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1. ACCOMPLISHMENTS

What are the major goals of the program?

The goal of the National Center for Sustainable Transportation is to meet the challenge of Preserving the Environment by transforming the transportation system to improve environmental sustainability nationwide. We aim to provide leadership that produces meaningful action and outcomes by mobilizing innovative and accomplished research teams, and partnering with influential leaders and stakeholder groups. To provide this leadership, we are building upon the early successes of the NCST by strengthening the existing programs and adding important new initiatives, including research in the critical areas of sustainable freight, new mobility, and environmental review. The well-established and highly influential transportation centers in our consortium have developed a self-supporting center that supports influential research and education programs fully integrated with an aggressive program of stakeholder engagement.

Specific actions NCST is taking to achieve our goals include:

- mobilizing a network of leading universities to generate new knowledge and tools that address environmental sustainability in transportation;
- designing and evaluating real-world strategies that contribute to the mitigation of environmental impacts of transportation and enhance system resiliency; and
- delivering knowledge and tools through an innovative engagement program to state departments of transportation, Metropolitan Planning Organization (MPOs), local governments, and other public and private sector stakeholders to support implementation of these real-world strategies.

During the reporting period, the major goals of the NCST were to:

- Convene the NCST Leadership Council and facilitate an engaging and productive meeting to review NCST’s accomplishments and discuss opportunities for growth and improvement.
- Release calls for proposals at each of the NCST’s partner institutions to select projects for NCST’s third year of funding under this USDOT grant.
- Hire a new Policy Director; a new online events and outreach specialist at ITS-Davis; and a new science writer/editor. These positions will help the NCST to produce more polished products and improve the Center’s research tech transfer capabilities.
- Support large outreach efforts organized by the NCST partner institutions in order to maximize efforts to disseminate NCST research findings.
- Continue to grow the NCST educational activities.

What was accomplished under these goals?

Administrative Accomplishments

As the NCST team continues to grow, the Center has been able to expand its programs and activities. Specific administrative accomplishments during the reporting period include:

NCST staff has ensured that publications, briefs, and other materials are in compliance with Section 508 and meet ADA accessibility requirements.

UC Davis issued its annual call for proposals (CFP) for federal- and Caltrans-funded research grants on January 30, 2019, with proposals due March 1st. The NCST made several changes this year to streamline the CFP process, including for converting a proposal to a Caltrans task order. These upgrades have already reduced the entire CFP timeline, through making award decisions, by at least two months. At the time of this report, funding decisions are being finalized, award announcements will be made in the next reporting period, and selected projects are expected to start in October 2019.
The University of Southern California (USC) held two CFPs during the reporting period. CFP 2a was issued on October 15, 2018, with proposals due on January 7, 2019. The goal of CFP 2a was to obligate the remaining USC funds from year 2 of the USDOT grant. CFP 3 was issued on February 15, 2019, with proposals due on March 15, 2019. Proposals from CFP 3 are currently under review, and projects will be selected for funding during the next reporting period.

From its June 2018 CFP, Georgia Tech awarded 2 NCST projects that started during the reporting period. In late October 2018, UC Riverside (UCR) issued a CFP to select additional projects to use available Caltrans funding. Of the proposals received, one addressing brake particulate matter was moved forward, and was subsequently forwarded to Caltrans for consideration. This proposal is still under review.

The NCST has been instrumental in re-building the University of Vermont (UVM) Transportation Research Center (TRC) after the end of UVM’s own national UTC and its move to the College of Engineering and Mathematical Sciences due to university budget structure. This center building has focused around sustainable transportation that complements the NCST theme. Growth has included new courses, increased national visibility of workforce development programs, a new TRC structure, renewal of the external advisors, and hiring of two new faculty. In the coming year, UVM TRC will move to be proximate to its new College and the graduate student offices will be integrated into interdisciplinary hubs with transportation students.

Research Accomplishments

NCST research accomplishments during the reporting period reflect the completion of several projects, as well as the launch of many new projects. More information on research findings and results can be found in Sections 4 (Outcomes) and 5 (Impacts).

UC Davis launched 24 new applied research projects, seed grants, and white paper projects during the reporting period, over half of which are funded by Caltrans. Three UC Davis projects ended during the reporting period and final reports for these are expected during the next reporting period.

A new project at USC, titled, “Congestion Reduction Through Efficient Container Movement under Stochastic Demand”, was started in February 2019 with $100,000 in match funding from Caltrans. Additionally, two new projects were selected for funding from USC’s CFP 2a: “Failing Malls: Optimizing Opportunities for Housing”, and “Robust Design, Analysis and Evaluation of Variable Speed Limit Control in a Connected Environment with Uncertainties”.

UC Riverside launched one new project during the reporting period, “Integrating Zero Emission Vehicles into the Caltrans Fleet”, and completed two projects during the reporting period: “Deep Learning-based Eco-driving System for Battery Electric Vehicles” (final report in review); and “Renewable Natural Gas (RNG) Technology Demonstration Phase 2” (final report in review).

One UVM project started during the reporting period: “Quantifying Real-World Hybrid Electric Vehicle Energy-Emissions Relationships for Improved Modeling of Hot-Spots in Future Electrified Vehicle Fleets.”

Education and Workforce Development Accomplishments

With the addition of an Assistant Program Manager to the NCST team, the Center was able to expand the education-related activities. Specific accomplishments during the reporting period include:

UC Davis hosted Laguna Creek High School Green Energy Technology Academy students to provide an overview of ITS-Davis, tour electric vehicles and charging stations, and engage in small group discussions with NCST researchers, faculty, staff and grad students. Students had the opportunity to discuss and explore potential future opportunities in research and educational paths.

During the reporting period, UC Davis awarded two dissertation grants in Fall 2018, and released its call for applications for Spring 2019 dissertation grants. Three dissertation grants awarded at Georgia Tech started
during the reporting period. An additional CFP was released in March 2019 for dissertation grants; 7 proposals were received and 3 are expected to be awarded.

NCST kicked-off its new video lecture series titled, “Sustainable Transportation Concepts: A Mini-Lecture Series”, which aims to supplement college-level courses with sustainable transportation-related material. UC Davis also continued to host weekly seminars, available in-person and online for UC Davis students and those of other partner institutions. During the reporting period, NCST supported 12 seminars.¹

UC Davis and UVM staff and researchers met February 26th to discuss opportunities for a K-12 curriculum collaboration, potential funding, and potential partners. NCST researchers Dahlia Garas and Beth Ferguson have identified schools who are interested in utilizing sustainable transportation related to K-12 curriculum. UVM’s Dr. Lisa Aultman-Hall submitted two K-5 curriculum proposals for cost-share funding; neither were successful.

METRANS² partners with the Southern California Regional Transit Training Consortium (SCRTTC). SCRTTC provided in-kind support to NCST for curriculum development and programmatic support for one class, EV Transit Bus High Voltage Safety Awareness, prior to the current reporting period. The class was held once during the reporting period (via other funding sources) at Monterey-Salinas Transit. Six students registered and 88 student training hours were completed.

METRANS held a field trip on October 20, 2018, for students, faculty and staff to visit Foothill Transit, a public transit agency funded by 22 member cities in greater Los Angeles, California. Field trip activities include an electric bus demonstration.

California State University, Long Beach (LBSU) is undertaking a transit technology workforce development white paper, the goals of which are to (1) identify the technology transfer gaps in environmental technology facing the transit industry; and (2) suggest training strategies to help bridge these gaps. LBSU has developed a series of questions that will help identify these tech transfer gaps in environmental technology facing the transit industry. The survey includes both quantitative and qualitative questions, such as the size of the company and how workforce development needs are met at the company. The survey will be deployed to transit operators and education service providers. After identifying the technology transfer gaps, the LBSU research team will focus on developing strategies for bridging the gaps and provide a discussion of possible educational delivery methods.

On October 3, 2018, the UC Riverside College of Engineering – Center for Environmental Research and Technology (CE-CERT) co-hosted the 8th Annual Science and Technology Education Partnership (STEP) Conference, which was partially sponsored with NCST funds. During this event, several hundred high school students from Riverside Unified School District visited CE-CERT to tour the labs, discuss transportation research with CE-CERT graduate students, and participate in hands-on research activities. This event is intended to spark an interest in STEM careers, with an emphasis in transportation.

Figure 1. Students from the Riverside Unified School District visiting the UCR CE-CERT labs and discussing transportation research with graduate students.

¹ https://its.ucdavis.edu/news-and-events/its-seminars/
² USC and California State University, Long Beach together make up the METRANS Transportation Center, housed at USC.
Engagement and Outreach Accomplishments

Additional engagement and outreach accomplishments are listed in the next section, “How have the results been disseminated?”

NCST convened its Leadership Council in March 2019 in Davis, California, and took a new, more engaging approach to the meeting. Rather than the typical board room style meeting, NCST utilized group work, some pre-meeting assignments, and a diverse group of stakeholders, faculty, researchers, students, and staff, to identify areas where NCST excels and areas where the Center could further grow. Some key take-aways and action items from the meeting: 1) focus NCST efforts on producing strong policy briefs, research briefs, and implications from research; 2) Begin with the end in mind: what more can NCST do to be connected with stakeholders at the outset of research; 3) provide training and guidance for researchers on how to conduct policy-relevant research; 4) prioritize research on transportation funding issues and housing issues; and 5) formalize a NCST Communication Plan so that we can apply the right strategies for engagement at a national level.

![Figure 2. Attendees of the 2019 NCST Leadership Council meeting, including Council members, NCST Directors, Associate Directors, faculty, researcher, students and staff.](image)

NCST staff helped to launch ITS-Davis’s new webinar series, GreenLight Webinars, which will serve as the home for NCST’s future webinars. ITS-Davis’s new online events and outreach specialist has been instrumental in coordinating and facilitating engaging webinars on sustainable transportation topics.

The production of policy and research briefs has scaled up significantly during the reporting period, with five briefs being finalized during the review period and over a dozen in the process of review and revision. The new science writer/editor at ITS-Davis has contributed significantly to the production of briefs that are accessible and understandable by NCST’s target audiences and stakeholders.

USC held its inaugural “Emerging Scholars Transportation Research Symposium” on March 29, 2019. Student presenters represented four different universities, including NCST-partners USC and UC Davis. Justine Johnson of Ford Smart Mobility delivered the closing address.

UCR CE-CERT sponsored a Clean Air Day Open House targeted for all ages from the community in October 2018. This annual engagement event (partially sponsored with NCST funds) consists of showcasing CE-CERT’s research laboratories, which were open for tours and where graduate students interacted with members of the Riverside community with hands-on research activities. Displays were transportation/air quality themed, and the evening featured 30-minute talks from two of the three 2018 UCR NCST grantees.
How have the results been disseminated?

NCST findings and results were disseminated through engagement activities, including briefings, meetings, seminars, webinars, conferences, and other events; professional development workshops, publications and policy/research briefs, and through online outreach, such as via social media, the NCST website, and newsletters.

NCST organized a briefing in the Dirksen Senate office building in January around the Annual Meeting of the Transportation Research Board, where NCST researchers Dr. Alan Jenn (UC Davis) and Dr. Carol Vallett (UVM) presented on their research on the effectiveness of electric vehicle incentives and state DOT workforce and knowledge transfer activities, respectively. The audience was around 40 people, primarily Congressional staff.

NCST Policy Director, Colin Murphy, organized and/or participated in 16 meetings with Congressional staff in January around the Annual Meeting of the TRB, at which they presented an overview of current NCST research and discussed ongoing research and policy needs. There have also been more than 15 meetings with State legislative staff in Sacramento, for the same purpose.

UVM TRC faculty, staff and students were also active at the Annual Meeting of the TRB in January 2019. Glenn McRae co-organized and co-hosted the National Transportation Training Directors Annual Conference; supported NTTD’s revival as an active network. In addition to NCST reports the UVM TRC published 3 technical reports in the reporting period. UVM completely updated our TRC website in this phase.

NCST Policy Director, Colin Murphy, organized and co-presented with NCST researchers three briefings in the California State Capitol on key topics in transportation, titled “Transportation Fundamentals”: Electric Vehicles, the Low Carbon Fuel Standard, and Sustainable Freight. The briefings are aimed at an audience with a limited exposure to the specific topic and its relevant policy, and are intended to help inform policymakers about key issues in transportation.

UC Davis NCST researchers participated in and presented at the joint workshop on the prospects for global truck electrification and automation, and the resulting energy impacts. The workshop was co-hosted by the Columbia University Center on Global Energy Policy and UC Davis, and was held in New York City on February 19, 2019. Attendees of the workshop consisted of experts on these topics and included representatives from think tanks, academia, government, truck manufacturers, autonomous delivery services, oil companies, consultants and NGOs. The workshop discussed medium duty/urban delivery trucks, heavy duty/long-haul trucks, buses, and a deep dive on China. It covered the pace and timing of electrification and automation and the use of alternative fuels for heavy-duty trucks. It also covered the potential for new freight delivery models, and on scenarios for how energy demand would be impacted by these trends.

Dr. Susan Handy and Dr. Alissa Kendall participated in a workgroup meeting with the California Air Resources Board (CARB) on “Methods to Estimate Emission Reductions from Bicycle and Pedestrian Facility Projects”, a NCST cost-share project funded by CARB. Dr. Handy and Dr. Kendall presented research findings on potential updates to existing CARB methods and proposed new methods that rely on active transportation count data.
What do you plan to do during the next reporting period to accomplish the goals?

Administrative Plans & Goals

NCST has been working on developing a new website using a new platform and server at UC Davis. This redesign has worked to take all users of the NCST website into consideration to improve the functionality and searchability of the site, the presentation of information, and the accessibility of results and tools for stakeholders to use. The redevelopment will also add the capability to survey those who download NCST reports, white papers, and potential policy/research briefs regarding the reason they accessed the product, their use of the product, and the product’s impact and usefulness, among other questions. This will help NCST to measure the impact of its research. NCST plans to complete the site development and migration in the next reporting period, and launch the new site.

UC Davis and USC will select projects for funding under their year 3 CFPs. Georgia Tech and UVM will both issue a new CFP to obligate their respective year 3 funding. UC Davis will lead the processing of new Caltrans task orders for UC Davis, USC, and UCR project selected for Caltrans funding.

UVM TRC is actively writing proposal for external grant funding and when possible tries to include these projects as NCST cost share.

Research Plans & Goals

All NCST partners will continue work on ongoing projects, and expects to close out approximately a dozen research projects, seed grants, and white papers during the next reporting period.

UVM will fund at least two new graduate students, work on publications for journals from closed NCST projects, and support progress on three active projects.

Georgia Tech has a collaboration with Argonne National Labs planned for a MOVES-Matrix demonstration, specifically on the supercomputing time for MOVES-Matrix Demo.

Education and Workforce Development Plans & Goals

NCST will continue ongoing educational activities and programs, including participating in the UC COSMOS program, awarding dissertation and graduate research project grants, the annual UC Davis undergraduate summer research fellowship program, and the graduate student exchange program. We will continue to host K-12 students to facilitate the exploration of future transportation-related educational and career paths.

NCST will release the first video lecture in the Sustainable Transportation Concepts: A Mini-Lecture Series. The first lecture features NCST Director, Dr. Susan Handy, and discusses the importance of accessibility and mobility, the differences between the two concepts, and the mobility-accessibility relationship.

The class developed by SCRTTC, EV Transit Bus High Voltage Safety Awareness, will continue to be held periodically moving forward.

UCR will host its 9th Science and Technology Education Partnership (STEP) Conference in October 2019. This event provides opportunity to high school students to tour CE-CERT labs, perform hands-on experiments, and engage with graduate students in an effort to stimulate their interest in STEM careers.

Engagement and Outreach Plans & Goals

NCST is planning a number of strategies, activities and events in the next year related to advancing research, disseminating results, and providing outreach to the community.

Based on feedback and direction received from the Leadership Council, NCST will develop and formalize a Communication Plan, using the Tech Transfer Plan as a foundation.
NCST will also work to update and improve the process for producing briefs based on NCST research. The Leadership Council indicated a desire to produce both research and policy briefs, depending on the subject and status of the research being discussed. NCST will likely take a lead role at ITS-Davis in updating procedures for writing, formatting and disseminating brief summaries of research, and help to develop a more focused and effective process for developing and disseminating briefs.

To disseminate results more widely, UC Riverside is also launching a new website (including a new NCST section) by June 2019. These webpages will feature all activities, products, and media associated with NCST. UC Riverside will also be increasing its social media presence with regard to current research. UCR is also developing a new transportation webinar/seminar series, expected to launch in the next reporting period. The series will feature both UC Riverside and guest speakers.

UC Davis’s Grant Matson will represent NCST at the 2019 UTC Spotlight Conference in May in Washington, DC, and will present a poster on NCST research on “Attitudinal and Lifestyle Factors Affecting AV Adoption Propensity: Insights from the California Panel Study of Emerging Transportation Trends.”

UC Davis will continue its new GreenLight Webinar series, with two NCST webinars already planned during the next reporting period: “Incorporating Long-distance Travel into Transportation Planning in the United States”, with Dr. Lisa Aultman-Hall on April 24th; and “A New Tool to Calculate Induced Travel”, with Dr. Jamey Volker and Dr. Susan Handy on May 23rd.

LBSU will produce brief videos to accompany the freight-related environmental policy evaluation done in the case studies portion of the same project in order to reach a wider audience.

NCST continue to seek additional opportunities for in-person engagement with critical stakeholders. There is interest in developing a briefing series on current research topics, in partnership with Caltrans. This could be a model for future work with stakeholders at the Federal level or in other states.

UC Davis will organize Asilomar 2019, its 17th Biennial Conference on Transportation and Energy, focusing this year on “Big Ideas, Big Solutions: Future of Mobility.” NCST researchers will participate and contribute to the conference’s opportunity to confer and collaborate on the business and policy models needed to address the transportations of electrification, automation, and sharing, and direct them toward the public interest.

METRANS will organize the International Urban Freight Conference in October 2019. NCST funded research will be showcased in a panel session. Planning, including identification of papers and speakers, is underway and will be finalized during the summer of 2019.

UC Riverside will host its Dynamic Mobility Monitoring Systems Workshop (DyMMS) on April 18, 2019. During this event, stakeholders from academia, industry, and regulatory agencies will learn about novel approaches to reduce vehicle emissions and/or increase fuel efficiency in specific areas based upon the concept of “geofencing.” It is expected that over 50 critical stakeholders will participate.

UCR’s Renewable Natural Gas Symposium will take place in September 2019. This symposium will provide attendees with multi-faceted discussions on the current state of RNG technology and policy; the challenges in technology adoption from the lab to the marketplace; and the potential solutions. The significant benefits of RNG and the important role it can play in mitigating greenhouse gas emissions and increasing renewable energy use, including in transportation, will also be addressed.

UCR will facilitate the second session of the Air Quality and Climate Change Training Program (ACT) in October 2019: “Collecting Real-World Emissions Using Portable Emissions Measurement Systems (PEMS)”. This certification course will introduce participants to the fundamentals of emissions measurements, the capabilities of PEMS equipment, the theory of calculations and corrections, and current global emissions standards. Participants will then apply that knowledge to an actual field study in a laboratory environment. The first session of this course was successfully launched in July 2018.
2. PARTICIPANTS & COLLABORATING ORGANIZATIONS

What organizations have been involved as partners?

During the reporting period, NCST has engaged a number of partners, many of which are at the project level, such as working with our sponsors and affiliates.

AVL, Inc.: AVL has provided over $1M in new instrumentation to UCR’s emissions and fuels research laboratory. CE-CERT is providing space for AVL engineers to interact with our research staff. AVL is based in Graz, Austria.

California Air Resources Board: CARB provides match funding for the NCST through three large research projects at UC Davis. CARB is located in Sacramento, California.

California Department of Transportation: Caltrans continues to provide match project funding for NCST projects. 19 new Caltrans-funded projects started during the reporting period. Partner’s contribution: Financial support.

California Governor’s Office of Planning and Research: OPR worked with NCST researchers on the development of the Induced Travel Calculator.

City of Atlanta: The City of Atlanta, Georgia, provides financial support for Georgia Tech.

Georgia State Road and Tollway Authority (SRTA): Georgia SRTA provides financial support for Georgia Tech in the form of matching funds.

Horiba, Inc.: Horiba is providing in-kind support in terms of instrumentation and Horiba staff time; UCR and Horiba are working together on new instrumentation for vehicle measurements (emissions, energy, activity), data management strategies, and dynamic geofencing techniques; and Horiba is planning on sending a rotating staff member to CE-CERT on an annual basis, starting in April 2019. Horiba is based in Kyoto Japan with offices in Irvine and Ann Arbor.

South Coast Air Quality Management District: SCAQMD funds three major research projects at UC Riverside and USC as match projects for NCST. The organization is located in Diamond Bar, California, and has the goal of cleaning the air and protecting the health of all district residents through practical and innovative strategies.

Southern California Regional Transit Training Consortium: SCRTTC developed a class under NCST titled “EV Transit Bus High Voltage Safety Awareness”. The class was developed with NCST funding prior to the current reporting period, but it was held once during the reporting period and will continue to be held periodically moving forward via other funding sources. Partner’s contribution to the project: Collaborative research.

Tokyo Institute of Technology: Tokyo Institute of Technology is carrying out research in transportation and air quality which is closely aligned with the research being conducted at UCR CE-CERT. UCR has had technical exchange through visits from their researchers and a visit to Tokyo, as well as meetings at conferences. This research is on transportation air quality, overlapping with UCR’s NCST research program. Tokyo Institute of Technology is planning on sending a visiting researcher starting in April 2019. Tokyo Institute of Technology is based in Tokyo, Japan.

Toyota: Toyota-ITC is carrying out research in connected and automated vehicles which is closely aligned with the research being conducted at UCR CE-CERT. UCR now has a joint research project with Toyota looking at new strategies for connected and automated vehicle applications, which overlaps with UCR’s NCST research program. UCR also has monthly in-person meetings with Toyota. Toyota is based in Palo Alto, California.

Waseda University: Waseda University has a new Vehicle Technology Research unit which is closely aligned with the research being conducted at UCR CE-CERT. UCR has had technical exchange through visits from Waseda researchers and a visit to Tokyo in October 2018. This research is on a variety of vehicle technology that overlaps with the NCST research program. UCR and Waseda University have had several visits back and forth, consisting of seminars, discussions, and exchanging ideas. Waseda University is based in Tokyo, Japan.
Have other collaborators or contacts been involved?

NCST affiliates are members, co-chairs and chairs of numerous TRB Committees, as well as serve on advisory panels, NCHRP project panels, organizing committees for conferences and events organized by other entities, and others.

UC Davis hosted representatives from the Forum of European Highway Research Laboratories (FEHRL) on their U.S. Scanning Tour, on October 10, 2018. NCST researchers presented on current research and recent findings, and the meeting attendees discussed research needs and transportation challenges for both Europe and the U.S.

Stakeholders from the UC Davis Policy Institute for Energy, Environment, and the Economy have regularly collaborated with NCST staff in the development of communications and outreach efforts. Policy Institute staff, researchers and fellows have collaborated on brief writing and editing, and may play a larger and more formal role in a redesigned department-wide brief production process.

Dr. John Harvey, NCST researcher and Director of the University of California Pavement Research Center, is serving as a co-chair of the 6th International Conference on Accelerated Pavement Testing, organized by the French institute of science and technology for transportation, development and networks (IFSTTAR), in Nantes, France, on September 21-23, 2020.

UC Davis has continued its relationship with Laguna Creek High School’s Green Energy Technology Academy. UC Davis continues to host Laguna Creek High School’s Green Energy Technology Academy (GETA) students to conduct tours and engage in small group discussions with NCST researchers, faculty, staff and graduate students. During these visits, students have the opportunity to discuss and explore potential future opportunities in research and educational paths. During this current reporting period, NCST researcher Dahlia Garas was invited to join the GETA Advisory Committee. She attended her first advisory committee meeting and received positive feedback. The GETA has expressed their gratitude and hopes for continued collaboration with ITS-Davis.

UC Davis, UVM, and USC are members of the Joint Clean Climate Transport Research Partnership (JCCTRP). JCCTRP is a new interdisciplinary and transdisciplinary research partnership focusing on issues related to transport and climate policy in Quebec, California, Ontario and Vermont. The ultimate goal of the JCCTRP is to identify technical, economic and political factors shaping the potential for environmentally effective, economically efficient, and politically viable low-carbon transport and climate mitigation policy, and understand their implications for emissions trading. A Joint Workshop of the JCCTRP and the California Climate Policy Modeling Forum was held at ITS-Davis on February 27 and 28, 2019.

Georgia Tech collaborates with MOVES model users, i.e., those users that Georgia Tech is currently working with and anyone else who wants to use the tools. NCST researchers at Georgia Tech also work with other non-NCST research teams on grant applications, as well as with other UTCs that Georgia Tech participates in, such as STRIDE (led by the University of Florida), particularly on communications and conference planning/participation.

UC Riverside’s Dr. Matthew Barth continues to participate on the organizing committee for the multi-campus undergraduate course, “Bending the Curve: Climate Change Solutions”, coordinated by the University of California Office of the President. The course follows the interdisciplinary nature of the UC’s report “Bending the Curve: Ten scalable solutions for carbon neutrality and climate stability”, and aims to attract students from various academic backgrounds and fields of study to have them work together in identifying and exploring solution-focused projects. The course is framed around the report’s 10 scalable solutions and features video lectures from top UC experts on each topic.
3. OUTPUTS

Publications, conference papers, and presentations

Journal publications


Books or other non-periodical, one-time publications


Aultman-Hall, Lisa, and Hannah Ullman. Long-Distance and Intercity Travel: Who participates in Global Mobility?. In Mapping the Travel Behavior Genome, Konstadinos Goulias Editor, in press with Elsevier.

Other publications, conference papers and presentations

Conference Papers


Presentations


Other Publications


Website(s) or other Internet site(s)

The NCST website (www.ncst.ucdavis.edu) is the main site for information on programs, projects, and activities.

NCST social media accounts are used to disseminate recent research results, events, activities, and other news: Twitter (www.twitter.com/ncst_research) and LinkedIn (www.linkedin.com/company/national-center-for-sustainable-transportation).

ITS-Davis website and social media accounts are also used to help disseminate NCST research and promote NCST activities and news: website (www.its.ucdavis.edu); Facebook (www.facebook.com/ITSUCDavis/); Twitter (www.twitter.com/its_udavis); and YouTube (www.youtube.com/channel/UCGncBZ4CE94jmeSk1aiKZw).

eScholarship: All NCST final reports, white papers, and policy/research briefs are deposited to the University of California’s repository: www.escholarship.org/uc/itsdavis_ncst
METRANS website: The METRANS website ([www.metrans.org](http://www.metrans.org)) is a central portal for information on METRANS and CITT’s programs including NCST. All research reports generated by METRANS related faculty using NCST funding are available at metrans.org.

METRANS News: METRANS News ([www.metrans.org/newsletters](http://www.metrans.org/newsletters)) is generally published three times a year and summarizes METRANS research, education and outreach, including coverage of NCST projects and activities. It is distributed to university transportation centers and faculty throughout the U.S., to federal, state, and local public agencies, and to the transportation industry.

UC Riverside CE-CERT maintains several social media accounts used to help disseminate results: LinkedIn ([www.linkedin.com/school/college-of-engineering-center-for-environmental-research-and-technology](http://www.linkedin.com/school/college-of-engineering-center-for-environmental-research-and-technology)); YouTube ([www.youtube.com/channel/UCH-39JCcjNIKNu6VT5yw6Q](http://www.youtube.com/channel/UCH-39JCcjNIKNu6VT5yw6Q)); Instagram ([www.instagram.com/ucrcecert](http://www.instagram.com/ucrcecert)); and Twitter ([www.twitter.com/ucrcecert](http://www.twitter.com/ucrcecert)).

UVM TRC website: UVM maintains a NCST webpage on its Transportation Research Center website ([www.uvm.edu/cems/trc/national-center-sustainable-transportation](http://www.uvm.edu/cems/trc/national-center-sustainable-transportation)).

Georgia Tech Center for Transportation Research website: Georgia Tech also disseminates its NCST research and findings through its Center for Transportation Research website ([www.transportation.ce.gatech.edu/node/78](http://www.transportation.ce.gatech.edu/node/78)).

Technologies or techniques

The Georgia Tech project, “A Framework for Optimizing Public Transit Bus Fleet Conversion to Alternative Fuels”, with Dr. Haobing Liu, Dr. Michael O. Rodgers, and Hanyan (Ann) Li, resulted in the development of machine-learning models for predicting transit energy consumption, which are readily applicable for other agencies’ use.

Inventions, patent applications, and/or licenses

Nothing to report.

Other products


Jenn, Alan. TTP 289A-001, Energy and Transportation Modeling for Policy Analysis. This course is a track course in the Vehicles and Fuels track of the UC Davis 2018 Transportation Technology & Policy (TTP) degree requirements. The course familiarizes students with building energy models for policy analysis, with an emphasis on the transportation sector.

Pike, Susan. TTP 289A-002, Travel Behavior Theories and Applications. This course is a track course in the Demand and Behavior track of the UC Davis 2018 TTP degree requirements. This course examines theories of behavior and their application to understanding travel behavior, focusing on policy applications.


Sullivan, James; Sentoff, Karen (2019), Identifying Roadway Physical Characteristics that Contribute to Emissions Differences between Hybrid and Conventional Vehicles, DataONE Dash, Dataset, https://doi.org/10.15146/R36975

Wu, Guoyuan et al. (2019), Deep Learning-based Eco-driving System for Battery Electric Vehicles, UC Riverside Dash, Dataset, https://doi.org/10.6086/D1FW9G


**Research Outputs Goals, Performance Measures, and Targets**

The annual period for these targets is October 1 – September 30. This semi-annual progress report aims to report at 50% or more of the annual targets.

**NCST Output Goal #1: Produce Research-based publications for general audiences.**

**Number of white papers:** 0 [Target: 3 per year]. However, three white papers are expected to be completed in the next reporting period.

**Number of policy briefs:** 1 [Target: 4 per year]. One under this grant; however, NCST produced four policy briefs for projects funded by the Center’s prior USDOT grant, and expects to publish 10 or more policy briefs during the next reporting period.

**Number of blog posts:** 6 [Target: 4 per year] in Forbes, Vox, The Hill, Issues in Science and Technology, and Planetizen.

**NCST Output Goal #2: Disseminate research products through high-quality outreach activities, such as briefings and webinars, for appropriate audiences.**

**Number of dissemination activities hosted or sponsored:** 27 [Target: 28 per year]
4. OUTCOMES

At the December 4, 2018, joint California Transportation Commission and California Air Resources Board meeting, which focused on the success and progress of Senate Bill 375, the Sustainable Communities Act, CARB provided an overview of the November 2018 report requested by the Legislature (Senate Bill 150) on the progress of SB 375. At the meeting, UC Davis research was cited numerous times, including Dr. Susan Handy’s explanation of induced travel, Dr. Handy’s briefs on SB 375 (https://arb.ca.gov/cc/sb375/policies/policies.htm), and NCST findings that point towards the transportation financing system not being aligned with California’s state climate goals.

During the reporting period, Dr. Susan Handy and Dr. Jamey Volker produced a new tool, the Induced Travel Calculator, for the California Governor’s Office of Planning and Research (OPR) to help estimate how much vehicle miles travel a freeway or highway expansion will produce. Dr. Susan Handy and Dr. Marlon Boarnet (USC)’s NCST research on induced travel was cited in the OPR’s Technical Advisory document on Evaluating Transportation Impacts in CEQA (December 2018), along with the Induced Travel Calculator.  

Dr. Alan Jenn’s research, “Investigating the Use of Electric Vehicles in New Mobility Services,” helped to inform the shaping of Senate Bill 1014, California Clean Miles Standard and Incentive Program: zero-emission vehicles. Dr. Jenn has also provided guidance to CARB for implementation of the same regulation.

Automobile OEMs are using the results from several UCR NCST projects in developing new technologies for their vehicles.

Motivated by Auburn University Associate Professor Dr. Jeffrey LaMondia’s visit, NCST-funded undergraduate researcher Anuar Onayev created a new algorithm to estimate air travel time and cost between origins and destinations so that long-distance mode choice models could be estimated. The inability to estimate mode choice models between air and surface highway modes for intercity travel has been a long-standing challenge in demand modeling. Dr. LaMondia and Dr. Lisa Aultman-Hall also jointly gave a seminar at the University of Connecticut on October 15, 2018, titled, “Completing the Regional, National and Global Transportation Planning Picture by Capturing Long Distance Travel Patterns.” As a result of his visit to Vermont, Dr. LaMondia was appointed to the UVM TRC external advisors group, filling a key gap in academic representation. There are two papers in preparation as a result of his visit: one using Vermont data and one using California data to model long-distance model choice.

A UVM NCST research survey and the assessment of the spatial distribution of cell phone ownership informed a decision made by the Vermont Agency of Transportation regarding what travel data they wanted to pursue: VTrans ultimately chose big data rather than the survey UVM designed, but the research still influenced this outcome.

NCST staff have provided guidance to Caltrans staff regarding complying with Section 508 and making documents accessible.

Research Outcomes Goals, Performance Measures, and Targets

The annual period for these targets is October 1 – September 30. This semi-annual progress report aims to report at 50% or more of the annual targets.

**NCST Outcome Goal #1: Increase the body of knowledge amongst attendees (policymakers, practitioners, federal/state officials, etc.) at NCST outreach activities.**

- **Number of people participating in webinars, briefings, and other outreach events**: 1,648 [Target: 1,600 per year]

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3 http://opr.ca.gov/docs/20190122-743_Technical_Advisory.pdf
NCST Outcome Goal #2: Results and findings of NCST research are utilized by members of the research community, practitioners, and the public to influence policy and practice related to environmentally sustainable transportation.

**Number of downloads of reports and white papers:** 218 [Target: 800 per year] collective downloads during the reporting period of one white paper and one report (the latter published in January 2019).

**Number of downloads of policy briefs:** 27 [Target: 160 per year]. NCST has produced one policy brief under this grant thus far, which was published in January 2019. However, NCST is still producing many briefs under its prior USDOT grant, including one in January and three in March 2019. As an indication of potential future downloads of policy briefs, those latter four had 16 downloads collectively between publication and the end of the reporting period; and the 12 policy briefs produced in the reporting period immediately prior (April – Sept 2018) under NCST’s previous USDOT grant collectively had 81 downloads during this reporting period, October 2018 – March 2019.

**Number of web hits on NCST websites:** 9,288 [Target: 6,400 per year]

5. IMPACTS

What is the impact on the effectiveness of the transportation system?

We have communicated the results of NCST research and combined expertise of our researchers and staff to a wide range of policy stakeholders. We have seen several indications that our voice is being heard and valued. Several Congressional staff have reached out to us with questions or updates on their ongoing legislation after we visited. Staff from Julia Brownley (D-CA) reached out to us to let us know about their recently introduced legislation to require all FTA grants for transit buses go toward EV buses. NCST has done several projects on EV-Buses, and we discussed them when we met with her staff in January. Joe Sheehy, LD for Grace Napolitano followed up on the meeting that Kelly Fleming and I had with him to discuss several transportation policy issues.

NCST researchers have been approached for input onto policy topics by a variety of legislative and regulatory stakeholders. Many of these requests resulted in a simple conversation or exchange of emails, but several ongoing consultations continue including with the California Air Resources Board on the development of TNC emissions performance metrics, and with stakeholders in both the California Legislature and regulatory agencies regarding the design and evaluation of ZEV incentives.

On Tuesday, February 26, ITS-Davis’ founding director, NCST co-director, and California Air Resources Board (CARB) member Daniel Sperling was the first to testify on one of two panels before the U.S. Congressional House Committee on Transportation & Infrastructure at a hearing titled “Examining How Federal Infrastructure Policy Could Help Mitigate and Adapt to Climate Change.” Dr. Sperling shared his “experiences from California” and “insights from over 30 years studying the transportation system of this country.” Throughout his testimony, Dr. Sperling identified policy strategies for promoting more environmental, equitable, and efficient transportation in ways that support the economy and promote innovation without necessarily burdening taxpayers. In his opening comments, he highlighted how the current transformative revolutions in transportation—electrification, automation, and shared mobility—present government with the challenge and opportunity to “refocus and restructure how we fund and manage our transportation system, such that we direct these many innovations toward the public interest.” A key role for government in supporting innovations is to support “pilot and demonstration programs” to enable necessary experimentation. After opening remarks from each of the five panel members, congressional members asked questions and spoke about their concerns over a two-and-a-half-hour period. During this Q&A, Dr. Sperling responded to questions posed by representatives including Julia

Brownley (D-CA), Mark DeSaulnier (D-CA), Alan Lowenthal (D-CA), Pete Stauber (R-MN), Lizzie Fletcher (D-TX), Abby Finkenauer (D-IA), and Salud Carbajal (D-CA), who recognized Dr. Sperling for his “testimony and leadership on reducing greenhouse gas emissions.”

Through various UCR NCST projects, researchers have quantified specific GHG emissions reductions, as stated in the associated research papers. These GHG reductions range anywhere from 5% up to 25%.

In addition, NCST funds have supported the new Renewable Natural Gas Research Center at UC Riverside. The center is among the first academic establishments in the U.S. dedicated to the study and applied research of renewable gas technologies, and focuses on improving technologies and removing barriers to increase renewable gas use in California and beyond.

What is the impact on the adoption of new practices, or instances where research outcomes have led to the initiation of a start-up company?

Dr. Lisa Aultman-Hall has extensively participated in and contributed to efforts to incorporate long-distance travel into the NextGen National Household Travel Survey plans. Dr. Aultman-Hall chaired the August 2018 NHTS conference where she and other researchers discussed with FHWA data manager what NextGen NHTS would be.

From UVM’s work on workforce development and employee retention, the research team developed a new exit interview protocol and approach. The Vermont Agency of Transportation picked up this new protocol and approach and are using it as an active feedback loop to inform future management decisions.

What is the impact on the body of scientific knowledge?

UC Davis researchers have published multiple articles and papers over the last six months, which reflect our strong contribution to the development of this field. Many NCST faculty also incorporate findings and results from NCST projects into their course materials. At Georgia Tech, new research tools have been implemented in the CEE 6625 course, Transportation, Energy & Air Quality.

Many UC Davis and UC Riverside faculty and researchers participated in the University of California Institute of Transportation Studies (UC ITS) Forum on Innovative Mobility on November 30, 2018, in Sacramento, California. This forum convened UC experts to kick-off an effort led by UC ITS to develop a California statewide Innovative Mobility Applied Research Program that will deliver impartial policy analysis and guidance, technical support, and training to the State of California on the transition to shared, automated, electric, and connected mobility. NCST researchers contributed their knowledge and insights to a variety of topics relating to innovative mobility, such as Integration with Other Modes and the Built Environment; Environmental, Health, and Energy Impacts; Travel Behavior and Travel Demand; Governance and Regulation; and others.

UC Davis’s visit and meeting from representatives of the Forum of European Highway Research Laboratories (FEHRL) in October 2018 resulted in shared scientific knowledge at an international, but intimate scale. Both NCST and FEHRL attendees gained new insights from the meeting on approaches to transportation challenges and issues.

What is the impact on transportation workforce development?

The effect of automation has been a primary focus of much of our transportation research over the last 3 years. Understanding the impact of automation is critical to predicting and preparing for the workforce impacts which will follow. NCST partners have conducted multiple research studies on workforce related issues in transportation. NCST staff have helped with translating the work into briefs and for presentation at the Capitol briefing in January.
LBSU’s investigation into the workforce needs of the transit industry in California provide useful lessons for the transit industry as a whole. Our partnership with the SCRTTC has resulted in the development of NCST-funded training modules that continue to be offered in both a classroom-based and online format.

The Port of Long Beach Academy of Global Logistics (AGL) at Juan Rodriguez Cabrillo High School is a partnership of the Port, Long Beach Unified School District and LBSU’s Center for International Trade and Transportation (CITT). As an integrated approach to workforce development, it uses a Small Learning Community approach to combine academic curriculum with industry-relevant training and information, informed by research, to support academic and career development. AGL builds on the Long Beach College Promise by introducing high school students to career opportunities in global trade and logistics and showing them how to prepare for those careers through a wide range of training and education programs including certificates, certifications, and degrees offered by Long Beach City College and California State University, Long Beach. CITT’s efforts include the incorporation of sustainable freight topics in curricular materials developed for both students and as part of the annual summer Teacher Externship for Cabrillo High School instructors. The program serves an outlet for research done by CITT under other grants such as NCST. For example, the outcomes of the policy briefs on freight efficiency strategies will be incorporated into teacher externships and student exercises, and the videos resulting from the environmental policy evaluation will be used as curricular tools.

Additionally, LBSU will produce brief videos to accompany the environmental policy evaluation done in the case studies portion of the project to reach a wider audience for the Center’s research activities.

**Impacts Goals, Performance Measures, and Targets**

The annual period for these targets is October 1 – September 30. This semi-annual progress report aims to report at 50% or more of the annual targets.

**NCST Impact Goal #1: Serve as a leading resource on environmentally sustainable transportation research and issues for policymakers.**

Percent of surveyed stakeholders that report that NCST research, findings, and recommendations are impactful and useful: 86% [Target: 50%]. This result is based on follow-up surveys issued for three NCST-organized events that occurred during the reporting period, as well as one NCST-sponsored event at ITS-Davis that featured a number of NCST researchers and projects.

**NCST Impact Goal #2: Drive plans and policies on environmentally sustainable transportation issues nationwide.**

Instances of stakeholders utilizing NCST research, findings, and recommendations in plans, policies, or guidance: 2 [Target: 2 per year]

- Several UC Davis researchers are acknowledged for their contributions to the 2018 Progress Report to the Legislature on California’s Sustainable Communities Implementation (CARB, November 2018), and two NCST reports are specifically cited. The progress report uses data-supported metrics to assess progress on transportation, housing, and land use strategies, identifies best practices and challenges to achieve greater reductions in GHG emissions, and discusses the impact of State policies and funding.
- NCST research and guidance, Dr. Susan Handy, and the recently created Induced Travel Calculator are included on the California Governor’s Office of Planning and Research’s webpage that provides guidance on evaluating the transportation impacts in CEQA. [http://opr.ca.gov/ceqa/updates/sb-743/](http://opr.ca.gov/ceqa/updates/sb-743/)
6. CHANGES/PROBLEMS

Changes in approach and reasons for change

Nothing to report.

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

Delays in receiving our year 3 funding allocation from USDOT resulted in delays in research project starts at all NCST partner campuses.

Georgia Tech did not receive any applications to their summer 2018 call for proposals for TEDx-style lectures, and has decided not to pursue the program due to the lack of interest and the high costs of producing these lectures.

Changes that have a significant impact on expenditures

Delays in receiving our year 3 funding allocation from USDOT resulted in delays in research project starts and associated expenditures at all NCST partner campuses.

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

Given that data scientists are becoming more capable of retroactively determining who survey participants are, NCST researchers at UVM are putting extra care into how GPS data from surveys is handled, stored, and archived in order to better protect participants’ privacy.

Change of primary performance site location from that originally proposed

Nothing to Report

7. SPECIAL REPORTING REQUIREMENTS

In compliance with the Grant Deliverables and Reporting Requirements for 2016 and 2018 UTC Grants (November 2016, revised June 2018), NCST requires a project-level data management plan (DMP) for every submitted proposal, or if a project is not selected through a call for proposals, a DMP is required when notice is sent to UC Davis of a new project. The NCST DMP template (using DMPTool.org) also requires all project researchers to include their ORCID number.

The NCST also submits a project description to the TRB Research in Progress (RiP) database for each new project. All NCST RiP entries are available [here](https://ncst.ucdavis.edu/), that contains information similar to that in RiP as well as the project’s information form.

For final publications, the NCST has created a template that includes a Technical Report Documentation Page with fields for the project researchers’ ORCIDs, the publication DOI, and the dataset DOI, as well as a section in the report for project data, in order to comply with the DOT Public Access Plan and the NCST’s DMP. The NCST publication template is also Section 508 compliant, which helps to ensure authors are generating compliant reports. Final reports and white papers are published in the University of California’s repository, eScholarship,\(^5\) as well as on the respective NCST project webpage. NCST staff also updates the RiP entry for the project. Project data is archived as outlined in the NCST’s DMP, with most PIs using Dash\(^6\) to archive their data. NCST staff distributes final publications per the Grant Deliverables and Reporting Requirements for 2016 and 2018 UTC Grants.

\(^5\) [https://escholarship.org/uc/itsdavis_ncst](https://escholarship.org/uc/itsdavis_ncst)

\(^6\) [https://dash.ucop.edu/stash](https://dash.ucop.edu/stash)