Program Progress Performance Report for University Transportation Center at

Portland State University

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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 (Oregon Tech), 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 503-725-2855
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Table of Contents

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?

The following progress was made under each of the above state goals.

Research

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

Thirteen projects were selected for **NITC National Year 1** funding. Of these projects, eleven projects have been completed and published on NITC's website. One project is still in progress (80% completed). One project was cancelled, because the PI passed away and the necessary expertise was not anymore available at the university to complete the project (Appendix, Table 1).

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

Sixteen projects were selected for **NITC National Year 2** funding. Of the funded projects, 14 projects have been completed and published on NITC's website, and one project is currently prepared for publication. The remaining project is still active and 85% complete (Appendix, Table 2).

Four Small Starts projects were funded, and all projects have been completed and published on NITC's website (Appendix, Table 2).

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

Ten of the 11 projects funded **in Year 3** have been completed. Seven reports have been published, and three reports are currently in peer review. One project is still active and 60% completed (Appendix, Table 3).

Both Small Starts projects selected in Year 3 have been completed with one published and the second one is under peer review (Appendix, Table 3).

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

The pooled fund project, **Contextual Guidance at Intersections for Protected Bicycle Lanes (Chris Monsere, PSU),** is 95% complete and the research team is currently finalizing the report the project.

The project set out to identify contextually appropriate, safe, and comfortable designs for intersection locations, for planners and engineers. The research team employed a combination of user surveys and simulations to anticipate expected bicyclist and turning vehicle interactions and bicyclist comfort based on design type and volumes. A total of 277 respondents rated 26 video clips showing cyclists riding through a variety of intersections, for a total of 7,166 ratings. Surveys were conducted at four locations in three states, including urban and suburban locations in Oregon, Minnesota and Maryland.

Findings suggest that, of the design types tested, cyclists experience the highest expected comfort level at bicycle signals and protected intersections. Next are designs that maintain separation but bend-in toward the turning vehicle lane, which increases visibility and reaction time for cyclists. The comfort level of cyclist at intersections with designs types such as the "bend-in" approach are quite sensitive to turning vehicles, with expected comfort levels decreasing substantially at higher-turning volume locations. Designs that force cyclists to merge or cross vehicle travel lanes upstream of intersections, such as mixing zones, lead to the lowest expected comfort; the ability of these designs to attain acceptable comfort thresholds may depend on turning vehicle volumes and design elements that maximize cyclists and motorist visibility, as well as establishing designated (and preferably protected) lane locations for bicyclists upon crossing the turning vehicle lane.

This project will provide valuable information to cities as they seek to include comfort-based factors into design selection criteria – an endeavor that may be essential to attracting the coveted interested but concerned riders.

Leadership

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

Jennifer Dill, PSU, is a member of a multidisciplinary, multinational research team exploring 'Safer cycling in the urban road environment.' This June, she traveled to the University of Melbourne, the lead on the project, to review and discuss project findings. Professor Dill also spoke at Clark County Commission on Aging Meeting (Aug. 21, 2018 Vancouver, WA)

focusing on how walking and biking can contribute to healthy aging by improving seniors' mobility, access to services, and physical and mental health.

NITC researchers Keith Bartholomew and Reid Ewing, UU, published the book, Best Practices in Metropolitan Transportation Planning, which discusses how innovative MPOs are tackling equity and social justice.

Additional updates are included in the FAST Act PPPR.

- **Serve on national committees and panels.**
  - Faculty members and students currently hold 57 TRB volunteer memberships, including 42 memberships on committees/task forces and 15 on NCHRP/SHRP2/NCFRP/TRB panels. Two faculty members serve as Chair on a panel or committee.
  - Forty-five NITC faculty and staff serve on editorial, policy and other advisory boards.
  - NITC staff are active in the AASHTO-RAC liaison group.
  - NITC's Director, Jennifer Dill, serves on the Board of Trustees for the Transit Center and on the Board of Advisors, UC Davis Institute of Transportation Studies.

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

Due the large number of bridges in Oregon that cannot withstand a significant earthquake, the **Oregon Department of Transportation (ODOT)** is interested in innovative retrofits to make them more resilient. **Peter Dusicka (PSU)** has developed a design retrofit and is working with ODOT to demonstrate the concept on an actual bridge.

Kristin Tufte (PSU) and **John MacArthur (PSU)** were instrumental in developing the Regional Smart Cities Action Plan for the Portland Metro area. They convened and facilitated meetings, engaged stakeholders in and outside these meetings, and offered critical guidance in the areas of their expertise.

Education and Workforce Development

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

NITC universities offer **11 bachelor**, **15 graduate** and **6 PhD degrees** in transportation, closely related fields as well as **seven dual degree** options. Two of the degree programs offered by the University of Utah receive support from the Mountain Plains Consortium.

- **Provide Experiential Learning.**

Our campuses incorporate education with access to community partners and employment opportunities. This is primarily supported through student groups and student scholars. During this reporting period, this grant supported PSU's student group. The other NITC student group activities are included in the NITC FAST Act PPPR.

The **PSU student group, STEP**, hosted numerous events and supported student attendance at conferences.

Events:

- National APA Conference Recap. Two STEP members presented about their experience at the National APA Conference. (27 students)
- Spring Bike Facilities Tour. Students were led on a bicycling tour of of Portland to learn about the infrastructure that makes Portland rank consistently as one of the best bike cities in America. (12 students)
- Spring Movie Social. Students watched Oregon Experience: the Streetcar city while enjoying lunch. After movie discussion spanned from the history of streetcar to the transit enhancement and policy issues revolving around the same. (24 students)
- Maseeh College of Engineering and Computer Science (MCECS) End of the Year BBQ. The aim of event was for the students of MCECS to learn about the different clubs and help with club events' participation numbers. STEP among other clubs had a table describing the width of events we cover and possible involvement that could happen. (100 students)
- Board Game Fun time. A board game evening based on transportation games. (22 students).

Conferences:

- ITE Western District Annual Meeting (4 students): Students presented on the bike share and transit integration project and attended the ITE Student Chapter Leaders' meeting. They also participated in the ITE Western District traffic Bowl and won the 3rd place (figure 1).
- National APA Conference. (1 student)
- International Conference on Travel Behavior Research. (1 student)
- ITE International Annual Meeting. (1 student) A student represented presented on the work done on bike share and transit integration project.

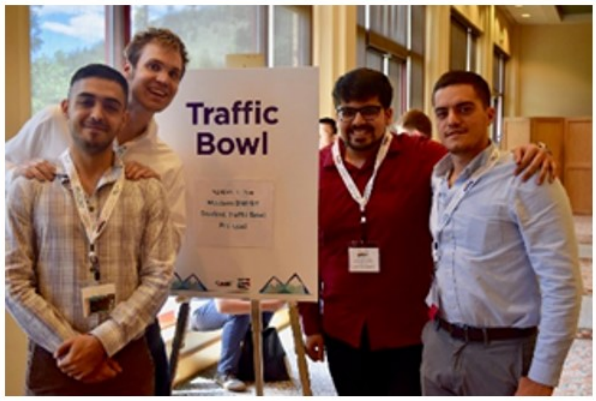

Figure 1. STEP students attending the ITE Western District Annual meeting (Mostafa Khademi Moughari, Joseph Totten, Darshan Chauhan, David Soto Patin I. to r.).

- **Develop Innovative New Curriculum.**

NITC funded 13 education projects. All projects have been completed and eleven of these projects developed curriculum that was published on NITC's website (Appendix, Table 4).

These projects fill a curriculum gap or offer innovative ways to teach specific topics:

- Multimodal planning is a fast-growing field and university course materials are often derived from an older, auto-centric system. **Two funded projects** (Kristine Williams, USF) develop curriculum for multimodal transportation planning and its role in advancing livability and related objectives. Curriculum developed under this project

was designed for integration into university urban planning programs, but is also relevant to graduate-level engineering and architecture/community design programs.
- The project **Pedestrian Observation and Data Collection Curriculum** (Jennifer Dill, PSU) synthesizes new and available and new curriculum to help educators integrate Pedestrian curriculum in their teaching.
- **A Smart Bike Project for Grades 6-12**, (Stephen Fickas, UO) uses YouTube videos developed by students for students to teach how to develop and program a bike box that can be used to trigger a street light remotely.
- **Collaborative Regional Planning: Tools and techniques for teaching collaborative regional planning to enhance livability and sustainable transportation**, a project designed for teaching collaborative planning to students and practitioners, it has become significant traction regionally. The PI, Danya Rumore (UU), has received significant interest for the curriculum and is now developing a webpage with a local partner that will house it.
- The field collection of vehicle dynamic response is a topic not usually found in undergraduate programs, and not all that common in graduate-level electives. This **Instructional Modules for Obtaining Vehicle Dynamics Data with Smart Phone Sensors**, (Roger Lindgren, Oregon Tech) This project supports coursework development at both the undergraduate and graduate level by the creation of field laboratory modules related to vehicle operating dynamics with the use of smartphone/iPod technology.
- The project, **Dynamic Evaluation of Transportation Structures with iPod-Based Data Acquisition** (Charles Riley, Oregon Tech), uses a new and innovative way to teach and evaluate bridge infrastructure.

- **Educate Professionals.**

As NITC is starting to close out this grant, activities and events that focus on educating professionals are detailed in NITC's FAST Act PPPR.

- **Attract and Support Undergraduate Students.**

These activities are detailed in NITC's FAST Act PPPR.

- **Attract and Support Graduate Students.**

NITC awards scholarships to fund student-led research projects and professional development activities. During this reporting period, NITC awarded **28 scholarships** to PSU students. The rest of the activities are detailed in NITC's FAST Act PPPR.

NITC funded **four Ph.D. fellowships**. Three dissertation fellows have successfully defended their dissertation in the spring and summer of 2017. They have moved on to tenured track positions at the University of Arizona (Kristina Currans), Texas A & M University (Tara Goddard), and Utah State University (Patrick Singleton). The fourth fellow, Steven Howland, is expected to defend his dissertation in early 2019.

Technology Transfer

- **Move Research into Practice.**

During this reporting period, researchers gave **4 presentations** at conferences, workshops, and webinars **reaching 284 people**. This research was also published in **2 peer-reviewed journal articles** and **1 publication** in trade journals.

NITC solicits input from practitioners, who downloaded final reports from NITC's website to assess if the reports meet the needs of professionals. During this reporting period, 313 practitioners downloaded final reports from NITC's website. Of the 34 practitioners, who responded to our survey requests, 85% (29) rated the final reports as useful and 82% (28) reported that the content of the report will help them make decisions about practice. For example, a Transit Planner for Cherriots, a public transit operator in Salem, Oregon, is planning to work with the researcher **Ran Wei** to integrate her methodology developed as a result of her research into the performance reporting for their transit system.

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

Compared to the previous six-month period, the NITC website has seen a significant increase in web traffic:

  - Overall, there was a **7% increase** in number of visitors to our site, which indicates we are reaching a broader audience.
  - The people visiting our NITC website are also spending more quality time reading content, as the "number of sessions" has increased 5.1%.
  - The NITC website continues to attract an **international audience**, as the visitors from the U.S. comprise only 77% of the total. Our most notable international reach is with France, Canada, Brazil, India, China, and Australia.

Most significantly, visitors are entering the site from the NITC News pages that shares the stories behind the research and people. We saw a 30% increase in users arriving to the site via our staff-written news stories.

Collaboration

- **Collaborating within our consortium.**

These activities are detailed in NITC's FAST Act PPPR.

- **External collaboration.**

The following people and organizations were members of the NITC Advisory Board:

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
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.**

These activities are detailed in NITC's FAST Act PPPR.

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

Eight projects directly address equity issues:

- Encouraging Low-Income Households to Make Location-Efficient Housing Choices Developing a model for Transit Oriented Development in Latino Immigrant Communities *(published)*
- Planning ahead for livable communities along the Powell-Division BRT: neighborhood conditions and change *(published)*
- What do we know about Location Affordability in U.S. Shrinking Cities? *(published)*
- Integrating Title VI and Equitable Investment in Transportation Alternatives into the MPO Transportation Planning Process *(published)*
- Racial Bias in Drivers' Yielding Behavior at Crosswalks: Understanding the Effect *(published)*
- Evaluating Efforts to Improve the Equity of Bike Share Systems *(3 reports published)*
- Evaluating and Enhancing Public Transit Systems for Operational Efficiency, Service Quality and Access Equity *(published)*
- The Use of Mt. Mazama Volcanic Ash as Natural Pozzolans for Sustainable Soil and Unpaved Road Improvement *(published)*

How have the results been disseminated?

During this reporting period, NITC published nine final reports of funded research. NITC also created 8 Executive Summaries that distill a project's premise, key findings and recommendations into a brief document. Nineteen NITC research stories were featured in local and national news outlets. NITC research resulted in publications in four peer-reviewed journals and one trade publication. NITC researchers gave four presentations at conferences that reached nearly 284 practitioners, fellow academics, and policy makers.

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

Expected highlights for the next reporting period include:

- Complete all remaining active projects

- Publication of remaining research reports
- Promote NITC final reports in newsletters, through social media, and webinars
- Identify and implement specific research results with partner agencies

2. PRODUCTS: What has the program produced?

Publications, conference papers, and presentations

A total of **51 final reports** have been published to NITC's website and PDX Scholar, PSU's online archive for scholarly publications. The research was also published as **30 peer-reviewed articles** in academic journals and **8 white papers** in trade publications or on professional or agency websites that have been cited **93 times**. In addition, **103 presentations** on NITC National research reached an **audience of 14,384** people at various venues, including professional and academic conferences.

Website(s) or other Internet site(s)

NITC continues to leverage our strong social media presence to promote the results of our research and tech transfer events as well as raise awareness of important transportation issues and findings nationwide. Our followers on these platforms have increased steadily:

- **NITC website:** Updated daily, the website provides comprehensive information about our center and complete research portfolio. This includes stories about our research, press coverage, tech transfer resources, professional development events, and opportunities for students.
- **Twitter (2973 followers, +118):** We promote NITC-sponsored research, publications, reports, and events while also uplifting the activities of fellow UTC's. We also share news from NITC consortium members, including achievements of students, student group activities, and ongoing projects.
- **Facebook (655 followers, +36):** In addition to sharing NITC research, a significant focus of Facebook is to share photos of NITC-sponsored our events and to connect with other organizations, researchers, and practitioners.
- **YouTube (504 subscribers, +61):** To reach a broader audience, we publish freely accessible video recordings of our weekly seminars and monthly webinars, as well as promotional videos.
- **LinkedIn (129 followers, +49):** We target transportation professionals to share tools, practical information, and our latest studies.
- **Flickr:** An archive of photo collections from events we hosted or attended, most notably used to showcase the presence of NITC researchers and students at the annual meeting of TRB.
- **Instagram (217 followers):** The newest platform to our strategy, we use it to showcase the people behind the research and put a face to our center. Instagram has provided a high level of engagement.

Technologies or techniques

The project **Evaluating and Enhancing Public Transit Systems for Operational Efficiency, Service Quality and Access Equity** developed a new tool that introduces techniques that can evaluate operational efficiency and equitable access holistically, providing a comprehensive assessment for transit service performance. The interdisciplinary team, Ran Wei (University of California, Riverside) and Thomas Cova (UU) Liming Wang and Aaron Golub (PSU) developed a comprehensive framework and an open-source toolbox for evaluating the overall performance of public transit systems.

The **open-source toolbox** is accessible to transit planners, decision makers and the public. The toolbox can be accessed and downloaded on its **GitHub site.** This tool can be used to measure the total performance of passenger travel modes, which are a major contributor to both national and local economies. Outcomes will help researchers, policymakers, and practitioners support targeted investments to improve the experience of the traveling public.

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?

Each NITC-funded research project is required to have 120% match; other projects require a 100% match. Match partners for projects funded to date 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 (PSU)
Intel
Lane Transit District
OPAL Environmental Justice Oregon
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

NACCO Industries
Natural Resources Defense Council
Wasatch Front Regional Council
Washington County

Have other collaborators or contacts been involved?

NITC researchers work 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
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 Milwaukie
Venture Portland

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?

The collaboration between **Civil Engineering (CE)** and **Social Work (SW)** has become well established at UTA thanks to the leadership of **Stephen Mattingly (CE), Noelle Fields (SW),** and **Courtney Cronley (SW).** They continue to draw more colleagues and students into their cross-disciplinary circle by using their work and relationship as a model to demonstrate the efficacy and benefits of cross-disciplinary research.

Amy Parker, PSU, the coordinator of PSU's Orientation and Mobility Program under the Graduate School of Education, is leading the way in creating new and innovative ways to address mobility needs of people with disabilities. She has established a partnership with TriMet, the local transit agency, with the ultimate goal of creating urban environments that are designed for all ages and abilities.

Marc Schlossberg and **Heather Brinton (UO)** are combining their expertise in planning and law to address the need for developing codes and policies that address the possible impacts of autonomous vehicles on cities**.**

The above information is also included on NITC's FAST ACT PPPR

What is the impact on the transportation workforce development?

The skills and knowledge of the current transportation workforce needs to keep pace with the changing times. NITC has made significant impacts training the current transportation workforce in several areas:

- **Bicycle design and planning.** Few professionals responsible for designing bikeways were taught bicycle design or planning in their undergraduate or graduate education. PSU's bicycle-focused workshops provide hands-on training for professionals to directly apply to their community. A participant that attended the summer course noted, "I have already applied what I have learned to a new bikeway that is in the early phase of design and I expect to apply more of what I have learned to other upcoming projects."

- **Transportation data.** The transportation system is generating more data than ever, and professionals need to understand how to sort, digest, synthesize and visualize these data to make sense of their meaning. NITC attempts to address this with skills-based workshops that help professionals learn techniques such as R and data analysis techniques to make more meaningful use of their data. One participant in the R workshop stated that they would use their training to "build interactive dashboards using dynamic data to pull and clean data from database servers." In our data analysis workshop, another mentioned that, "I hope to more competently and confidently discuss the use and analysis of statistics in the reports I prepare at work."

- **Emerging technologies and new mobility.** NITC plays a significant role in helping to convene and lead conversations on the impact of emerging technologies and new mobility on the workforce. We continue to work with our partners across our communities such as through Urbanism Next.

The above information is also included in NITC's FAST ACT PPPR.

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

PSU launched **two new university research centers** focused on solving some of Portland's biggest challenges. TREC and NITC were models for these new centers and we will be collaborating with them on projects The PSU **Homelessness Research & Action Collaborative** will focus on combating homelessness by understanding its root causes and using evidence-based science. The PSU **Digital City Testbed Center** will examine the benefits technology brings to the city, while also addressing concerns about privacy, security, and equity. This center will also function as a test bed where cities, companies, university

researchers and the public will be able to evaluate new technologies before installing them in neighboring communities.

The **UO** established the **new Urbanism Next Center**, which explores the secondary effects of autonomous vehicles, e-commerce, and the sharing economy on the form and function of cities. This new center is part of the **UO's Sustainable Cities Initiative**, which was previously established with the help of NITC seed funds. The Urbanism Next Center held its first national conference in May 2018, drawing over 500 people from the private, public, educational, and non-governmental sectors. Center staff are already busy working with cities across the U.S. to help them proactively understand the secondary impacts of these transformative technological changes on local government finance, land use and transportation systems, street design and curb management, greenhouse gas impacts, equity and health.

Oregon Tech now serves as the host for the new **Oregon Manufacturing Innovation Center Research and Development (OMIC R&D)**. The center brings together manufacturing companies and higher education in an innovation environment where applied research with faculty and university students solves real problems for advanced manufacturers while training the next generation of engineers and technologists.

UO, Oregon Tech, and UA added new faculty to their teams. **UO** hired **Anne Brown** as a new tenure-track transportation faculty member, who joined the School of Planning, Public Policy and Management. Professor Brown brings expertise in equity, shared and innovative mobility, travel behavior, and transportation finance. **Oregon Tech** welcomed **Erin Cox**, an Environmental Engineer, as a new tenure-track assistant professor to its engineering department. At **UA, Nicole Iroz-Elardo** joined the College of Landscape Architecture & Planning as a research assistant professor. Professor Iroz-Elardo is cross-trained in planning and public health, and her research focuses on how to plan healthier and more equitable communities. She is also a former OTREC scholar.

The above information is also included on NITC's FAST ACT PPPR.

What is the impact on technology transfer?

The Transportation & Communities Academy (TCA) has great impact on transferring knowledge to professionals in a way that they can implement directly to policies, practices, designs or their work. Post-TCA survey shows that 81% (62) expect that they will use learned content in practice (e.g., apply at work or communicate to work teams, peers, or stakeholders.

Building on previous research, Chris Monsere (PSU) and David Hurwitz (OSU) worked on understanding the potential for using a flashing yellow arrow (FYA) for right turn movements. The research offers specific updates to the Oregon Department of Transportation documents, policies and manuals to put into practice the use of the FYA.

The 2018 AASHTO Bike Guide includes significant updates from the previous guide and is informed by research on protected bike lanes from NITC researchers Christopher Monsere, Jennifer Dill, and Nathan McNeil (PSU).

Our work has been instrumental in helping to infuse equity into civil engineering and planning that will ultimately help equalize the pedestrian experience for everyone. For example, one of the workshops offered at TCA focused on how to use the dual lenses of equity and universal accessibility when designing pedestrian infrastructure. Through exercises and storytelling, participants learned how to integrate pedestrian safety, equity, and accessibility at each of the phases of project development, from planning through design to construction. PSU will continue that conversation at Mobility Matters 2019, a summit that will focus designing systems that support access for all people.
The above information is also included on NITC's FAST ACT PPPR.

What is the impact on society beyond science and technology?

Electric bicycle (e-bike) use is a rising phenomenon in North America, as a growing number of manufacturers produce a variety of bicycles that can accommodate the needs of diverse populations. However, little research has been conducted on e-bikes within North America, especially on the individuals who have purchased e-bikes. The NITC study "**National Electric Bike Owner Survey**" examined if e-bikes have the potential to overcome many common barriers to bicycling. Results suggest that e-bikes reduce the physical demands on the rider and encouraging more people to replace car trips with bike trips. This research has garnered significant interest since it was published in March 2018. The final report has been downloaded 248 and eight articles were published in a variety of news outlets, including the *Washington Post*. As an e-bike manufacturer puts it: "*This report has helped us understand more about our target market and will give us real evidence in making our argument for why folks should embrace the electric bike*." He intends to use findings from the study to market his products.

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.

6. Additional information regarding Products and Impacts

Nothing to Report for this period.

APPENDIX

Table 1. List and Status of Year 1 Research Projects.

NITC Grant	Project	Status
General Research	Changing attitudes toward sustainable transportation: The impact of meta-arguments, David Sanbonmatsu and David Strayer, UU	Published
	Developing a model for Transit Oriented Development in Latino Immigrant Communities: A National Study of Equity and TOD, Gerardo Sandoval, UO	Published
	Do TODs make a Difference? Phase 2, Arthur Nelson and Reid Ewing, UU, and Jenny Liu, PSU	Published
	Encouraging Low-Income Households to Make Location-Efficient Housing Choices, Andree Tremoulet, PSU	Published
	Improving Trip Generation Methods for Livable Communities, Kelly Clifton, PSU and Nico Larco, UO	Published
	Integrating Freight into Livable Communities, Kristine Williams, USF	Published
	Metropolitan Centers: Evaluating local implementation of regional plans and policies, Richard Margerum and Rebecca Lewis, UO, and Keith Bartholomew, UU	Published
	Modeling and Analyzing the Impact of Advanced Technologies on Livability and Multimodal Transportation Performance Measures in Arterial Corridors, Miguel Figliozzi, PSU	Published
	Rapidly Expanding Mobile Apps for Crowd-sourcing Bike Data to New Cities. Sean Barbeau, University of South Florida	Published
	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	Published
	Improving Bicycle Crash Predictions, Sirisha Kothuri, Portland State University	Published
	Creating Livable Communities through Connecting Vehicles to Pedestrians and Cyclists, John MacArthur, Portland State University	Active
	Generalized Adaptation of an Electric-Hydraulic hybrid drive system, James Long and David Culler, Oregon Institute of Technology	Cancelled

Table 2. List and Status of Year 2 Research Projects.

NITC Grant	Projects	Status
General Research	Integrating Title VI and Equitable Investment in Transportation Alternatives into the MPO Transportation Planning Process, Kristine Williams, USF, and Aaron Golub, Lisa Bates and Liming Wang, PSU	Published
	Planning Ahead for Livable Communities Along the Powell-Division BRT: neighborhood conditions and change, Lisa Bates and Aaron Golub, PSU	Published
	How Does Transportation Affordability Vary Between TODs, TADs, and Other Areas, Brenda Scheer and Reid Ewing, UU	Published
	Impacts of Bus Rapid Transit (BRT) on Surrounding Residential Property Values, Victoria Perk and Martin Catala, USF	Published
	What Do We Know About Location Affordability in U.S. Shrinking Cities? Joanna Ganning, UU	Published
	The Economic and Environmental Impacts of Smart-Parking Programs, Nicole Ngo, UO	Published
	Racial Bias in Drivers' Yielding Behavior at Crosswalks: Understanding the Effect, Kimberly Barsamian Kahn, PSU	Published
	Building Planner Commitment: Are Oregon's SB 1059 & California's SB 375 Models for Climate-Change Mitigation? Keith Bartholomew, David Proffitt and Reid Ewing, UU	Published
	Evaluation of roadway reallocation projects, Miguel Figliozzi, PSU	Published
	Evaluating Efforts to Improve the Equity of Bike Share Systems, Nathan McNeil, John MacArthur and Jennifer Dill, PSU	Published
	Effectiveness of Transportation Funding Mechanisms for Achieving National, State, and Metropolitan Economic, Health, and Other Livability Goals, Rob Zako and Rebecca Lewis, UO	Published
	Addressing Bicycle-Vehicle Conflicts with Alternate Signal Control Strategies, Sirisha Kothuri, Christopher Monsere, PSU, Krista Nordback, UNC, and Ed Smaglik, NAU	Published
	Framing Livability: A Strategic Communications Approach to Improving Public Transportation in Oregon, Deb Morrison, Kelli Matthews and Nico Larco, UO	Published
	Understanding the Economic Impacts of Urban Greenway Infrastructure, Jenny Liu, PSU	Published
	Multimodal Trip Generation, Vehicle Ownership and Use: Characterizing The Travel Patterns of Residents of Multifamily Housing, Kelly Clifton, PSU	Active
	Incorporate Emerging Travel Modes in the Regional Strategic Planning Model (RSPM) Tool, Liming Wang, Kelly Clifton and Jennifer Dill, PSU	Completed, in copy edits
Small Starts	Narratives of Marginalized Cyclists: Understanding Obstacles to Utilitarian Cycling Among Women and Minorities in Portland, Oregon, Amy Lubitow, PSU	Published
	Travel to Food: Transportation Barriers for the Food Insecure in Tampa Bay, Kevin Salzer, USF	Published
	Active and Public Transportation Connectivity between North Temple TOD and Jordan Park River Trail, Ivis Garcia Zambrana, UU	Published
	How Do Stressed Workers Make Travel Mode Choices That Are Good For Their Health, Safety, and Productivity? Liu-Qin Yang, PSU	Published

Table 3. List and Status of Year 3 Research Projects.

NITC Grant	Projects	Status
General Research	Does Compact Development Increase or Reduce Traffic Congestion? Reid Ewing, UU and Shima Hamidi, UTA	Published
	Electric Bicycle Nationwide Survey, John MacArthur, PSU, and Christopher Cherry, UT	Published
	Rapid Transportation Structure Evaluation Toolkit, Charles Riley, Oregon Tech	Published
	Overcoming Barriers for the Wide-Scale Adoption of Standardized Real-time Transit Info, Sean Barbeau, USF	Published
	The Contribution of Transportation and Land Use to Citizen Perceptions of Livability in Oregon MPOs, Rebecca Lewis and Robert Parker, UO	Published
	Transferability & Forecasting of the Pedestrian Index Environment (PIE) for Modeling Applications, Kelly Clifton, PSU	In review
	Biking and Walking Counts: Data Quality, Nathan McNeil and Kristin Tufte, PSU	In review
	Understanding Economic and Business Impacts of Street Improvements for Bicycle and Pedestrian Mobility, Jenny Liu and Jennifer Dill, PSU	Published
	Evaluating and Enhancing Public Transit Systems for Operational Efficiency, Service Quality and Access Equity, Ran Wei, UU, and Liming Wang and Aaron Golub, PSU	Published
	SEGMENT: Applicability of an Existing Segmentation Technique to TDM Social Marketing Campaigns in the United States, Philip Winters and Amy Lester, USF	Published
	V2X: Bringing Bikes into the Mix, Stephen Fickas, UO	In review
	Does Compact Development Increase or Reduce Traffic Congestion? Reid Ewing, UU, and Shima Hamidi, UTA	Published
Small Starts	The Use of Mt. Mazama Volcanic Ash as Natural Pozzolans for Sustainable Soil and Unpaved Road Improvement, Matthew Sleep, Oregon Tech	Published
	Engaging Youth to increase their Transportation System Support, Understanding, and Use, Autumn Shafer, UO	In review

Table 4. Education Projects Funded by Grant.

Projects	**Link to Deliverable(s)**
Multimodal Transportation Planning, Kristine Williams, USF	NITC-ED-851_Final_Report.pdf
Phase 2: Multimodal Transportation Planning Curriculum for Urban Planning Programs, Kristine Williams, USF	NITC-ED-998 Phase 2 Final Report, see also Project Brief
Graduate-level Civil Engineering Transportation Course, Roger Lindgren, Oregon Tech	NITC-ED-853_Final Report
Dynamic Evaluation of Transportation Structures with iPod-Based Data Acquisition Charles Riley, Oregon Tech	NITC_985_Final Report, see project page for additional resources
Advanced GIS: Smart Transportation, Christopher Bone, UO	NITC-ED-850_Final_Report.pdf
Design of an Aging Population, Trygve Faste and Kirsten Muenchinger, UO	NITC_784_Final Report
Pedestrian and Transit Oriented Design, Keith Bartholomew, UU	NITC-ED-852 Final Report
Introduction to Scientific Computing for Planners, Engineers, and Scientists Liming Wang, PSU	NITC_854_Final Report, see also Executive_Summary.pdf
Instructional Modules for Obtaining Vehicle Dynamics Data with Smart Phone Sensors, Roger Lindgren, Oregon Tech	NITC_1073_Final Report, see also Project Brief
Collaborative Regional Planning: Tools and techniques for teaching collaborative regional planning to enhance livability and sustainable transportation, Danya Rumore, UU	NITC_1074_Final Report, see also Project Brief
Graduate Certificate in Sustainable Transportation, Keith Bartholomew, UU	Final report completed but not published
A Smart Bike Project for Grades 6-12, Stephen Fickas, UO	Published; see also You Tube tutorial
Pedestrian Observation and Data Collection Curriculum, Jennifer Dill, PSU	Published; see also Project Brief