

UNIVERSITY OF VERMONT

TRANSPORTATION RESEARCH CENTER



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ANNUAL REPORT 2018-2019

We are growing again!

As we submit this report for publication, the TRC team is welcoming Associate Professor Greg Rowangould and Research Assistant Professor Dana Rowangould to the TRC's new locations in buildings on the main UVM campus. We have expanded our collaborators to include more Vermont groups, academics in California through the National Center for Sustainable Transportation, New England universities through the Transportation Infrastructure Durability Center, and partners in Quebec on transportation and energy modeling. One of our projects with the

Vermont Agency of Transportation on workforce development continues to win accolades and awards. And alumnus Mitchell Robinson returned to Vermont and joined us to work with the Transportation Air Quality Lab (TAQLab).

Thank you for continuing to support our mission of transportation research, education, and outreach. This work is best achieved when diverse partners come together in an interdisciplinary center of faculty, staff, and students. We are proud to be that hub for Vermont.

PROGRAM UPDATES

Transportation Infrastructure Durability Center

Mandar Dewoolkar, Institutional Lead

In 2018, UVM began its partnership with the University of Maine and four other universities for the USDOT-funded [Transportation Infrastructure Durability Center](#) (TIDC). Five projects led by five different UVM faculty are being funded using the first year of TIDC funds. Each project helps support a graduate student, and a number of undergraduate students will be engaged in the research. UVM presented highlights of our research at the inaugural TIDC conference in Maine in June 2019.

National Center for Sustainable Transportation

Lisa Aultman-Hall, Associate Director

UVM began its partnership with the University of California Davis for the National USDOT-funded University Transportation Center (UTC) in 2013. To date, eight research projects and three white paper projects have been selected for funding. The [NCST](#) theme of sustainable transportation complements the research, education and workforce efforts at the TRC. On-going projects address automated vehicles, electric vehicles, food access, tailpipe emissions and long-distance intercity travel.

Vermont Clean Cities Coalition

Peggy O'Neill-Vivanco, Program Coordinator

The [Vermont Clean Cities Coalition](#) (VTCCC), a Department of Energy funded program, provides technical assistance and outreach, and helps raise awareness of alternative fuels, advanced vehicle technology, and fleet energy efficiency to fleets in Vermont. In FY 2018, VTCCC worked with fleets to reduce over 1.2 million gallons of gasoline equivalent and over 11,300 tons of greenhouse gas emissions. Peggy participated in outreach events across Vermont, promoted Volkswagen Settlement funding opportunities, and worked with stakeholders to apply for external grants. With funding from Argonne National Laboratory, VTCCC hired two interns in 2018 and 2019.



Northeast Transportation Workforce Center

Glenn McRae, Director

At the end of its 4-year cooperative agreement with Federal highway Administration (FHWA), the [Center](#) was tasked with additional assignments through December 2019, focusing on an evaluation of informal career advancement programs for FHWA, and support of a community of practice for USDOT's Intelligent Transportation Systems Professional Capacity Building Program (ITSPCB).

PROJECT HIGHLIGHTS

Snow and Ice Control Performance Measurement for the Vermont Agency of Transportation

Effective performance measurement provides benchmarking for transportation agencies to promote transparency, accountability, cost-effectiveness, and process improvement. The objectives of this project were to better understand a new approximation of road surface friction termed "Grip" (calculated based on the infrared reflectivity of the road surface using a proprietary methodology developed by Vaisala) and to investigate the relationship between Grip and safety outcomes during and after winter storms. To accomplish these goals, the research team reverse engineered the Grip calculation methodology, correlated Grip with changes in observed traffic speeds under winter storm conditions and assessed the relationship between Grip, traffic speed, and traffic safety outcomes (crashes and incidents). Instances where these metrics diverged were useful indicators of high-risk situations, where the traveling public failed to respond appropriately to winter road conditions. *Contact: [Jim Sullivan](#)*

Intercity Travel and Sustainability

Sustainable transportation includes alternative vehicle use, fuel systems, bicycling, walking, transit, land use, and travel behavior choices. For the last 7+ years our research group has expanded on sustainable transportation by considering long-distance intercity travel, associated emissions and impact on well-being, infrastructure and congestion. In 2018-2019, our projects incorporated aviation into studies of long-distance travel. With visiting scholar Dr. Jeffrey LaMondia and student interns, we have measured impedance between nation-wide origins and destinations by commercial air, facilitating more accurate intercity mode choice models. Increased air travel brings economic and social benefits but results in significant energy use and greenhouse gas emissions. Volume of air travel is growing, yet it is absent from most climate action plans. Universities are an important actor in convening stakeholders for long range planning for air travel in the future climate-constrained world, including advancing integrated modeling of surface and air systems to better plan infrastructure and modal substitution. *Contact: [Lisa Aultman-Hall](#)*

Quantifying Hybrid-Electric Vehicles Energy-Emissions Relationships for Improved Modeling of Hot Spots

It is anticipated that the future motor vehicle fleet will have a larger proportion of electrified vehicles. Currently, relatively little quantitative understanding exists for hybrid-electric vehicle (HEV) emissions despite the need to create representative emissions projections. On-road, second-by-second data have been collected by UVM across all seasons, varying road types and driving conditions. Over 140,000 seconds of data were collected, including spatial, environmental, roadway characteristics, particulate and gaseous emissions, and vehicle operating parameters. Data are currently being analyzed to assess the effects of environmental conditions and road characteristics on hybrid-electric vehicles' electric motor/ICE "power split" and the subsequent emissions. *Contact: [Mitchell Robinson](#)*

PROJECT HIGHLIGHTS Continued



Modeling Electric Vehicle Charging Station Scenarios for New York and New England

Rapid expansion of renewable electricity generation and vehicle electrification are central strategies for reducing greenhouse gas emissions. The goal of this project is to utilize detailed travel behavior data to calculate time-specific, regional demand for vehicle charging and input this high-resolution electricity demand into an economic dispatch model for power plants in New York and New England. The integration of travel behavior and power sector modeling will facilitate the assessment of the combined impact of increased electric vehicle charging and renewable electricity generation on the power sector as well as the total GHG emissions. Contact: [Jonathan Dowds](#)

Evaluating Effectiveness of Floodplain Reconnection Sites along the Lamoille Valley Rail Trail

In a Vermont Agency of Transportation funded project, Kristen Underwood (UVM Civil & Environmental Engineering) and others are modeling alternatives for floodplain reconnection along shared river, rail and road corridors to consider the multiple uses and functions of these corridors and assess the potential impacts and benefits to infrastructure, life safety and health, and the environment. To balance the diverse management objectives for these shared floodplains, this research has engaged a broad group of stakeholders, including landowners and farmers, the Vermont Association of Snow Travelers, Lamoille County Planning Commission, VT Agency of Natural Resources, and VTrans. Contact: [Kristen Underwood](#)

RECENT REPORTS AND PUBLICATIONS

James Sullivan and Karen Sentoff. (2019). *Identifying Roadway Physical Characteristics that Contribute to Emissions Differences between Hybrid and Conventional Vehicles*. [National Center for Sustainable Transportation Research Report](#).

John Lens, Mandar Dewoolkar, and Eric Hernandez. (2019). *Quantifying the Vulnerability of Vermont Bridges to Seismic Loading*. [VTrans Research Project 737-12 Final Report 2019-12](#).

Sarah Howerter, Hannah Ullman, Jonathan Dowds, and Lisa Aultman-Hall. (2019). *Exploring the Influence of Social Network Geography on Long-Distance Travel Behavior*. [TRC Report #19-004](#).

Jonathan Dowds and James Sullivan. (2019). *Snow and Ice Control Performance Measurement: Comparing "Grip," Traffic Speed Distributions and Safety Outcomes During Winter Storms*. [TRC Report #19-003](#).

Lisa Aultman-Hall and Jonathan Dowds. (2019). *Who Do We Miss by Moving Travel Surveys Online? Assessments from Vermont*. [TRC Report #19-002](#).

Phoebe Spencer and Lisa Aultman-Hall. (2019). *Assessing Seasonal and Climate-Related Variability in Rates of Walking and Physical Activity with Time Use Data*. [TRC Report #19-001](#).

Lisa Aultman-Hall. (2018). *Incorporating Long-Distance Travel into Transportation Planning in the United States*. [National Center for Sustainable Transportation White Paper](#).

Gabrielle Freeman, Glenn McRae, and Peggy O'Neill-Vivanco. (2018). *The Emerging Clean Transportation Workforce: Opportunities and Recommendations to Support the Growing Alternative Fuels Industry*. [TRC Report #18-003](#).

Glenn McRae, Carol Vallett, and Jennifer Jewiss. (2018). *Vermont Agency of Transportation Employee Retention and Knowledge Management Study*. [TRC Report #18-002](#).

Jonathan Dowds, Chester Harvey, Jeff LaMondia, Sarah Howerter, Hannah Ullman, and Lisa Aultman-Hall. (2018). *Advancing Understanding of Long-Distance and Intercity Travel with Diverse Sources*. [National Center for Sustainable Transportation Research Report](#).

James Sullivan and Jonathan Dowds. (2018). *Emergency Operations Methodology for Extreme Winter Storm Events*. [Clear Roads Project CR 16-04](#).

James Sullivan. (2018). *Analysis of Address-Based Employment and Demographic Data Sources for Travel Modeling and Transportation Planning*. [TRC Report #18-001](#).

View [all research reports](#) on the TRC website.

TRC WELCOMES TWO NEW FACULTY

Dr. Greg Rowangould will join the CEE department as an Associate Professor in Fall 2019. He will join us from the University of New Mexico (UNM) where he has been an Assistant Professor since 2012. Dr. Dana Rowangould will join the CEE department as Assistant Research Professor. Greg and Dana's passion for transportation research and education is rooted in a deep concern for the sustainability of communities and the environment – interests that will make them feel right at home in Vermont.

THE YEAR IN REVIEW

July 2018

- Hannah Ullman's graduate research on long-distance intercity travel & well-being is presented at the 15th International Conference on Travel Behavior Research in Santa Barbara, CA

August 2018

- Dr. Linda Schadler becomes new CEMS dean & appoints Lisa Aultman-Hall and Mandar Dewoolkar as TRC Co-Directors
- Lisa Aultman-Hall hosts NHTS Workshop in Washington, DC

September 2018

- Jeff LaMondia arrives from Auburn University for sabbatical
- Jonathan Dowds and Lisa Aultman-Hall start work with the Quebec, California, and Vermont EV modeling group JCCTRP
- VTrans' Research Symposium in Montpelier, VT

October 2018

- Glenn McRae organizes the annual National Transportation Training Directors (NTTD) meetings in Chattanooga, TN
- Mitchell Robinson joins the TRC team
- Jonathan Dowds begins work on VT Transportation Energy Profile, now in its fourth edition

November 2018

- NCST publishes Lisa Aultman-Hall's white paper on long-distance travel

December 2018

- Alison Conway from City College of New York gives seminar on e-commerce impact on logistics and urban street activity
- Eric Hernandez investiture as the inaugural Gregory Sweeney Green & Gold Professor

January 2019

- Glenn McRae is an invited speaker at the National Conference of Mayors Workforce Development meetings
- TRC staff traveled to the 2019 TRB Annual Meeting in DC
- Jim Sullivan teaches Transportation Modeling and Planning to seniors and graduate students

February 2019

- Peggy O'Neill-Vivanco hosts Burlington City and Lake students from Burlington High School



- Jonathan Dowds & Lisa Aultman-Hall present at Joint Clean Climate Transportation Research Partnership workshop

March 2019

- Glenn McRae presents on career education in Intelligent Transportation Systems (ITS) for the USDOT professional capacity building Academic Forum in Tampa, FL
- VTrans' Michele Boomhower attends the NCST Leadership Council Meeting in Davis, California as Vermont's advisor to the National UTC



April 2019

- NCST webinar features UVM TRC's long-distance travel research
- TRC team attends roundtable of nation-wide experts to discuss automated vehicle modeling in Davis, California

May 2019

- Undergraduate research assistant Anuar Onayev graduates after successfully modeling air accessibility with TRC team
- Master's student Sarah Howerter travels to present her work on electric vehicle charging at UC Davis seminar series
- Britt Holmén leads a UVM team to visit the Flux LAB at Saint Francis at Xavier University
- Lisa Aultman-Hall receives the College of Engineering and Mathematical Sciences CEMS Excellence in Research Award

June 2019

- Mandar Dewoolkar and Dryver Huston attend first TIDC Conference in Maine
- Greg and Dana Rowangould arrive in Vermont

July 2019

- TRC moves across UVM campus to new home in [Mansfield House](#)



UVM Transportation Research Center
Mansfield House, 25 Colchester Avenue,
Burlington, VT 05405 | transctr@uvm.edu