources at the university or other partner institutions and communities?*
- *What is the impact on technology transfer?*
- *What is the impact on society beyond science and technology?*
- *In what ways have researchers and students who are part of or who focus on native or federally recognized tribes and communities been involved?*

CSET continues to work with tribes to reduce dust in their communities. The focus is moving from institutional controls to application of calcium chloride with minimal equipment.

## 6. Changes/Problems

- Impacts on the Center from COVID-19
  - The CSET project, *Development of Grass-Roots Data Collection Methods in RITI Communities*, reported that some of the planned data collection activities, originally scheduled for earlier this year, were affected by the COVID pandemic. Although this will not affect the final report submission timeframe, the impacts of this change in plan will be documented in the final report.
  - Multiple projects requested no-cost extensions due to COVID impacts. The reasons included lack of access to lab facilities due to campus closures, delays in the arrival of graduate students, and inability to conduct field work for data collection.
  - CSET year 4 projects have experienced start up delays due to contract processing issues due to COVID restrictions on campus.
  - The CSET project, *Developing a Data-Driven Safety Assessment Framework for RITI Communities in Washington State*, requested a no-cost extension because of the impact of COVID-19 on their collaborating partner, the Yakama Nation Department of Natural Resources (DNR) Engineering

department. During the report period, Yakama Nation experienced rebounds in COVID cases and wildfires, which had slowed down the scheduled work, but the team has managed to keep the overall research schedule on track.