



## Program Progress Performance Report for University Transportation Center at Portland State University

Submitted to: U.S. Department of Transportation  
Office of the Secretary-Research

Grant Number: DTRT1-G-UTC27

Project Title: National University Transportation Center  
National Institute for Transportation and Communities (NITC)

*Consortia members: Portland State University (PSU), University of Oregon (UO), University of South Florida (USF), Oregon Institute of Technology (OIT), University of Utah (UU)*

Program Director: Jennifer Dill, Ph.D.  
Professor, Portland State University  
Director, National Institute for Transportation and Communities (NITC)  
[jdill@pdx.edu](mailto:jdill@pdx.edu)  
503-725-2855

Submitting Official: same as above

Submission Date: October 30, 2016

DUNS: 05-222-6800

Recipient Organization: Portland State University  
PO Box 751  
Portland, OR 97207-0751

Grant Period: October 1, 2013 – September 30, 2018

Reporting Period End Date: September 30, 2016

Report Term: Semi-annual

Signature:

A handwritten signature in black ink, appearing to read "J. Dill".

## 1. ACCOMPLISHMENTS: What was done? What was learned?

The information provided in this section allows the OST-R grants official to assess whether satisfactory progress has been made during the reporting period.

### What are the major goals of the program?

The major goals for NITC as described in our application fall into six categories:

#### *Research*

- **Build and extend our current research through Year 1 Projects.** During the first year, we will undertake research projects that build upon and extend our current work, and reflect priorities identified by our external advisory board. All Year 1 project work plans will be peer-reviewed.
- **Competitive, peer-review project selection process in Years 2 and 3.** Our projects in Years 2 and 3 will be selected through an open RFP process to consortium faculty. These funds will be available for projects consistent with our theme.
- **Transportation for Livable Communities Pooled-Fund Research.** We will continue the Transportation for Livable Communities Pooled-Fund Research program. This program provides regional and local agencies, such as metropolitan planning organizations and municipalities, more opportunity to be invested in research.

#### *Leadership*

- **High Standing within National and International Arenas of Transportation.** NITC faculty are well regarded nationally and internationally as leaders in their fields. They will continue to demonstrate this leadership through publishing in the top journals and presenting their work at conferences. NITC takes the concept of leadership far beyond academic circles, as evidenced by the wide dissemination of research results in professional, technical and general publications and other media.

NITC faculty help address national transportation problems through volunteer leadership on TRB committees and in other positions. By serving on these committees, faculty will help set national research agendas and connect with agency leaders and practitioners on pressing research issues. To continue and reinforce this practice, NITC will mentor our new, junior faculty to apply for committee and panel membership and recognize the activities of all faculty members.

- **Solving Regional and National Transportation Problems.** NITC researchers have a long history of conducting research that is useful in solving the problems practitioners and decision-makers face every day. NITC's director and staff will serve as points of contact for agency leaders and policymakers regionally, statewide and nationally. When we identify needs that match the expertise of our researchers, we will make a connection. We will work with key staff at the DOT modal administrations, both in Washington, D.C., and within our regions to determine the most effective way for our researchers to learn from and inform agency activities.

- **Future Leaders.** We recognize the investment we must make in our young faculty and students by prioritizing research projects that include them. We will support students traveling to conferences to present their work, a key activity in developing the next generation of leaders.
- **Development and Delivery of Programs.** We demonstrate our leadership in innovating transportation education, workforce development, deployment of research results and conducting research.

#### *Education and Workforce Development*

- **Offer Degrees and Courses in Multiple Disciplines.** NITC will continue to offer a rich array of degrees that serve the transportation profession.
- **Provide Experiential Learning.** A key component of our education strategy is experiential learning, which will help attract and retain students. Our campuses will continue to provide these opportunities, and NITC will seek ways to expand them.
- **Develop Innovative New Curriculum.** We will develop new, innovative curriculum consistent with transportation and livable communities that can be tested and shared among NITC and other universities.
- **Educate Professionals.** NITC will maintain a vibrant program of seminars, workshops, professional courses and other training opportunities that provide transportation practitioners with the latest tools and techniques.
- **Attract and Support Undergraduate Students.** NITC will build upon existing and effective mechanisms to expose K-12 students to transportation, attract and retain new undergraduate students to our degree programs, and involve undergraduates in our research.
- **Attract and Support Graduate Students.** NITC will support graduate students directly through research assistantships working on projects. We will provide dissertation fellowships for students to research surface transportation topics that fit under the NITC theme. This will be a competitive process open to Ph.D. students at NITC universities.
- **Sponsor a Transportation and Livable Communities Student Competition.** To further attract students to transportation-related professions and to promote integrated education into transportation and livability issues, NITC will sponsor an annual competition on transportation and livable communities.

#### *Technology Transfer*

- **Move Research into Practice.** Each research project will include a well-defined scope of work that identifies the problem the research will solve, how the research will address the problem and how the results will be implemented. We will continue our practice of having every final report peer reviewed by at least one academic and one practitioner with relevant knowledge. We will also identify "implementation champions" the influential decision makers, executives and other top officials who can

cut through organizational obstacles to deploy research results. We will provide these champions yearly summaries of our deployment successes as a reminder of the value of our research. Researchers working closely with practitioners and champions throughout the project ensures that our research stays current with the changing needs of practice and delivers research results in the optimal format.

- **Use Innovative Approaches to Communicate Research Results.** NITC will embark on an ambitious program of sharing information through traditional and new media.

#### *Collaboration*

- **Collaborating within our consortium.** NITC's governance structure is cooperative and leadership is distributed. The Executive Committee includes one faculty member from each campus. The Executive Committee provides overall direction for the Center, makes project funding decisions, and selects Center award recipients, including student of the year. They will meet in person at least once a year, rotating the location between campuses, and hold regular conference calls. Each Executive Committee member will be responsible for representing and supporting their respective campus
- **External collaboration.** In addition to the partnerships that occur through individual projects and the pooled-fund program, NITC will foster collaboration with a range of "end-users" of our work through an External Advisory Board.

#### *Diversity*

- **Attract underrepresented students to transportation careers.** We aim to attract underrepresented middle through high school students to transportation as a career through our partnerships with STEM and WTS.
- **Priority funding to research with an equity focus.** We give priority to funding research projects that have an equity focus by awarding them additional points in the RFP process. In addition, three of our projects selected for the first year directly address equity issues.

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

#### *Research*

- **Build and extend our current research through Year 1 Projects.**

Thirteen projects were selected for NITC National Year 1 funding. The total allocation of NITC funds for these projects is \$870,266. As of September 30<sup>th</sup>, 2016, five reports are completed and currently in peer review and three projects are completed with published reports. The remaining five projects are still in progress and, on average, 55% completed. The completed projects include:

- Encouraging Low-Income Households to Make Location-Efficient Housing Choices, Andree Tremoulet, Portland State University
- Integrating Freight into Livable Communities, Kristine Williams, University of South Florida
- Do TODs make a Difference? Phase 2, Arthur Nelson and Reid Ewing, University of Utah and Jenny Liu, Portland State University

The completed projects that are currently in peer-review are:

- Improving Trip Generation Methods for Livable Communities, Kelly Clifton, Portland State University and Nico Larco, University of Oregon
- Metropolitan Centers: Evaluating local implementation of regional plans and policies, Richard Margerum and Rebecca Lewis, University of Oregon, and Keith Bartholomew, University of Utah
- Developing a model for Transit Oriented Development in Latino Immigrant Communities: A National Study of Equity and TOD, Sandoval, Gerardo
- Changing attitudes toward sustainable transportation: The impact of meta-arguments, David Sanbonmatsu and David Strayer, University of Utah
- Rapidly Expanding Mobile Apps for Crowd-sourcing Bike Data to New Cities. Sean Barbeau, University of South Florida

The projects in progress include the following:

- Generalized Adaptation of an Electric-Hydraulic hybrid drive system, James Long and David Culler, Oregon Institute of Technology.
- Improving Bicycle Crash Prediction, Krista Nordback, Portland State University
- Transportation Cost Index: A Comprehensive Performance Measure for Transportation and Land Use Systems and its Application in OR, FL, and UT, Liming Wang and Jenny Liu, Portland State University
- Creating Livable Communities through Connecting Vehicles to Pedestrians and Cyclists, John MacArthur, Portland State University
- Modeling and Analyzing the Impact of Advanced Technologies on Livability and Multimodal Transportation Performance Measures in Arterial Corridors, Miguel Figliozzi, Portland State University

- **Competitive, peer-review project selection process in Year 2**

A request for proposals (RFP) for the [NITC National Year 2](#) funds was released in January of 2015 for research and technology transfer projects. NITC required that all proposals fit within the NITC theme of livability, safety and environmental sustainability. The NITC Advisory Committee provided guidance at the December 2014 meeting that the RFP give priority for research funding that examines the economic impact of transportation and livable communities. Fifty-eight abstracts and 39 proposals, requesting more than \$4 million were received.

Sixteen projects were selected through a competitive, peer review process and with the approval from the executive committee on June, 10<sup>th</sup>, 2015. The allocation of NITC funds for these projects is \$1,525,362. Several of the funded projects had an economic focus that evaluated urban greenways, location affordability in shrinking cities, transportation affordability in developments near transit, smart-parking programs, or effects of bus rapid transit on surrounding property values. Many of the projects started August 1, 2015. Each project is between 12 and 18 months in duration. As of September 31st, 2016, the 16 projects are on average 47% complete.

The projects in progress include the following:

- Understanding the Economic Impacts of Urban Greenway Infrastructure, Jenny Liu, Mike Paruszkiewicz and Jeff Renfro, Portland State University.
- How Does Transportation Affordability Vary Between TODs, TADs, and Other Areas, Brenda Scheer and Reid Ewing, University of Utah
- Integrating Title VI and Equitable Investment in Transportation Alternatives into the MPO Transportation Planning Process, Kristine Williams, University of South Florida, and Aaron Golub, Lisa Bates and Liming Wang, Portland State University
- Building Planner Commitment: Are Oregon's SB 1059 & California's SB 375 Models for Climate-Change Mitigation? Keith Bartholomew, David Proffitt and Reid Ewing, University of Utah
- Racial Bias in Drivers' Yielding Behavior at Crosswalks: Understanding the Effect, Kimberly Barsamian Kahn, Portland State University
- The Economic and Environmental Impacts of Smart-Parking Programs, Nicole Ngo, University of Oregon
- What do we Know About Location Affordability in U.S. Shrinking Cities? Joanna Ganning, University of Utah
- Framing Livability: A Strategic Communications Approach to Improving Public Transportation in Oregon, David Remund, Kelli Matthews, Deb Morrison and Nico Larco, University of Oregon
- Effectiveness of Transportation Funding Mechanisms for Achieving National, State, and Metropolitan Economic, Health, and Other Livability Goals, Rob Zako and Rebecca Lewis, University of Oregon
- Multimodal Trip Generation, Vehicle Ownership and Use: Characterizing The Travel Patterns of Residents of Multifamily Housing, Kelly Clifton, Portland State University
- Incorporate Emerging Travel Modes in the Regional Strategic Planning Model (RSPM) Tool, Liming Wang, Kelly Clifton and Jennifer Dill, Portland State University
- Evaluating Efforts to Improve the Equity of Bike Share Systems, Nathan McNeil, John MacArthur and Jennifer Dill, Portland State University
- Evaluation of roadway reallocation projects, Miguel Figliozzi, Portland State University
- Impacts of Bus Rapid Transit (BRT) on Surrounding Residential Property Values, Victoria Perk and Martin Catala, University of South Florida
- Addressing Bicycle-Vehicle Conflicts with Alternate Signal Control Strategies, Sirisha Kothuri, Christopher Monsere and Krista Nordback, Portland State University and Ed Smaglik, Northern Arizona University
- Planning Ahead for Livable Communities Along the Powell-Division BRT: neighborhood conditions and change, Lisa Bates and Aaron Golub, Portland State University

- **Competitive, peer-review project selection process in Year 3**

The NITC National Year 3 RFP was released in January of 2016 for research projects following the same format as in previous years. Twenty-seven proposals were submitted, requesting \$2.7 million with \$3.5 million available for match. Eleven projects were selected through a competitive, peer review process and with approval from the executive committee on June, 21<sup>st</sup>, 2016. The allocation of NITC funds for these projects is \$929,970. Most projects started on August 1<sup>st</sup>, 2016 and are 18 months in duration.

Funded projects include the following:

- Overcoming Barriers for the Wide-Scale Adoption of Standardized Real-time Transit Info, Sean Barbeau, University of Southern Florida
- Transferability & Forecasting of the Pedestrian Index Environment (PIE) for Modeling Applications, Kelly Clifton, Portland State University
- Does Compact Development Increase or Reduce Traffic Congestion? Reid Ewing, University of Utah and Shima Hamidi, University of Texas
- V2X: Bringing Bikes into the Mix, Stephen Fickas, University of Oregon
- The Contribution of Transportation and Land Use to Citizen Perceptions of Livability in Oregon MPOs, Rebecca Lewis and Robert Parker, University of Oregon
- Understanding Economic and Business Impacts of Street Improvements for Bicycle and Pedestrian Mobility, Jenny Liu and Jennifer Dill, Portland State University
- Electric Bicycle Nationwide Survey, John MacArthur, Portland State University and Christopher Cherry, University of Tennessee
- Biking and Walking Counts: Data Quality, Nathan McNeil and Kristin Tufte, Portland State University
- Rapid Transportation Structure Evaluation Toolkit, Charles Riley, Oregon Institute of Technology
- Evaluating and Enhancing Public Transit Systems for Operational Efficiency, Service Quality and Access Equity, Ran Wei, University of Utah and Liming Wand and Aaron Golub, Portland State University
- SEGMENT: Applicability of an Existing Segmentation Technique to TDM Social Marketing Campaigns in the United States, Philip Winters and Amy Lester, University of Southern Florida

Six Small Starts projects have been funded. The purpose of these grants are to assist researchers who are interested in transportation but have not had an opportunity to undertake a small project that supports safe, healthy, and sustainable transportation choices to foster livable communities.

Four Small Starts projects was selected on November 15<sup>th</sup>, 2015. These projects started in January 2016. One of the projects is completed and under peer review: Active and Public Transportation Connectivity between North Temple TOD and Jordan Park River Trail, Ivis Garcia Zambrana, University of Utah. The remaining three projects are 22% completed:

- Travel to Food: Transportation Barriers for the Food Insecure in Tampa Bay, Kevin Salzer, University of South Florida
- How Do Stressed Workers Make Travel Mode Choices That Are Good For Their Health, Safety, and Productivity? Liu-Qin Yang, Portland State University
- Narratives of Marginalized Cyclists: Understanding Obstacles to Utilitarian Cycling Among Women and Minorities in Portland, Oregon, Amy Lubitow, Portland State University

Two Small Starts projects were selected in September 2016, and will start in November 2016. They include:

- Engaging Youth to increase their Transportation System Support, Understanding, and Use, Autumn Shafer, University of Portland
- The Use of Mt. Mazama Volcanic Ash as Natural Pozzolans for Sustainable Soil and Unpaved Road Improvement, Matthew Sleep, Oregon Institute of Technology

- **Transportation for Livable Communities Pooled-Fund Research.**

This program provides regional and local agencies more opportunity to be invested in research that has a national impact. The program offers a process by which cities, counties, MPOs and other regional or local agencies can pool relatively small pots of research dollars to leverage NITC funds for a single project. Partnering agencies work with NITC staff to develop a clear problem statement and identify match partners. NITC then issues the request for proposals (RFP) for a response from faculty at our partner universities.

NITC staff worked with the lead agency, Portland Bureau of Transportation, to secure \$125,000 in cash match from the municipalities and partners including the cities of Los Angeles, Chicago, Seattle, Washington, D.C., Portland, Oakland and Cambridge; TriMet; Metro; Washington County; and SRAM Foundation to support the project 'Contextual Guidance at Intersections for Protected Bicycle Lanes'. Two proposals were received from teams at our NITC partner campuses. The technical advisory committee consisting of members from partner cities selected the Portland State University team led by Civil and Environment Engineering Chair, Professor Christopher Monsere. The Portland State team also includes Jennifer Dill and Nathan McNeil.

There are two objectives of this research. The first is to identify the context in which the intersection treatments are most effectively employed. This will ideally result in quantitative guidance about motor vehicle and bicycle speeds, volumes, turning movements and delay, intersection geometry, interactions with transit stops and other factors that will indicate the best treatment. The second objective is to identify the critical elements and dimensions of each treatment so the design treatments can achieve a uniformity and level of standardization across jurisdictions.

We anticipate that this research will provide cities around the country with better, evidence-based, information with which to design intersection treatments for protected bike lanes, allowing for safer and more comfortable bicycling conditions.

*Leadership*

- **Shape national & international conversations on transportation research and education.**

Highlighted examples of how NITC researchers are leading the way:

Kelly Clifton's work on multi-modal trip generation has made a significant contribution to the state of the practice. Trip generation methods have always been challenged to provide adequate support for sustainable development and multi-modal transportation. Dr. Clifton and her team has been asked to participate in a number of national forums led by the Institute of Transportation Engineers, Caltrans and the National Association of City Transportation Officials (NACTO) on how to revise current methods in light of her research. Her work was included in the latest edition of the ITE Trip Generation Handbook.



Additionally, her work on pedestrian modeling has received interest from across the globe. Her aim is to advance the analytical tools available for non-motorized modes in order to plan for the safety, health, and environment of all transportation system users. Dr. Clifton and her team have presented this work at numerous domestic and international conferences including the United Kingdom, Chile, and Portugal and most recently in Mexico, Sweden, and the UK. Because the methods developed in this research are designed to integrate with existing demand modeling tools, the work has been well received by professional and academic audiences alike. Most recently, she led a workshop at the Transportation and Communities Summit that focused on her vision and proposed methods for transportation impact analyses.

Bike share systems are sweeping the nation but there is also significant discussion on how access to and utility derived from bike share is not equitably distributed. Research from Nathan McNeil and Jennifer Dill is starting to shed light on which of these efforts have been most effective in getting people to use bike share, and what current barriers to bike share exist for these communities. This project provides already some important insights.

The project team conducted a survey of bike share operators (55 responded out of 70 invited) to assess what barriers exist for under-served communities in using bike share, what barriers the bike share system faces in serving these communities, and how equity considerations inform bike share station-siting, fee structures and payment systems, system operations, employment approaches, marketing, and data collection. Their results indicate that one in five systems have written policies around equity; although larger systems of over 500 bikes were twice as likely to have such policies. However, many more systems incorporated equity into various aspects of their systems. For example, systems incorporated equity into station siting, fee structure and payment systems, and promotion and marketing at much higher rates (68%, 72%, and 57% respectively) and into system operations and data collection and analysis to a lesser extent (42% each). Even so, the largest barriers facing systems seem to be still cost, access, and outreach to users as well as overall funding and staff levels for the system organization.

- **Serve on national committees and panels.**

- Faculty members and students at the five NITC member campuses currently hold 67 TRB volunteer memberships and serve on 46 different TRB committees/task forces and 12 different NCHRP/SHRP2/NCFRP/TRB panels. Four faculty members serve as Chair or Co-Chair on panels or committees.
- Twenty-one NITC faculty and staff serve on editorial, policy and other advisory boards.
- NITC staff are active in the AASHTO-RAC liaison group.
- NITC faculty are part of the team (led by ICF International) that developed FHWA's Strategic Agenda for Pedestrian and Bicycle Transportation.
- NITC's Director, Jennifer Dill, serves on the Executive Committee of the Council of University Transportation Centers (CUTC) and the Board of Trustees for the Transit Center. She is also chairing the 2016 UTC-TRB Spotlight Conference, focused on Pedestrian and Bicycle Safety.

- **Solving Regional and National Transportation Problems.**

The majority of NITC funded research works to solve transportation problems that can have a direct impact at the regional and national level. Highlighted examples below will prove to have near immediate impact in communities across the county.

Investment in public transit that make neighborhoods more desirable and lucrative can increase the risk of gentrification, specifically in low-income and minority neighborhoods. Research by NITC researcher Gerardo Sandoval addresses the concern of gentrification in Transit-Oriented Developments (TODs). His research, using cases studies from different Latino neighborhoods, has been able to provide important insights and strategies that will help urban planners and policy makers mitigate gentrification. For example, Dr. Sandoval points to the importance of creating affordable housing, providing a culturally relevant public space, and incorporating art from local artists in the project. He also suggests engaging the community in the planning process and, if needed, using the community as political capital to move the project forward. His research also shows that if done right, TODs can produce positive social and economic outcomes for Latino neighborhoods.

NITC researcher Krista Nordback focuses on bicycle and pedestrian counting and safety. She investigates metrics that best capture bicycle and pedestrian travel on roads and paths in both urban and rural areas. Her work has brought attention to the need for improved collision measures and a source of such information which is currently underused, count data. Her NITC research illustrates how such data can be aggregated and used to estimate annual bicycle and pedestrian volumes at locations where only short duration counts were collected. This information is critical for integrating bicycling and walking in to planning, design, operation, and maintenance systems which currently focus almost exclusively on motor vehicles.

Kelly Clifton's NITC funded research provides resources to local governments on how to better account for the travel demand of new development. Her work provides a methodology to better estimate vehicular trip generation when development is in urban contexts that support multimodal transportation. Her team has been asked to assist local governments in revising their transportation system development charges to better reflect sustainable priorities and a more equitable development pattern. Additionally, Dr. Clifton's team is now working with Caltrans to investigate travel demand associated with affordable housing. All of this work collectively contributes to solving transportation issues associated with supporting more sustainable and livable development patterns.

The Transportation and Communities Summit (formerly the Oregon Transportation Summit) was held on September 8th and 9th, 2016 at Portland State University. The event hosted 272 practitioners, policymakers, students, and researchers. The goal of the Summit is to educate professionals, advance the state of research and to facilitate a conversation between practitioners and researchers to shape future research. This year's Summit also included five workshops that offered participants training opportunities on topics ranging from modeling health impacts, bike and pedestrian access to transit, transportation impact analysis, use of online data for address transportation questions, and using livability as a framework to engage the public. A total of 113 individuals participated in these workshops.

### *Education and Workforce Development*

- **Offer Degrees and Courses in Multiple Disciplines.**

The five-university consortium offers 13 graduate and six PhD degrees in transportation, closely related fields, and many dual degree options. During the past academic year, 58 undergraduate- and 58 graduate-level transportation-related courses were offered among the universities.

- **Provide Experiential Learning.**

Our campuses continue to incorporate access to community partners and employment opportunities in a number of ways. The support for the student groups and student scholars are our priority method for accomplishing this goal. Student groups are also active in hosting events and attending conferences.

The University of Utah student group, Point B, hosted, co-hosted, or participated in five events during the reporting period, including:

- Utah Bike Summit' featuring Mikael Colville-Andersen (collaboratively with Bike Utah)
- Tour of the Utah Transit Authority's Jordan River Rail Service Center Bikeshare ride and tour of downtown
- 'Summer By Rail' visit to Salt Lake City (in collaboration with NARP and Amtrak)
- Annual WTS Northern Utah Chapter Gala

Ten Point B members attended four different national conferences, including:

- American Planning Association conference in Phoenix, Arizona
- National Association of Railroad Passengers' spring council meeting in Washington, DC
- Congress for the New Urbanism in Detroit, Michigan
- National Association of City Transportation Officials Designing Cities conference in Seattle, Washington

Point B continues their partnership with the local WTS chapter and participates in the TransportationYOU program with middle school girls in the Salt Lake City area.

The University of Oregon student group, LiveMove, organized the following events

- Guest lecture, 'Fighting Traffic', presented by Peter Norton,
- Guest lecture, 'Building and Sustaining and an Advocacy Movement', presented by Lori Kessler-Gretl,
- Guest lecture, 'Family Biking, From Everyday Transport to Full on Adventure,' by Madi Carlsen
- End of Year Event

The Oregon Institute of Technology (OIT) student group, ITE, organized and hosted several events:

- Guest lecture by Joe Chang, PE, of Kiewit Infrastructure Engineers

- Guest lecture by Eric Leaming, PE of ODOT and OIT Alum on ODOT's new speed limit program for rural 2-lane highways in eastern and southern Oregon
- Klamath Falls Complete Streets Conference (collaboratively with Healthways Inc.'s Blue Zone Project)
- Blue Zones Project and the Sky Lakes Medical Center's Klamath Falls Bike/Walk to work day

Five students from OIT attended the WTS Annual Meeting in Austin, TX and the ITE Western District Annual Meeting in Albuquerque, NM. One OIT student received the WTS/CH2M National Graduate Student award at the WTS Annual Meeting.

At Portland State University, the College of Urban and Public Affairs continues to offer the Pedestrian and Bicycle Planning Lab. The source provides the opportunity to participate in a workshop-based planning process and is taught by top professionals in the field of bicycle and pedestrian planning and design. Two Portland State University students presented their research at Pro Walk Pro Bike Pro Place Conference in Vancouver, BC.

The University of South Florida chapter of LiveMove hosted a visit of Gil Penalosa, founder of 880 cities, a non-profit organization that champions the Open Streets concept. This visit included meetings with two MPO Boards, student groups, and the general public and drew 120 attendees.

- **Develop Innovative New Curriculum.**

In Year 1 and Year 2, ten education projects were awarded. Of these projects, four are completed and the remaining six projects are 56 % completed.

- Kristine Williams, University of South Florida, completed her project and established an official, permanent course in the Urban Planning Program curriculum - URP 6711 Multimodal Transportation Planning, effective this Fall. The course was also included in a new Sustainable Transportation concentration and certificate program now available to MURP and transportation engineering graduate students at USF.
- Roger Lindgren, Oregon Institute of Technology, designed a Graduate-level Civil Engineering Transportation Course
- Christopher Bone, University of Oregon, completed the design of an advanced GIS course (GEOG 491/591: Advanced GIS: Smart Transportation)
- Keith Bartholomew, University of Utah, developed the course Pedestrian and Transit Oriented Design

The six projects still in process are highlighted below.

- Charles Riley's project (Oregon Institute of Technology), Dynamic Evaluation of Transportation Structures with iPod-Based Data Acquisition, has so far been met with interest by practitioners, who see a potential in incorporating his approach into bridge inspection and evaluation practices. NITC funding made it possible for Dr. Riley to engage two Masters students in the projects, who presented the project at a national meeting.

- In the project Design for an Aging Population, Trygve Faste and Kirsten Muenchinger of the University of Oregon developed and implemented a design studio course in which students use interviews and ride-alongs to gather data that shed light on the challenges aging riders face when using buses. Students are also asked to design solutions that address the identified problems and challenges they observe. As a result, this project provides an important educational opportunity while also gathering data and developing products and services that will provide better public transportation for aging riders.
- Jennifer Dill, Portland State University, is developing a course titled Pedestrian Observation and Data Collection Curriculum designed to help students relate to travel behavior, traffic safety, urban planning and design, or civil engineering while also gaining research experience and collecting valuable data for the research and transportation community.
- Liming Wang, Portland State University, is developing the course Introduction to Scientific Computing for Planners, Engineers, and Scientists that exposes students in these disciplines to the best practices in scientific computing through hands-on lab sessions and aims to help students tackle the challenges when dealing with overwhelming amount of data that is increasingly common in these disciplines.
- Kristine Williams, University of South Florida, is currently implementing the second phase of the curriculum development at USF that introduces students to specific applications in multimodal planning that are reinforced through community project (Phase 2: Multimodal Transportation Planning Curriculum for Urban Planning Programs).
- Keith Bartholomew, University of Utah, is working with the student group Step B to establish a Graduate Certificate in Sustainable Transportation at the university with the goal of providing all residents of the Western US states access to the certificate program at Utah for in-state tuition rates.

In Year 3, the following three education projects were funded and started in the summer of 2016:

- Education-Instructional Modules for Obtaining Vehicle Dynamics Data with Smart Phone Sensors, Roger Lindgren, Oregon Institute of Technology
- Education-A Smart Bike Project for Grades 6-12, Stephen Fickas, University of Oregon
- Collaborative Regional Planning: Tools and techniques for teaching collaborative regional planning to enhance livability and sustainable transportation, Danya Rumore, University of Utah

- **Educate Professionals.**

During the reporting period, NITC supported 20 events offering 102 professional development hours. A total of 1023 people attended these events. These events are detailed below.

NITC hosted five webinars/seminars on funded research between April 1<sup>st</sup> and September 30<sup>th</sup>, 2016. The events were attended by practitioners and policymakers.

- Investigations in Transportation: Partnering Industry Professionals and Elementary Teachers in a STEM Unit of Study, 22 attendees
- Evaluation of an Electric Bike Pilot Project in Portland, Oregon, 49 attendees
- States on the Hot Seat: State Efforts to Reduce Greenhouse Gas Emissions from Transportation, 31 attendees
- Modeling the health impacts of a shift to active travel, 25 attendees
- Why Near Misses Matter, 22 attendees

Each Friday during the quarter, Portland State University holds a Friday Transportation Seminar that is open to the public. We do a live webcast of the event. The Spring semester had 416 non-student participants (primarily professionals) at either the in-person event or live webcast.

The Initiative for Bicycle and Pedestrian Innovation (IBPI) offered two different workshops on comprehensive bikeway design in July and August and a course on how to integrate bike-ped topics into university courses. These workshops were attended by 38 professionals.

The International Open Streets Summit was held August 18<sup>th</sup>-21<sup>st</sup>, 2016 at Portland State University and gave participants from around the world the opportunity to learn the techniques to fill their streets with people. During four breakout sessions, 198 participants could choose between a total of 31 different workshops that ranged in themes from inspiring community resilience, making the case for open streets to policy makers, building a movement to using different approaches to re-imaging out streets.

The Transportation and Communities Summit that took place September 8-9, 2016 on the PSU campus and was attended by 222 practitioners, policy makers, and researchers. Five different workshops were offered during the summit:

- Using Integrated Transport and Health Impacts Model (ITHIM) to integrate health impacts into transportation decision-making tools
- Enhancing bicycle and pedestrian access to transit
- PORTAL data archive workshop
- Transforming transportation impact analysis: A new vision for coordinating transportation and land development
- Livability: A strategic frame for public engagement

- **Attract and Support Undergraduate Students.**

The NITC program supports projects and initiatives that expose students to transportation concepts and careers. In Year 3, NITC funded the Transportation Undergraduate Research Fellowships (TURF) program at Portland State University. The main purpose of this program is to expose and equip engineering undergraduate students with critical thinking and research skills and tools through supervised research on topics relevant to transportation engineering and planning with a livability theme under a faculty mentor. The program enables undergraduate students to work with a faculty on a pre-approved research plan. At the end of the research program, the students will be expected to provide

a concise technical report describing research findings. Three undergraduate students were awarded a fellowship for the 2016-2017 academic year.

NITC also aims to attract and retain new undergraduate students to transportation-related degree programs and increase the number of women and students of color in these programs. Exposing these students to transportation concepts at a young age will eventually expand the workforce pool and diversity of new professionals. NITC has offered the following programs:

- *National Summer Transportation Institute Program:* The National Summer Transportation Institute (NSTI) at Portland State University (PSU) is a free two-week day camp for 15 to 25 girls entering 9th through 12th grade. The 2016 program was held from 11<sup>th</sup> July to 22<sup>nd</sup> July, and a total of 22 high school girls participated. The program provides experiential learning on transportation that supports livable communities, connects high school girls with women in transportation-related fields and attracts young women from diverse backgrounds to transportation-related course work in their higher education pursuits.
- *ChickTech Workshops:* NITC developed and hosted a workshop in May 2016 with the Portland chapter of ChickTech for high school girls interested in technology. ChickTech's high school program focuses on events that pose engineering challenges to get girls excited about technology. The program broke down stereotypes and provided opportunities to encourage girls to consider technology-based fields. Fifteen high school girls, grades 9-12, from across the Portland Metro area attended the workshop.

The workshop, led by Sirisha Kothuri (PSU research associate) and Kristina Currans (PSU civil engineering Ph.D. student), consisted of two parts focusing on transportation safety. In part one, the girls were given GIS introduction and led through some exercises that included hands on exposure to ArcGIS software. During the second part of the workshop, the girls were given a real-world transportation problem and were instructed to use the skills that they learned in part one to develop solutions. The girls were also given a walking tour of the PSU campus. The tour was designed to showcase the existing bicycle and pedestrian infrastructure.

- **Attract and Support Graduate Students.**

During the 2015-2016 academic year, NITC continued to award scholarships to support student-led research projects. To-date, NITC has awarded a total of 18 scholarships to Portland State University, two to the University of Oregon, seven to the University of Utah, seven to the Oregon Institute of Technology and two to the University of South Florida. Each student who receives a NITC scholarship develops a research product (such as a thesis or conference paper) that fits within NITC themes.

During the reporting period we awarded fellowships to the following PhD candidates:

- Kristina Currans, Portland State University, Data and Methodological Issues in Assessing Multimodal Transportation Impacts for Urban Development

- Patrick Singleton, Portland State University, Exploring the Positive Utility of Travel and Mode Choice

- **Sponsor a Transportation and Livable Communities Student Competition.**

NITC staff developed with leaders from the student groups a student video competition for the Fall of 2016. Six student teams from Portland State University, the University of Oregon, Oregon Institute of Technology, and the University of Utah submitted entries to the competition. Entries were reviewed and scored by a panel of distinguished judges from across the country, representing academic, public, and private sector professionals. The winning video was screened at the Transportation and Communities Summit, and all finalist videos are available on the NITC web site, <http://nitc.trec.pdx.edu/content/student-video-contest>.

#### *Technology Transfer*

- **Move Research into Practice.**

NITC researchers gave 34 presentations on their NITC funded research at professional and trade conferences reaching 2482 people. This research has been published in nine peer-reviewed journal articles and as three publications in trade journals.

- **Use Innovative Approaches to Communicate Research Results.**

Ten percent of visits to the NITC website was generated by social media. The majority of this traffic came through Twitter, at 54 percent. Facebook accounted for 30 percent of social media referrals. LinkedIn came in third, with seven percent. Blogger accounted for four percent of visits. Others, including Disqus, Weebly, Naver and Reddit, each accounted for less than two percent of visits. More than two thirds (69 percent) of visitors coming from Facebook were first-time visitors. LinkedIn visitors spent the longest, on average, on the site, with sessions lasting three minutes, 20 seconds. Sitewide, the average session lasted one minute, 46 seconds.

#### *Collaboration*

- **Collaborating within our consortium.**

The Executive Committee met at the University of Utah on June 21<sup>st</sup>, 2016. A combined NITC Advisory Board and Executive Committee meeting was held on September 8<sup>th</sup>, 2016 at Portland State University. Most members participated in person, a few connected via conference call.

- **External collaboration.**

The following people and organizations were members of the NITC Advisory Board during this reporting period:

Alan Lehto, Director of Planning & Policy, TriMet

Michael Baltes, ITS Program Manager, Office of Mobility Innovation, Federal Transit Administration

Michael Bufalino, Research Section Manager, Oregon Department of Transportation

Wendy Cawley, Traffic Safety Engineer, Portland Bureau of Transportation

Tyler Deke, Executive Director, Bend MPO



Susan Handy, Director, National Center for Sustainable Transportation  
Matthew Hardy, Program Director, Policy and Planning, AASHTO  
Susan Herbel, Principal, Cambridge Systematics  
Craig Honeyman, Legislative Director, League of Oregon Cities  
Cameron Kergaye, Director of Research, Utah DOT  
Wayne Kittelson, Founding Principal, Kittelson & Associates, Inc.  
Ted Knowlton, Sustainability Director, Wasatch Front MPO  
Brian Lagerberg, Director, Public Transportation Division, WSDOT  
Alan Lehto, Director of Planning & Policy, TriMet  
Ivan Marrero, Division Administrator, Utah Division, Federal Highway Administration  
Gabe Rousseau, Safety Operations Team Leader, FHWA  
Brian Saelens, Professor of Pediatrics and Psychiatry & Behavioral Sciences, Seattle Children's Hospital  
Tom Schwetz, Planning & Development Manager, Lane Transit District  
Ted Trepanier, Director of Product Management, Traffic, Inrix  
Yinhai Wang, Director, PacTrans

### *Diversity*

- **Attract underrepresented students to transportation careers.**

One of the key objectives of the 2016 NSTI summer program is to attract underrepresented students to transportation careers. The partnership with Oregon MESA is critical in developing an outreach plan to attract young women and students of color. The weeklong residential program was at no cost to the participants in order to reduce any financial barrier to participation. NITC's partnerships with WTS Portland and ChickTech focuses on attracting female students to the transportation workforce. NITC also provides grants to faculty who wish to include an underrepresented, undergraduate student in their research project.

For this reporting period, NITC also awarded a diversity grant to an underrepresented student who has greatly contributed to an ongoing NITC project at the University of Southern Florida. The grant allowed the student to continue working on the project during the summer months.

- **Priority funding to research with an equity focus.**

Two of our Year 1 projects address equity issues. The research project 'Encouraging Low-Income Households to Make Location-Efficient Housing Choices' and 'Developing a model for Transit Oriented Development in Latino Immigrant Communities' and are completed.

Five of the Year 2 projects address equity issues. These research projects include:

- Integrating Title VI and Equitable Investment in Transportation Alternatives into the MPO Transportation Planning Process
- Racial Bias in Drivers' Yielding Behavior at Crosswalks: Understanding the Effect
- What do we know about Location Affordability in U.S. Shrinking Cities?
- Evaluating Efforts to Improve the Equity of Bike Share Systems

- Planning ahead for livable communities along the Powell-Division BRT: neighborhood conditions and change

One of the Year 3 projects addresses equity issues.

- Evaluating and Enhancing Public Transit Systems for Operational Efficiency, Service Quality and Access Equity

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

The NITC researchers gave 34 presentations at conferences and reached nearly 2482 fellow academics, practitioners and policy makers. Nine articles have been published in peer-reviewed journals and three have been published in trade journals.

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

Expected highlights for the next reporting period include:

- Selection of Fall 2016 Dissertation research awards
- Continue publishing Year 1 & 2 research reports
- Promote NITC final reports through social media and webinars
- Identify and implement specific research results with partner agencies
- Organizing the 2017 Transportation and Communities Summit
- Host 2017 National Summer Transportation Institute (NSTI)

## **2. PRODUCTS: What has the program produced?**

### **Publications, conference papers, and presentations**

To date, 34 presentations on NITC National research reaching 2482 people have been given at professional and trade conferences. A total of nine articles have been published in academic journals and three papers have been published in trade publications.

### **Website(s) or other Internet site(s)**

The website for NITC is located here: <http://nitc.us>

### **Technologies or techniques**

Sean Barbeau, University of Southern Florida, in his project Rapidly Expanding Mobile Apps for Crowd-sourcing Bike Data to New Cities developed a proof of concept that represents the first steps towards helping to overcome the barriers to wide-scale adoption of bike data crowd-sourcing mobile apps by creating a proof-of-concept “multi-region” architecture that allows cities to share the same set of mobile apps on the respective apps stores while setting up their own server specific to their geographic area. This solution can reduce the cost of deployment by leveraging the mobile apps that already exist, rather than each city needing to modify and launch its own version of the app.

Lisa Bates and Aaron Golub, Portland State University, have been engaging with a variety of stakeholders as part of her project Planning ahead for livable communities along the Powell-Division BRT: Neighborhood conditions and change. They expect that their work

will inform the debate around housing impacts, policies to protect or expand affordable housing in the corridor, and the transportation needs in this corridor and have noted that some of their work has shaped the conversation around the need for additional service in the corridor. They also expect their data analysis to be relevant to understanding housing and transportation issues in the Powell Division corridor, but also to other corridors under development in Portland.

A new activity resulting from this project is an ongoing attempt to link housing displacement with greenhouse gas emissions via models of transportation. With matching funds from the Bullitt Foundation, Drs. Bates and Golub created a model of predicted household moves based on their income and housing needs. Households are likely to move based on their own characteristics, changes in the housing stock, and overall shifts in neighborhoods as gentrification occurs or deepens. Using logistic modeling to create predicted probabilities for household moves, they were able to assign population shifts to TAZ geographies. At this time, the City of Portland and Metro are using these estimates to assess how household moves affect transportation choices and therefore greenhouse gas emissions. This connection would add to practice by including an environmental sustainability component to considerations of housing locations and the displacement of low-income people. This is particularly relevant in light of the fact that their project found increased displacement for some household types near transit stops.

#### **Inventions, patent applications, and/or licenses**

Nothing to report for this period.

#### **Other products**

Nothing to report for this period.

### **3. PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS: Who has been involved?**

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

The members of the consortium include Portland State University, University of Oregon, Oregon Institute of Technology, University of Utah, and the University of South Florida. Each NITC-funded research project is required to have 120% match; other projects require a 100% match. Match partners for Year 1, Year 2, and Year 3 projects include the following:

American Automobile Association  
Caltrans  
City of Cambridge  
City of Chicago  
City of Eugene  
City of Flagstaff  
City of Los Angeles  
City of Oakland  
City of Seattle

City of Tigard  
Cleveland State University  
District of Columbia Department of Transportation  
Florida Department of Transportation  
Hillsborough County MPO  
Institute of Sustainable Solutions (Portland State University)  
Intel  
Lane Transit District  
NACCO Industries  
Natural Resources Defense Council  
Oregon Department of Transportation  
Oregon METRO  
People for Bikes  
Portland Bureau of Planning and Sustainability  
Portland Bureau of Transportation  
SRAM  
Summit Foundation  
Tampa Bay Network to End Hunger  
Transportation for America  
TriMet  
University of Arizona  
University of Colorado, Denver  
Utah Department of Transportation  
Utah Transit Authority  
Vancouver Housing Authority  
Wasatch Front Regional Council  
Washington County

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

Many NITC researchers are also working closely or are supported in their research efforts by a variety of stakeholders above and beyond match partners. This includes non-profit organizations, private industry, public agencies, research centers, or other university partners. Below is a list of these partners.

Bedford Stuyvesant Restoration Corporation in Brooklyn, New York  
Bicycle Product Suppliers Association (BPSA)  
Bicycle Transportation Alliance  
Chicago Department of Transportation  
City of Arlington, VA  
City of Gresham, OR  
Cleveland Regional Transit Authority  
Community Cycling Center  
Department of Land Conservation and Development (DLCD)  
GTFS-realtime communities (online community)  
Land Conservation Development Commission (LCDC)  
Mark O. Hatfield School of Government Center for Public Service (PSU)

National Park Service, Zion National Park  
Oregon Modeling Collaborative (OMC)  
Philadelphia IndeGO Bike Share  
Portland Business Alliance  
Portland Development Commission  
Robert F. Bennett Institute for Transportation and Development  
Sacramento Area Council of Governments (SACOG)  
San Francisco Public Health Department  
Sustainable Cities Initiative  
Toole Design Group  
Town of Rockville  
Town of Springdale  
Twin Cities Metropolitan Council  
University of Idaho  
University of Wisconsin at Milwaukee  
Venture Portland

Robert Zako's (University of Oregon) project Effectiveness of Transportation Funding Mechanisms for Achieving National, State, and Metropolitan Economic, Health, and Other Livability Goals is getting interest from around the country. In addition to the state DOTs and MPOs Dr. Zako and his research team are studying, the (national) State Smart Transportation Initiative, the (Michigan-based) Mackinac Center for Public Policy, and others are interested in seeing their findings and recommendations for best practices.

#### **4. IMPACT: What is the impact of the program? How has it contributed to transportation education, research, and technology transfer?**

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

Nothing to Report for this period.

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

NITC continues to lead the education of the current and next generation of bicycle and pedestrian professionals. There is widespread recognition that transportation planning and engineering courses lack multimodal topics, and traditionally focuses on the design of the transportation for vehicles. The bike-ped topics workshop trains university faculty to help them expand their curriculum to include multimodal topics. This is essential to helping update outdated curriculum.

For current professionals, NITC's support of continuing education workshops for transportation professionals who work on bicycle and pedestrian transportation is another way of ensuring that the latest research results get into the hands of practitioners. For example, much of the applied research relating to bicycle infrastructure safety and similar topics are directly shared with practitioners in these workshops who then use this information to help design better bicycle facilities in their communities.

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

Charles Riley, Oregon Institute of Technology, has used NITC funding to purchase a APS Dynamics ElectroSeis Linear Shaker and Control System that will allow him to pursue current as well as future research on structure health monitoring. His current research focuses on developing a wireless sensor network at bridges that links to a central data collection system and provides ongoing information about the structural health of a bridge. This particular piece of equipment builds on Dr. Riley’s previous work to produce an iPod-based sensor network and ensures that this sensor network can be used effectively to reach the goal of the project: to most accurately measure structure dynamic parameters. This equipment may also be used in future collaborations with PSU (Thomas Schummacher) and the University of Alaska Anchorage as structural health monitoring research is expanded with partner institutions. It will also be incorporated into classroom instruction.

**What is the impact on technology transfer?**

During the reporting period, NITC supported 20 events that offered 102 professional development hours. A total of 1023 people attended these events. These events included three webinars that focused on highlighting NITC research, which accounted for three professional development hours and were viewed by 102 professionals.

**What is the impact on society beyond science and technology?**

Nothing to Report for this period.

**5. CHANGES/PROBLEMS**

**Changes in approach and reasons for change**

Nothing to Report for this period.

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

Nothing to Report for this period.

**Changes that have a significant impact on expenditures**

Nothing to Report for this period.

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

Nothing to Report for this period.

**Change of primary performance site location from that originally proposed**

Nothing to Report for this period.

**Additional information regarding Products and Impacts**  
Nothing to Report for this period.