



Semi-Annual Progress Report #9

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1. Accomplishments

Major goals of the program

The Pacific Southwest Region UTC (PSR) addresses the transportation issues of Region 9 through an integrated, multidisciplinary program of research, education, and technology transfer aimed at FAST Act research priority area 1: improving the mobility of people and goods throughout the region. The goal of PSR is to improve passenger and freight transportation throughout Region 9.

Our consortium of universities and community colleges, together with partnerships with state Departments of Transportation (DOTs), Metropolitan Planning Organizations (MPOs), and industry leaders, forms a comprehensive, region-wide network. The University of Southern California (USC) leads the consortium. Partners include Long Beach State University (CSULB); University of California, Davis (UCD); University of California, Irvine (UCI); University of California, Los Angeles (UCLA); University of Hawai'i at Manoa (UH); Northern Arizona University (NAU); and Pima Community College (PCC). USC and CSULB are both partners in the METRANS Transportation Center, the entity that houses the PSR UTC.

The regional UTC must reach beyond the consortium, offering connections to all transport stakeholders within the region. In order to fulfill its goal, the PSR:

- Established a region-wide advisory council of government, academic, and industry leaders to provide guidance on all aspects of the center's activities
- Executes a research program informed by the needs of the region
- Is establishing a web-based clearinghouse for degree and non-degree curricula
- Develops training and workforce development programs transferable across the region
- Holds an annual Region 9 Congress to share research and best practices
- Conducts a comprehensive program of information dissemination, technical assistance, and communications

Accomplishments under these goals

Our accomplishments are categorized under research, education, and outreach.

A. Research Accomplishments

The goal of our Center is to address regional issues and provide public policy advisement, technical assistance to state and local agencies, and innovative workforce development strategies. Our multi-modal, multi-disciplinary research program is organized around four themes that are derived from the transportation needs assessment conducted during the proposal preparation process: 1) technology for improved mobility, 2) improving mobility for disadvantaged populations, 3) improving resilience and protecting the environment, and 4) managing mobility in high growth cities and regions.

Our research program has three parts: 1) research conducted by PSR faculty; 2) research conducted by researchers inside or outside PSR but within Region 9; and 3) a graduate research fellowship program. We have reserved a small pool fund for a Region 9-wide solicitation. Its purpose is to promote broader participation across the states and territories, in keeping with the purpose of a regional UTC.

The total research project and white paper count for PSR is 102. We have 4 regional projects at UC Santa Barbara and 3 at UC Riverside, the remainder of the projects are based at PSR-member institutions. PSR partners have now completed a total of 64 research projects and white papers.

PSR completed 23 projects and issued 23 reports during the reporting period (see [Table 1](#)).

Table 1: Projects completed during current reporting period

Partner	Project No.	PI	Title	Funding Source
CSULB	19-SP90	Thomas O'Brien	Caltrans Freight Academy	Caltrans
NAU	19-12	Chun-Hsing Ho	Development of Cost-Effective Sensing Systems and Analytics (CeSSA) to Monitor Roadway Conditions and Mobility Safety	DOT
UCI	19-30	Al Faruque	Software and Hardware Systems for Autonomous Smart Parking Accommodating both Traditional and Autonomous Vehicles	Caltrans
UCSB	19-15	Konstadinos Goulias	Revisiting the impact of teleworking on activity-travel behavior using recent data and sequence-based analytical techniques	DOT
USC, UCD	19-10	Jong-Shi Pang, Michael Zhang	Modeling e-hailing and car-pooling services in a coupled morning-evening commute framework	Caltrans
USC	19-01	Hilda Blanco	Failing Malls: Optimizing Opportunities for Housing	Caltrans
UCD	19-40	Austin Brown	Local Policy for Better Micromobility (white paper)	Caltrans
UH	19-70	Suwan Shen	Developing an Analytical Framework for Optimizing Disaster Relief Preparedness to Coastal Hazards: A Preliminary Investigation of Factors Affecting Supply Chain Resilience in Hawaii	DOT
USC	19-09	Tridib Banerjee	Increasing Access, Mobility, and Shelter Opportunities for Disadvantaged Populations: Affordable Housing in Transit-Oriented Developments	Caltrans
USC	19-02	Marlon Boarnet	Dockless Scooter Travel: A Land Use Model with Implications for California	Caltrans
UCI	19-33	Michael McNally	Analysis of Activity-Travel Patterns and Tour Formation of Transit Users	Caltrans
USC	19-24	Antonio Bento	Using big data to estimate the environmental benefits of congestion pricing in the Los Angeles metropolitan area	Caltrans
CSULB	20-SP98	Thomas O'Brien	Geospatial Approaches to Enhancing MPO Community Engagement	USDOT
UCI	19-31	Michael Hyland	Non-myopic path-finding for shared-ride vehicles: A bi-criterion best-path approach considering travel time and proximity to demand	Caltrans
USC	18-SP52	Genevieve Giuliano	Implementation of Action 6 of CSFAP Phase 2a Tracking Economic Competitiveness	GO-Biz
UCLA	19-61	Gregory Pierce	Assessing Effectiveness of Financing Subsidies on Clean Vehicle Adoption by Low- and Moderate-Income Consumers	Caltrans

UCLA	19-63	Paul Ong	Mobility, Accessibility, and Disadvantaged Neighborhoods: Assessing Diversity in Transportation-Related Needs and Opportunities	Caltrans
UCD	19-43	Miguel Jaller	Cargo Routing and Disadvantaged Communities	DOT
USC	18-SP91	Genevieve Giuliano	Improving Environmental Justice and Mobility in Southeast Los Angeles Executive Summary	Strategic Growth Council
UCR	19-26	Guoyuan Wu	Estimating the Impacts of Automatic Emergency Braking (AEB) Technology on Traffic Energy and Emissions	DOT
UCD	19-42	Sarah McCullough	Assessing the Impact of Equity Work in Transportation	Caltrans
UCI	21-34	Stephen Ritchie	Investigation of LiDAR sensing technology to Improve Freeway Traffic Monitoring	Caltrans
UCLA	19-60	Madeline Brozen	Intersectional transportation trends in Los Angeles County	Caltrans

Requests for Proposals (RFPs)

PSR issued a coordinated RFP 5 in early 2021 and received 40 proposals. The proposals were reviewed during the reporting period. Following the review process, we selected 25 projects for funding.

Match funding

PSR has the following match funding priority rankings: new funding, match from other existing research projects, and in-kind match. The University of California partners continue to have access to state funding through SB1, which increased the California fuel tax by 12 cents per gallon. A portion of SB1 funding is allocated to the UC Institute of Transportation Studies (ITS). UCD, UCLA, and UCI are part of ITS and receive SB1 funds. Some of these funds are used for PSR match. ITS is funded in-part by the state of California, as well as by Caltrans research contracts. There are several statewide research collaborations taking place through ITS. ITS has provided match funding support to initiate the Year 3 Faculty Research Projects and administer the PSR Publication at UCLA. The California partners continue to award funding via Caltrans, who has committed to a 50% match for PSR. USC has obtained additional research funding from local industry and agencies for specific projects. NAU continues to receive in-kind match funding from the Arizona Board of Regents Research Innovation Fund for research aimed at increasing freight safety and mobility along the I-10 corridor. UH requires each research project to provide its own match; the match is mainly in-kind. [Table 2](#) shows match funding sources and amounts.

Table 2: Match funding sources for PSR

Fund source	Amount
USDOT total for PSR	\$13,000,900
Caltrans match funding for PSR	\$2,831,763
Other match funding for PSR	\$10,169,137
Total match funding, all sources for PSR	\$13,000,900

New projects

A total of 15 new projects were started during the reporting period. [Table 3](#) lists the new projects and their funding sources.

Table 3: New research projects initiated during current reporting period

Partner	Project No.	PI	Title	Funding Source
USC	21-01	Genevieve Giuliano	The Potential for Ride-Matching is Disadvantaged Communities	Caltrans
USC	21-12	Marlon Boarnet	Institutional Obstacles to New Transportation Technology Adoption [white paper]	Caltrans
NAU	21-16	Steven Gehrke	Evaluation of Sidewalk Delivery Robot Interactions with Pedestrians and Bicyclists	DOT
NAU	21-17	Chun-Hsing Ho	Development of Instrumented Bikes: Toward Smart Cycling Infrastructure and Maintenance	DOT
UCSB	21-19	Konstadinos Goulias	Spatial microanalysis and equity assessment of joint relationships among destination choice, activity duration, and mode choice.	DOT
UCR	21-20	Guoyuan Wu	Connectivity-Based Cooperative Ramp Merging in Multimodal and Mixed Traffic Environment	DOT
USC	21-22	John Gunnar Carlsson	New continuous approximation models for passenger and freight transportation	DOT
USC	21-25	Ketan Savla	Coordinated Demand-side Management and Traffic Control for Tight Areas	DOT
UH	21-70	Chunhee Cho	Bridge Monitoring through a hybrid approach leveraging a modal updating technique and an artificial intelligence (AI) method	DOT
UH	21-71	Do Soo Moon	Integrated Hazard Vulnerability Assessment and Mitigation Framework with Mixed Reality for Transportation Infrastructures	DOT
UH	21-72	Qi Chen	Rapid and Accurate Assessment of Road Damage by Integrating Data from Mobile Camera Systems (MCS) and Mobile LiDAR Systems (MLS): Can we get the best of both worlds?	DOT
USC	21-SP80	Genevieve Giuliano	Implementation of Action 6 of the California Sustainable Freight Action Plan (CSFAP) Phase 4: Tracking Economic Competitiveness	Caltrans
USC	21-SP81	Dan Wei	Economic Analysis and Review of Commercial Vehicle Road User Charges	Caltrans
UCI	21-35	Michael Hyland	Evaluating Mixed Electric Vehicle and Conventional Fueled Vehicle Fleets for Last-Mile Package Delivery	Caltrans

UCI	21-34	Stephen Ritchie	Investigation of LiDAR sensing technology to Improve Traffic Monitoring along Multilane Freeways	Caltrans
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Student opportunities for research

Student support is an important component of research project selection. USC, CSULB, and UCD require that research projects include student support.

As reported in our Performance Indicators report, PSR funding supports over 160 students during the academic year. Our students are engaged in numerous research activities, and many go on to successful careers in the transportation field.

Student conference support

NAU funded 22 students and three faculty to attend their first in-person conference since pre-covid, ITS Arizona, on September 30th, 2021.

Additional accomplishments

A comprehensive report of the state’s falling transit ridership, “Transit Blues in the Golden State”, was recognized by various chapters — awards of excellence from APA Sacramento Valley and APA Inland Empire, and awards of merit from APA Central Coast, APA Northern California and APA California. “What’s Behind Recent Transit Ridership Trends in the Bay Area?”, a study that looked into the San Francisco Bay Area that until recently had bucked statewide declining ridership trends, received APA Northern California’s award of merit.

UCLA ITS itself was given the Planning Landmark Award for the UCLA Lake Arrowhead Symposium by the APA Los Angeles chapter. Since its creation in 1991, this event brings together industry professionals to discuss the connections between transportation, land use and the environment. This past year’s session focused on creating a just transportation recovery after the COVID-19 pandemic.

UC ITS’ COVID-19 Response and Recovery Research Program was awarded the Organized Research Program of the Year from the California Transportation Foundation.

Additional mentions

Tom O’Brien of CSULB became the Second Vice President for the Harbor Association of Industry and Commerce (HAIC) in September 2021. PCC’s Center for Transportation Training’s advanced program manager, **Missy Blair**, was elected to a 3-year term (2021-2024) with the National Association of Publicly Funded Truck Driving Schools (NAPFTDS) Board of Directors. **John G. Carlsson** (USC) was a finalist for the 2021 INFORMS Edelman Prize for research that used results from “The ‘sidekick’ routing paradigm for VMT reduction and improved accessibility” on efficient routing in a warehouse.

In memoriam

The late Martin Wachs was honored by both APA LA and APA California with the Planning Pioneer Award. Wachs, who passed away in April, was a preeminent figure in transportation planning. Not only did he have an illustrious academic career spanning seven decades, but he is remembered for his teaching, service, and drive to advance the field. He was the founding director of UCLA ITS. We published a [“Tribute to Martin Wachs”](#) in Issue 7 of our *Transfers* magazine. Prof. Wachs was a faculty affiliate of PSR and senior co-editor of *Transfers* e-magazine.

i. **Research dissemination**

Dissemination of our research results takes place via research reports and research briefs, scholarly publications, popular publications, conference presentations, and media. Numerous PSR researchers present at conferences and seminars throughout the region, nationally, and internationally. Projects that are funded by Caltrans require the PI to present findings to a panel of practitioners, and particularly to Caltrans personnel. Additionally, PSR researchers and students are very active with TRB. Collectively, we have submitted over 50 papers to the 2022 meeting of TRB.

Dissemination highlights

Results of the project “The Effectiveness of Alternative Policy Designs on Electric Vehicle Adoption: Purchase Rebates, Guaranteed Financing and Per-eVMT payments” were presented to the South Coast Air Quality Management District, Bay Area Air Quality Management District, and the California Air Resources Board.

Preliminary results from a paper based on Marlon Boarnet’s (USC) project “Displacement and Commuting in the San Francisco Bay Area and Beyond: An Analysis of the Relationship Between the Housing Crisis, Displacement, and Long Commutes” were presented to a session at the California American Planning Association conference in September with approximately 200 persons in attendance.

Julius Ceasar Aguma (UCI) presented results from his PSR dissertation fellowship at the IEEE International Conference on Intelligent Transportation Systems took place in Indianapolis between September 19-22nd, 2021. This work, conducted with Professor Amelia Regan, developed a matching mechanism for assigning drivers to routes where the drivers pay a toll for the marginal delay they impose on other drivers.

Ben Olson of CSULB presented on the curriculum development approach used in CITT’s Urban Goods Movement Training for Transportation Consultants and Urban Freight Solutions for a Smart City Workshop during the Federal Highway Administration’s International Urban Freight Roundtable in April 2021.

O’Brien served as guest speaker as part of Mineta Transportation Institute’s webinar series MTI Research Snaps. His talk addressed the state of the trucking workforce. O’Brien was also a panelist for in the Containerization & Intermodal Institute’s (CII’s) Building the Supply Chain Workforce of the Future event. Additionally, O’Brien presented the “Telling the Story of Freight” story map in June 2021 as part of the two-day FuturePorts virtual conference.

NAU gave multiple presentations during the Arizona Council for Transportation Innovation (ACTI) Virtual Innovation Exchange Series, prepared a presentation on transportation engineering/traffic safety for the National Association for College Admission Counseling (NACAC) Virtual STEM Fair, and recorded a presentation on transportation engineering for use in the Flagstaff STEM City Nights series and the Career Exploration Series.

The Center for Transportation Training (PCC) participates in monthly meetings, as available, for the USDOT Intelligent Transportation Systems (ITS) Professional Capacity Building (PCB) Community College Working Group 2 (Strengthening the ITS Workforce) and Working Group 3 (Defining the ITS Technician Job Market). Additionally, Missy Blair participated on a panel in AUVSI’s Automated Freight Summit on July 8, 2021 with Finch Fulton (Locomotion/former Assistant Secretary of Transportation at DOT), Sam

Loesche (Teamsters), Jeff Hickman (Virginia Tech Transportation Institute), and moderated by Selika Talbott (American University).

Media coverage

Dr. **Genevieve Giuliano** provided insight to the *Washington Post* for their coverage of the Ever Given, a giant cargo ship that became lodged in the Suez Canal for several weeks earlier this year. Select additional media mentions include **Marlon Boarnet** (USC), KCRW, *The San Diego Union-Tribune*; **Michael Manville** (UCLA), *The Atlantic*, *San Francisco Chronicle*, *Los Angeles Times*, KCRW; **Brian Taylor** (UCLA), *The Times*, *Los Angeles Times*, Yahoo Finance, The Pew Charitable Trusts; **Fraser Shilling** (UCD), *The Independent*, KQED, *Times of San Diego*.

Madeline Brozen's (UCLA) project "How People Move Analyzing Travel of Vulnerable Populations in Los Angeles" has spread awareness about the overrepresentation of Blacks and Latinos in collisions in LA County. The brief was cited in a recent [op-ed in the LA Times](#) and in a documentary short, [Biking While Black](#), supported by the Southern California Association of Governments.

ii. Plans for next reporting period

The next reporting period is October 1, 2021 through March 31, 2022. We plan to award over \$2M in funding from our RFP 6. We have 25 active projects that we will continue to manage. We anticipate completing 15 to 20 projects during the next reporting period. We have 13 new projects that will begin in January 2022.

METRANS will hold its next semi-annual Advisory Board meeting on November 5. The board meeting convenes senior leaders from regional transportation organizations in southern California.

Most PSR partners participate and PSR will have a strong presence at for the 101st Annual Meeting of the Transportation Research Board, which will take place January 9–13, 2022 in Washington DC. PSR participation will be reported in the next SAPR.

B. Educational Accomplishments

PSR's education goal is to foster education and training to produce the next generation of academic scholars, professionals, and skilled workers. PSR seeks to:

- Attract large numbers of the best students from non-traditional transportation fields – especially those from underrepresented groups – into transportation careers through personal and targeted recruitment from high-schools, community colleges, and universities
- Expand and enhance the multidisciplinary aspects of our transportation education programs, and student exchanges among campuses
- Conduct a comprehensive workforce development program

AZTrans faculty Brendan Russo presented an introduction to transportation engineering to two classes of 7th and 8th grade students (~50 students total) at Mount Elden Middle School in Flagstaff, AZ on September 24th, 2021. The AZTrans presentation included an introduction to the different disciplines of civil engineering, details on the type of work transportation engineers do, and included several in-class activities. For one activity, students assessed the impact of human perception-reaction time on stopping sight distance if they were designing a high-speed roadway. Students were also introduced to the basic

concepts of traffic signal operations and were introduced to the 4-step travel demand model used in transportation planning.

CSULB attended the Intermodal Expo hosted by IANA in September 2021 and coordinated participation by two teachers and six students from the Academy of Global Logistics (AGL) high school career preparation program at Cabrillo High School in Long Beach. CITT provides technical support to the program. The students and teachers had the opportunity to meet and speak with Congressman Alan Lowenthal and POLB Deputy Director Noel Hacegaba and to engage with industry professionals in logistics and intermodal operations.



Figure 1. AGL students and teachers at the IANA Intermodal Expo

USC, UCD, UCI, and UCLA continued their respective research seminars, which were converted to hybrid formats due to Covid.

USC seminars

- “Improving Shared-ride Mobility Services through Bi-Criterion Path-Finding” with Michael Hyland (UCI). September 8, 2021. Webinar recording: <https://www.youtube.com/watch?v=VBul06Bp1ds>
- “Freight Volume Modeling on Major Highway Links” with Dr. Luciano Nocera (University of Paris VI). September 22, 2021. Webinar recording: <https://www.youtube.com/watch?v=8j8b2IDAV2I>

UC Irvine seminars

- “Traffic Control by Isolated or Platoons of Autonomous Vehicles.” Paola Goatin, Institute of National Institute for Research in Digital Science and Technology (INRIA). April 2, 2021.
- “On the Empty Miles in Ridesourcing Systems.” Yafeng Yin, University of Michigan, Ann Arbor. April 16, 2021.
- “Algorithmic foundations for multi-modal transit systems (Helping Better Buses make Better Cities).” Samitha Samaranayake, Cornell University. May 21, 2021.
- “Optimizing the Procurement Auction for Public-Private Partnerships in Highway Franchise.” Hang Shu, Google. June 25, 2021.
- “Modeling and Forecasting Passenger Travel: from the lens of Regional Economic Simulator of Ontario (TRESO).” Naznin Daisy, University of Toronto. July 16, 2021.
- “Strategic Decisions in Agent-Based Freight Transportation Models: Methods and Data.” Monique Stinson, Argonne National Laboratory. August 20, 2021.

University of Hawaii seminars

- “Adaptation Urbanism and Resilient Communities.” Billy Fields, Ph.D. & John Renne, Ph.D. May 20, 2021. (86 participants)

- “Structural Engineering Transportation Infrastructure Mitigation and Assessment.” Chunhee Cho, Ph.D. & Do Soo Moon, Ph.D. July 22, 2021. (66 participants)
- “South Shore Promenade & Coastal Open Space Network.” Judith Stilgenbauer, ASLA. August 19, 2021. (73 participants)

NAU seminars

- Chad Loberger, Arizona Game and Fish, discussed countermeasures for animal-vehicle crashes. April 15, 2021
- Adam Shimoni, Council Member, City of Flagstaff. September 9, 2021



Figure 2. A photo of Council Member Shimoni’s talk

Student Fellowship Programs: In

the spring of 2021, 8 student projects including 11 students total, were recognized for their excellent contributions to the transportation field. A grand prize was given to two of those projects: Shelly Quan (UCLA), MURP ‘21 received the grand prize for her project titled “California Government Screening Maps: An Investigation into Geographic Prioritization in Support of State Climate and Planning Goals.” Jayne Vidhecharoen (UCLA), MURP ‘21 received the inaugural Excellence in Transportation Equity & Justice Capstone Prize for her project titled “Equity Lenses: Targeting Equitable Community Investment Across Southern California. More information on these projects can be found [here](#). The Student Fellowship program produced 17 graduates in the spring of 2021: 1 PhD, 16 MURP.

UCI awarded 6 Dissertation fellowships for PhD students in Civil & Environmental Engineering:

- **Brian Casebolt**, Impacts of Connected & Automated Vehicles on Traveler Behavior
- **Julius Ceasar Aguma**, Market Design for Congestion Pricing in Transportation Networks
- **Monica Ramirez-Ilbarra**, Dissertation Fellowship
- **Chenyang Qin**, Consistency for Statewide and Regional Models: The Interregional Trip Gap
- **Joseph Lo**, Dissertation Fellowship
- **Montana Reinoehl**, New student entered fall 2021

Student awards

Select USC student awards:

- **Hayley Rundle**, Master of Science, Urban Planning, *2021 Railway Association of Southern California (RASC) Scholarship*
- **Hayley Rundle**, Master of Science, Urban Planning, *WTS-Sacramento Scholarship*
- **Andres Zazueta**, Bachelor and Master of Science, Civil Engineering, *2021 Railway Association of Southern California (RASC) Scholarship*
- **Matthew Mena**, Bachelor of Science, Industrial and Systems Engineering, *2021 Railway Association of Southern California (RASC) Scholarship*
- **Isidoro Serna**, Bachelor and Master of Science, Urban Studies and Urban Planning, *2021 Railway Association of Southern California (RASC) Scholarship*

- **Reaghan Murphy**, Master of Science, Urban Planning, *First Place SCAG 2021 Planning Student Showcase*
- **Zoey Li**, Master of Science, Civil Engineering-Transportation Engineering, *WTS-LA Build Your Dreams Graduate Scholarship*
- **Elena Vindrola**, Master of Science in Green Technologies, *WTS-LA Zephyr Rail Scholarship*
- **Aisling O'Reilly**, Ph.D. in Urban Planning and Development, *WTS-LA Myra Frank Scholarship*

Select UCLA awards:

- **Connor Bente**, Master of Science, Urban and Regional Planning, *2021 Railway Association of Southern California (RASC) Scholarship*
- **Elizabeth Owen**, Master of Science, Urban and Regional Planning, *2021 Railway Association of Southern California (RASC) Scholarship*
- **Karen Phan**, Master of Science, Urban and Regional Planning, *2021 Railway Association of Southern California (RASC) Scholarship*
- **Timothy Wickland**, PhD Urban Planning, *Presidential Diversity Postdoctoral Fellowship at Brown University*
- **Sam Speroni**, Master of Science, Urban and Regional Planning, *APA LA Award of Excellence for capstone*
- **Mark Hansen**, Master of Science, Urban and Regional Planning, *APA LA Award of Merit for capstone*
- **Maddy Ruvolo**, Master of Science, Urban and Regional Planning, *APA Northern California's Award of Merit for capstone*

Emanuel James, one of NAU's UTC funded students, received several awards during this analysis period:

- ITE Mountain District Outstanding Graduate Student (2021)
- NAU College of Engineering, Informatics, and Applied Sciences 2021 Distinguished Graduate Student
- NAU Department of Civil Engineering, Construction Management, and Environmental Engineering 2021 Outstanding Graduate Student

Student Programs

PSR partners conduct a number of student programs designed to increase student engagement and nurture professional development. These programs have been described in-depth in previous reports. Continuing programs include: **FED Talks** (UCLA), assembles professors and graduate students to discuss and present new research and best practices around transportation-related issues; **Data Hack Night** (UCLA), these web meetings provide students an opportunity to work with others on their data projects to seek help and alternative approaches to accomplish data acquisition, cleaning, analysis, and visualization; **Soft Skills Webinar** (CSULB), incorporates "soft" or foundational skills into its training programs, including webinars, has evolved into a strategic partnership with the renowned Toastmasters International; **Get the Job** (USC), a speaker series designed to provide a small-group environment for students to receive advice from active practitioners on securing employment. **METRANS Mentor Program** (USC), transportation practitioner mentors guide students to make informed career decisions and to develop as well-rounded professionals; **WTS Partnerships** (USC, UCI, UCD, UCLA), sponsor membership and event attendance to promote student participation in the transportation resume book.

iii. Workforce development

PSR offers many ongoing workforce development programs that have been written about in-depth in past SAPRs. These programs include: **Commercial Driver License (CDL) Training** (PCC), an innovative Truck Driver Training Program that reaches out to a rural/tribal audience to provide the training and certifications necessary to start a career; **Southern California Workforce Development Needs Assessment for Supply Chain and Transportation Industries** (CSULB), identifies existing and future workforce skills gaps for middle-skill occupations in southern California's supply chain and transportation chain industries; **Academy of Global Logistics (AGL)** (CSULB), this collaborative partnership combines academic curriculum with industry-led training to support academic and career development for high school students; **AZTrans** (NAU), supports STEM outreach activities that provide exposure to transportation to K-12 students and members of the public; **IANA – Teaching Intermodalism Post-Covid-19**: (CSULB), provides support for student scholarships in Global Logistics Professional and Marine Terminal Operations Professional programs.

The first online session of the 2021 Arrowhead Webinar series (UCLA) included over 170 attendees, including students, scholars, practitioners, and public sector employees. The series provides professional development credits from the American Planning Association for attendees AICP certification.

CSULB hosted the Intermodal Association North America (IANA) Trade and Transportation Industry Association Forum on April 23, 2021. CSULB is one of IANA's scholarship partners. Funds are used to allow students on the CSULB campus to take CITT's Global Logistics Professional Program and to conduct applied research on intermodal topics. Past IANA scholarship recipients Diana Sanchez, Jeremy Stumpp, Nicholas Roy, and Jenny Benitez attended to share their experiences conducting research on various intermodal topics, e.g. blockchain, port congestion, chassis management, virtual intermodal education.

Pima Community College highlights

- Approximately 30 hours of creation and editing time has been dedicated to a 5-part webinar series on Geospatial Intelligence Systems (GIS). The series is intended to serve as professional development to upskill current staff and faculty.
- Class B Commercial Driver License theory training (TDT 116) master was completed and is available for online delivery.
- Introduction to GIS for CAD and Logistics (CAD 167) and GIS for Transportation and Logistics (CAD 177) classes were completed and elevated to master classes; they are available for online delivery. The content for both classes is GIS in a transportation context.
- 19 students enrolled in the online theory class (TDT 118) during the reporting period. The online implementation continues to result in 100% Class A commercial permit student success rate.
- Logistics has started a new IBEST cohort Fall 2021. There are 11 students in the current cohort, and they are currently taking LGM 106, Transportation and Traffic Management. LGM Discipline Coordinator will provide OSHA-10 training for the current IBEST cohorts.
- Prior Learning Assessment (PLA) exams have been created for the LGM program and are ready to be administered for students. The program is also fully prepared to accept PLA portfolios. The goal is to give extra attention to marketing PLA in the very near future.
- In July 2021, CTT hosted a tour of local Arizona@Work (funding agency) for key officials to highlight the program offerings, facilities, capacity to train, and equipment available to their clients.

iv. **Education and Workforce Development goals for next reporting period**

During the next reporting period, PSR partners will continue to administer degree and non-degree training programs to a broad array of students. We will continue the PSR seminar series at USC, UCD, UCI, and UCLA. Seminars will be offered in a hybrid format due to Covid.

The GIS 5-part webinar series, developed by PCC, will be completed and available for professional development. Through collaboration with the Volpe National Transportation Systems Center, PCC will add the **Autonomous Vehicle Driver and Operations Specialist** program to the USDOT online public database of curriculum and case studies.

LGM (PCC) is working with the Chamberlain Group to determine if the inventory and warehouse distribution planning software used by the company can be used in the classroom setting with students. The LGM program has also initiated a partnership with the Tucson Target.com Distribution Center. They will provide class tours of their operations for LGM students. The first tour is scheduled for October 12, 2021 and will be virtual due to covid restrictions. Additionally, Target is going to market the LGM program to their employees in hopes of developing their workforce through education and training with PCC. Finally, we are discussing the possibility of hiring events for soon-to-be graduates of the program. The HR Director has expressed interest in hiring our LGM graduates.

The white paper for the **Roadmaps and Story Maps for Public Outreach** program (CSULB), which researches how the public sector engages with the public and identifies the challenges and successes they are facing, was completed. In the time of COVID-19, with all work being remote, tools that will better support workers in maintaining connections with each other and disseminating information to the public is an essential part of responsible transportation system management. They will also produce a follow-up **State of the Mobility Workforce Report** that includes most recent Bureau of Labor Statistics and U.S. Census Bureau data.

C. Outreach Accomplishments

METRANS held its semi-annual Advisory Board meeting on April 2, 2021 via video conference. The meeting was well attended by senior leaders from the Center's industry and agency stakeholders. The meeting allowed METRANS to provide updates on its research, education and outreach activities. PSR research and workforce development activities were presented to the board. Additionally, the meeting allowed for discourse between the Center and its stakeholders, which will inform future Center activities and efforts. [METRANS Advisory Board](#) members are listed on its website.

ITS-Davis virtually hosted the **PSR Congress 2021** on April 12-13, 2021. The PSR's Annual Congress gathers transportation stakeholders from throughout the region to share new research results, best practices, and education and training tools produced by PSR. It also serves as a networking event to build a regional transportation community. Each year the Congress is hosted by one of the consortium schools in partnership with consortium universities and government and industry partners. Day 1, April 12th, was open to the public and featured a keynote from Dr. Robert Hampshire, Deputy Assistant Secretary for Research and Technology at the US DOT. Following the keynote were four panel sessions highlighting research and workforce development activities from the PSR campuses and moderated by PSR Advisory Council members. The panels were focused around the four PSR center themes: 1) technology to address transportation problems and improve mobility; 2) improving mobility for vulnerable populations; 3) improving resilience and protecting the environment; and 4) managing

mobility in high growth areas. The first day of the Congress also featured a recognition of the PSR student awardees. Day 1 closed with a networking opportunity for Congress attendees in the virtual conference platform. Day 2, April 13th, was a closed session for the PSR Advisory Council meeting as well as a PSR Student Roundtable and Career Pathway Panel session for undergraduate, graduate, and PhD candidates from the PSR campuses. Following a brief welcome, while the Advisory Council convened for the annual meeting, the students participated in small group discussions during the first half of the breakout session for an opportunity to meet students from other PSR campuses, learn about one another's research and interests, and explore potential cross-campus collaborations. The second half of the student session featured a panel of alumni from the PSR institutes who shared their various career pathways in transportation. The event webpage and program are available at <https://its.ucdavis.edu/news-and-events/conferences/psr-congress/>, which also includes video recordings of the Day 1 panels and presentations.

UCI hosted **Virtual Workshop on Safety and Security for Connected Autonomous Vehicles** on May 28th, 2021. This one-day workshop will involve 16 speakers across two sessions: One on the relationship between CAVs and the infrastructure and environment, and the second focused on CAV technology in the context of safety and security. The full program is [available online](#) and includes presentation abstracts and recordings.

Due to the COVID-19 pandemic, the annual **UCLA Lake Arrowhead Symposium** on the Transportation – Land Use - Environment Connection will again be held as an online series in 2021. The series will consist of 5 weekly webinars between September and October 2021 and will conclude in the spring of 2022 with an in-person program. This year's theme is *Transit in Transition*. More information can be found on the symposium website at www.uclaarrowheadsymposium.org. The first online session of the 2021 Arrowhead Webinar series included over 170 attendees, including students, scholars, practitioners, and public sector employees.

CSULB promoted the success stories at Pima's new Center for Transportation Training (CTT), which hosted distance-based training for transportation and supply chain careers (including the **Commercial Driver's License Training program**), through *METRANS News* and social media.

Tyler Reeb has recorded two new episodes for his podcast series, **Mobility Matters**, which seeks to stimulate discussion about transportation workforce topics. The first, "Bringing Mobility and Equity to Indian Country," explores why engaging and developing the Tribal workforce is critical to maintaining the nation's rural transportation infrastructure and how the future of Tribal technical assistance is key to achieving that goal. The second episode focuses on innovations in Intelligent Transportation Systems (ITS) with panelists from the Department of Transportation, academia, and a national workforce entity. Both episodes will be released in the following reporting period.

There has been significant outreach to MPOs throughout the PSR region, and participants from the following have been confirmed for the MPO Logistics Peer Exchange:

- San Diego Association of Governments (SanDAG), CA
- Southern California Association of Governments (SCAG), CA
- Gateway Cities Council of Governments (Gateway COG), CA
- Kern County Council of Governments (Kern County COG), CA
- Metro Plan (Flagstaff, AZ)

Additional outreach has been performed in Hawaii and the Pacific Islands, and it is anticipated that there will be one or more participants from Hawaii and Nevada. The original date for the Peer Exchange was scheduled for the Summer of 2021, however due to the unexpected cancellation by several of the participants, the event was postponed. It is now tentatively scheduled for Winter season, either in late 2021 or early 2022.

The monthly digital newsletter, **METRANS News**, is released on the first Monday of every month. It summarizes METRANS research, education, and outreach, including coverage of PSR-funded projects and activities. It is distributed to UTCs and faculty throughout the U.S., to federal, state, and local public agencies, and to industry. The newsletter has now expanded to include a section on “Partner Updates,” in which the Communications Manager and the Associate Director of Administration spotlight accomplishments from the various member campuses and initiatives (e.g. PCC and *Transfers Magazine*). The average open rate over the reporting period for this newsletter was 25.08%, which falls on the higher end of Constant Contact’s definition of a good open rate. The average click rate was 17.3%, which falls above the industry average on Constant Contact of 8.75%.

Transfers Magazine published its 7th issue in May 2021, consisting of four articles and one opinion piece. The issue also included a tribute to Marty Wachs, founding senior editor of *Transfers*, written by Donald Shoup. The authors represented four PSR campuses from USC, UC Davis, UCLA and the University of Hawaii. The website



www.transfersmagazine.org, which also features regularly updated blogs with transportation-related news, research and events, had more than 20,000 page views during this six-month period, which is comparable to the previous six-month period. Most of our web traffic comes immediately after publishing an issue. The *Transfers* team has worked to create a social media content calendar to maintain promotion of the issues throughout the full period between issues, and has coordinated with PSR staff at USC to cross-promote articles, research fast facts from the different campuses. Editing is currently underway for the next issue set to release in fall 2021. We’ve also begun recruiting articles for the spring 2022 issue. The goal of the magazine is to translate the research of faculty, staff, and students at the PSR campuses into highly accessible content for an audience of elected officials, transportation planners, members of the media, and the general public. *Transfers Magazine* received the APA California award of merit. By emphasizing clear and simple language, *Transfers* provides a forum to increase awareness of the most pressing transportation issues today.

PSR conducts many outreach efforts that have been described in past SAPRs. Ongoing outreach activities include: **CSULB CITT Center Updates**, bimonthly e-blasts to industry/academia consisting of brief articles covering relevant Center activities with a focus on the freight sector and workforce development; **Logistics Peer Exchange** (CSULB), a peer exchange on best practices in regional freight planning and coordination; **METRANS on the Move** (USC), this is a weekly e-newsletter written and produced by USC students with staff guidance.

i. Outreach plans for the next reporting period

METRANS will hold its next Advisory Board meeting on November 6th. The meeting will be held virtually due to restrictions brought on by Covid.

METRANS will continue planning for its premier biennial **International Urban Freight (INUF) Conference** to be held in person in Long Beach, CA in May 2022. The CITT International Trade and Transportation **Town Hall** will be held the day before.

UCI will be hosting the annual **Redefining Mobility Colloquium** on November 10th, focusing on Equity and Inclusiveness. The colloquium invites three transportation leaders from Southern California who address how their agencies are approaching equity: Stephanie Wiggins, CEO of LA Metro; Kome Ajise, Executive Director of SCAG; and Hasan Ikhata, Executive Director of SANDAG. Three invited respondents will discuss the presentation and help answer student questions and provide their own insights. Sarah Catz will moderate the Colloquium, including the Q&A and commentary portion in which you would participate. The Colloquium aims to bring together graduate students in engineering and urban planning, as well as other disciplines, at UCI as well as across the state, to share perspectives and to advance understanding of issues and policies to address transportation challenges.

The results of the **Port Solutions Summit** (SUCCESS Initiative) are currently being reviewed and documented in a report of the findings. The CSULB team will collaborate with GO-Biz, CalSTA and the Port of Long Beach on the dissemination of the findings. Although further discussion and collaboration are required to determine the scope, actors, and policy/funding mechanisms for the solutions discussed above, the summit provided a significant opportunity for transforming ideas to substantive policy, as well as setting a necessary precedent for ongoing dialogue. Considering that many of the issues addressed will necessitate long-term planning and coordination, the consensus outlined above could be a solid foundation for guiding future work.

The **Urban Freight Workshop** is a virtual workshop that will test Alison Conway's Complete Streets Guide for Freight in international settings. Research on the potential of gamification of urban freight has been initiated, with several interviews with technology providers that specialize in logistics and urban freight. Conversations with these technical experts will commence in Fall 2021.

In the process of developing education and training programs related to urban freight for MetroFreight, we have tracked through the **VREF Urban Freight Curriculum Database** the growth in resources that may be used as educational materials. While there has been an increase in awareness of the last mile, there remains a lack of both urban freight-specific courses in traditional degree programs and technology-based tools that teach about the last mile and allow users to engage with their surroundings in a way that teaches them about urban freight activity.

This project seeks to address the latter by:

1. Researching and documenting in a White Paper the use of gamification applications focused on freight in general and urban freight more specifically.
2. Developing an agenda for a workshop based on the White Paper findings designed to establish the blueprint for an Urban Freight app that can be used in teaching and other instances where knowledge about urban freight is needed. This workshop will be held at the May 2022 International Urban Freight Conference.
3. Update the Urban Freight Curriculum Database so that it incorporates the most recent resources available, including materials identified during the development of the White Paper.

2. Participants & Collaborating Organizations

Participants contribute to the work of the PSR through financial or other support, or directly in research, education, or technology transfer. Collaborating organizations participate in Center activities, provide advisement, or support the center.

A. Financial support

The following organizations provide match funding for PSR research projects:

- Bosch LCC
- California Community Foundation
- California Department of Transportation (Caltrans)
- California Strategic Growth Council
- Chan Zuckerberg Initiative
- Los Angeles County Metropolitan Transportation Authority (LA Metro)
- Los Angeles World Airports (LAWA)
- Port of Long Beach (POLB)
- South Coast Air Quality Management District (SCAQMD)
- Southern California Association of Governments (SCAG)
- State of California
- Volvo Research and Education Foundation (VREF)

CSULB works with several external transportation-related trade and industry associations. Three of these (Los Angeles Transportation Club, Harbor Transportation Club, Harbor Association of Industry and Commerce) have established endowments that are used to provide scholarships for educational opportunities in professional development programs. These are important resources for non-traditional students pursuing non-credit programs who are often not eligible for other kinds of financial support.

B. Other support

The following organizations provide indirect or in-kind support to PSR:

- **California:** AECOM (Los Angeles); Alliance for Community Transit; Amtrak Capitol Corridor; California Energy Commission (CEC); California Transit Association; Caltrans Office of Earthquake Engineering, Analysis and Research; City of Anaheim; City of Anaheim; City of Davis; City of Santa Clara; Cool Davis; Council of Supply Chain Management Professionals (CSMCP); Fehr & Peers; Foothill Transit; Gateway City Council of Governments; Governor's Office of Business and Economic Development (GO-Biz); HDR; International Longshoremen and Warehousemen's Union (ILWU) Local 13; Investing in Place (Los Angeles); Kiwi Inc.; Long Beach Transit; Long Beach Unified School District; Los Angeles Department of City Planning; Majestic Realty; MetroLink; Nixon Peabody; Orange County Transportation Authority (OCTA); Port of Los Angeles; San Francisco Metropolitan Transportation Commission; San Francisco Municipal Transportation Agency; Santa Clara County Assessor's Office; Southern California Association of Governments (SCAG); Southern California Edison; Toole Design Group; Tree People/Climate Resolve (Los Angeles); UC Davis Feminist Research Institute; UC Davis Policy Institute for Energy, Environment, and the Economy; UC Davis Road Ecology Center; UC Institute of Transportation Studies (UC-ITS); Watson Land Company; Yusen Terminals LLC

- **Arizona:** Arizona Board of Regents, Chamberlin Group, Pima Association of Governments, Northern Arizona University, Southern Arizona Anti-Trafficking United Response Network (SAATURN)
- **Hawaii:** National Disaster Preparedness Training Center (NDPTC), University of Hawaii
- **Others:** Federal Highway Administration; King County Metro (Seattle, WA); staff from state DOTs in California, Colorado, Maine, Minnesota, Nevada, and Virginia.

Additional Support

PSR has a tremendous network of partners as noted above and in past SAPRs. Additional supporters include: **Council of University Transportation Centers (CUTC)**, Thomas O'Brien (CSULB) completed his tenure as president of CUTC and Center Director Genevieve Giuliano (USC) is a past president and past executive committee member; **Institute of Transportation Studies (ITS)** (UCD, UCI, UCLA), provides match funding and other resources; **MetroFreight Center of Excellence** (USC, CSULB), METTRANS is the home of the Volvo Research and Education Foundation (VREF) Center of Excellence on urban freight and offers many opportunities for international collaboration and partnerships; **National Center for Sustainable Transportation (NCST UTC)** (UCD, USC), strengthens and expands our work in sustainable freight transport; **Southwest Transportation Workforce Center** (CSULB), provides significant infrastructure and professional capacity in support of workforce development programs for PSR; **The Center for International Trade and Transportation** (CSULB), uses its media and social media channels to announce events and other opportunities to a network of students and industry and government partners; **Toastmasters International** (CSULB), provides public speaking competency training for undergraduates; **TuSimple** (PCC), offers program support and priority hiring to graduates; **UCLA Lewis Center for Regional Policy Studies**, provides workspace and matching funds researchers and staff at UCLA ITS; **Velodyne Lidar** (UCI), provided a donation of two LiDAR units that are supporting current graduate student fellowship and faculty research projects.

C. Collaborations

PSR partners collectively submitted a successful proposal to Southern California Association of Governments (SCAG) to be identified as prequalified providers for on-call professional services to SCAG. The on-call services will primarily be used to support projects and technical assistance in support of SCAG's Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). Projects topics are grouped under 1) transportation finance, 2) transportation/mobility planning, and 3) goods movement. The open contract is currently pending review at USC.

UH has entered an agreement with ENSCO to be part of the C-STTAR: Center for Surface Transportation Testing and Academic Research, which is led by the University of South Florida (USF) Center for Urban Transportation Research (CUTR), and includes San Jose State University's Mineta Transportation Institute (MTI), Oregon State University, Michigan State University, Michigan Technological University, University of Nebraska-Lincoln, and Colorado State University-Pueblo to provide expertise in research focused across all modes of surface and intermodal transportation.

PCC initiated collaboration with Next Generation in Trucking, LLC to explore a pilot program allowing high school seniors to begin preparing for the commercial driving permit while in their senior year. A meeting is being planned to collaborate with the area high school career and technical directors. PCC has also facilitated a relationship between Andrada High School's automotive program and TuSimple's operations to begin exploration of early career opportunities for the high schoolers.

CSULB partnered with the California Governor’s Office of Business and Economic Development (GO-Biz), the California State Transportation Agency (CalSTA), and the Port of Long Beach to develop the California Supply Chain SUCCESS Initiative, a collaboration aiming to take a solutions-based approach to supply chain issues. CSULB deployed several strategies to guide stakeholders’ approach to discussing solutions, including a social media campaign, virtual workshop open to the supply chain community, and in-person Summit with key supply chain leadership. This collaboration brought together stakeholders from every sector of the supply chain, both public and private, to identify critical issues and build consensus on the next steps with the goal of formulating practical, near-term solutions that lead to long-term, sustained progress.

CSULB launched a SUCCESS social media campaign in September 2021. The objectives of the campaign were to begin garnering responses and solutions to recent supply chain disruptions and to begin promoting the Initiative and later events. The virtual workshop, held on September 1st, 2021, convened over 140 registrants to address four key issues: supply chain visibility, the role of government, efficiency of intermodal operations, and changes in consumer demand. Several points of consensus emerged:

1. Increasing the supply chain’s visibility necessitates expanded data access (especially to proprietary data) and standardization,
2. Establishing a digital platform to enable open dialogue about strategies and policies, and broader public education about supply chain processes.



Figure 3. A screenshot of the SUCCESS Virtual Workshop with CalSTA Secretary David Kim, GO-Biz Director Dee Dee Myers, POLB Deputy Executive Director of Administration and Operations Noel Hacegaba, and CITT Executive Director Tom O'Brien

The summit convened decision-makers from industry, state and federal government, and planning agencies with the goal of committing to actionable measures to move beyond problem identification. Although participants agreed generally on what problems posed the greatest threat to the supply chain – a clear validation of the virtual workshop outcomes – less consensus existed for identifying solutions.

UCI has collaborated extensively with major California MPOS, including SANDAG, SCAG, and the Metropolitan Transportation Commission. These collaborations have included exchanges of data as well as surveys. Additionally, UCI has collaborated with Caltrans staff on Caltrans-sponsors faculty research projects. Notable collaborations include:

- Professor Ritchie’s project with Caltrans “Investigation of Truck Data Collection Using LiDAR Sensing Technology Along Rural Highways,” which received extensive in-kind support from Caltrans, who allowed the installation of LiDAR technology on its facilities in the state to support data collection used in the research. The success of the project led to a follow-on funded collaboration to explore further use of the technology: “Investigation of LiDAR sensing technology to Improve Traffic Monitoring along Multilane Freeways.”
- Professor Saphores’ project “Public Transportation, Transportation Network Companies (TNC) and Active Modes: An analysis based on the 2009 and 2017 NHTS” was extended via additional funding to add a COVID analysis task.

UCLA has initiated numerous collaborations with industry/agency partners, who provide support for student capstone projects. Notable collaborators include: Joseph Forgiarini, Senior Director for LA Metro; Julia Salinas, Transportation Planning Manager at Los Angeles Mayor’s Office of Transportation; Dora Fritze-Armenta, Lead Project Planner at Pacoima Beautiful; Justin Resnick, Service Planning Manager at Washington State; Hannah Brunelle, Senior Regional Planner at SCAG; Brian Ling, Transportation Planner at SFMTA; Severin Martinez, Transportation Planning Associate at LADOT; Reena Brilliot, Planning Manager at City of Santa Clara; Steven Keck, Deputy Director of Finance at Caltrans; Josh Shaw, Executive Director at California Transit Association; Seleta Reynolds, General Manager at LADOT; Annalisa Schilla, Manager at California Air Resources Board (CARB).

NAU has finished two separate pilot evaluation projects with Maricopa Association of Governments (MAG), through this one of an adaptive-like technology, the other a novel method of improving preemption for emergency vehicles and have wrapped up our first task order to provide input on other pilots being completed by the University of Arizona and Arizona State University. We are in the process of initiating two new task orders, one for another pilot product evaluation, and the other for providing input on other ongoing pilots. This is all part of a Master Services Agreement we have with MAG, which we are in the process of extending for two more years.

NAU continues to work with Oregon State University, partnering with them on two research projects funded by the Oregon DOT. One of those projects also has Portland State University as a partner as well, a university NAU has been working with on various funded projects since 2014. Furthermore, NAU has established a relationship with the Arizona Institute of Automated Mobility (IAM). The IAM was established by Arizona Governor Doug Ducey in 2018 to provide technical guidance and coordination aimed at fostering the implementation of automated mobility across Arizona. The IAM is overseen by the Arizona Commerce Authority and is a consortium of academic institutions (NAU, U of Arizona, and ASU), government agencies (Arizona Department of Transportation, Maricopa County Department of Transportation, Maricopa Association of Governments, and Arizona Department of Public Safety), and

private industry (Intel and State Farm with more likely to be added). In this reporting period, NAU has secured funding for two research projects from the IAM; one is a collaboration with all IAM members, and the other is a collaboration between NAU (including Dr. Abolfazl Razi from the NAU School of Informatics, Computing, and Cyber Security) and the University of Arizona. Both of these projects were active during the reporting period and are ongoing.

PSR has an extensive network of collaborations with academic, public and private organizations. Many of these have been described in past SAPRs. Ongoing collaborations include: **Arizona Technology Park (PCC)**, seeks to bring economic developers and academic researchers together to attract autonomous vehicle manufactures to southern Arizona; **Florida Atlantic University (UH)**, engages in collaborative research on the use of visualizations to improve the understanding of sea level rise Impacts to transportation in FL and HI; **Maricopa Association of Governments (NAU)**, continues to work on pilot evaluation projects with the **University of Arizona**; **Oregon State University (NAU)**, partners on two research projects funded by the **Oregon Department of Transportation**; **University of Antwerp (CSULB)**, developing an executive workshop that address pharmacological supply chains including the rollout of vaccines in the City of Long Beach.

3. Outputs

PSR outputs include publications, reports, papers, presentations, media, and others. Our target for peer-reviewed publications is 5 per year; our target for presentations is 10. During this reporting period, we have produced 27 peer-reviewed journal publications and 18 presentations. For a list of the publications, conference papers, and presentations, see [Appendix A](#). See [Table 1](#) for a list of the 9 project final reports that were published during the reporting period.

CSULB has developed this K-12 Special Investigation Project as an introduction to ArcGIS StoryMaps, an engaging, free and sophisticated web-based GIS application. The result was a blueprint for middle school teachers including lesson plans on how to introduce geospatial topics in the classroom. The lessons center on e-commerce and its accompanying environmental and economic impact, but the activities can be easily adapted to projects in any subject area, such as humanities, science, math, or language arts. This teacher blueprint includes a teacher training guide with ten detailed lesson plans and activities. With the guidance of a National Board-Certified Teacher in Early Adolescence Math as lead instructor, the curriculum is designed to align with Next Generation Science Standards (NGSS). Exploration of STEM and GIS-related careers are also incorporated into the lesson plans.

NAU recently completed a project sponsored by the City of Phoenix which involves analysis of factors associated with pedestrian crash frequency and severity, as well as development of a pedestrian safety tool aimed planning pedestrian-focused countermeasures. This work has the potential to impact the field of pedestrian safety, which is particularly important given pedestrian fatalities have increased substantially over the last decade. The project is nearing completion, and it's been found that several land use, roadway, and demographic characteristics are significantly associated with pedestrian crashes; information which can assist practitioners in more efficiently planning countermeasure designs and locations.

D. Websites

The [PSR website](#) is the central, authoritative source of information regarding our center. Our consortium members also maintain additional sites that contain information relevant to PSR's research and activities. Some of these sites are:

- CITT (CSULB): <https://www.cpie.csulb.edu/center-for-international-trade-and-transportation>
- eScholarship (UCD, UCI, UCLA): <https://escholarship.org/>
- ITS-Davis: <https://its.ucdavis.edu/>
- METTRANS: <https://www.mettrans.org/>
- NAU PSR UTC: <https://in.nau.edu/aztrans/psr-region-9/>
- Transfers Magazine (PSR flagship publication): <http://www.transfersmagazine.org/>
- UC Davis Feminist Research Institute: <https://fri.ucdavis.edu/>
- UC Davis Policy Institute for Energy, Environment, and the Economy: <https://policyinstitute.ucdavis.edu/>
- UCI ISERT conference: www.its.uci.edu/isert2020
- UCI seminar series: www.its.uci.edu/seminars
- UCLA ITS YouTube channel: <https://www.youtube.com/c/UCLAInstituteofTransportationStudies/>
- UCLA ITS: <http://www.its.ucla.edu>
- UCLA Lake Arrowhead Symposium: <http://www.uclaarrowheadsymposium.org>
- UH website (includes posts on PSR research): <https://ndptc.hawaii.edu>

E. New methodologies, technologies, or techniques

Dr. Ketan Savla (USC) has applied for a patent for [Adaptive Traffic Control](#). The disclosure presents methods and apparatus for adaptive control of one or more traffic signals. A method may include determining an offset value based on a function of a traffic flow performance metric. The method may further include determining a green time split value based on a distributed algorithm. The method may further include adaptive control of the one or more traffic signals based on the green time split value and the offset value.

Also at USC, Professor Ioannou's developed a load-balancing traffic system with a co-simulation optimization method for mixed freight platoons with the aim of optimal combinational cost of energy consumption and time, while Dr. John Carlsson developed an efficient routing technology for coordinating multiple vehicles together in a service region with his "sidekick" project.

New methods were described and disseminated in two published reports from UCD. Miguel Jaller et al. developed a multi-class improved Traffic Assignment by Paired Alternative Segments (m-iTAPAS) algorithm to evaluate eco-routing strategies for trucks. Michael Zhang et al. developed a general equilibrium modeling framework to explore the complex interactions between solo-driving, rideshare, and e-hailing, in which travelers can switch between different transportation modes.

Chunhee Cho's (UH) research has adopted a wavelet transform technique to process sensor-based structural response data from time-domain into frequency domain as AI training examples. Compared with the conventional feature extraction approach, the deployed method provides a more accurate and effective solution for the proposed bridge monitoring project.



Figure 4. An image generated from MCS data

Qi Chen (UH) is collecting Mobile Camera System (MCS) data, which has been mostly used as a visualization tool. It has been challenging to do quantitative measurements from the photos it collects. However, Chen’s research indicates that it is possible to generate high quality geospatial products (3D models and orthomosaic) from this technique.

Professor Ritchie’s (UCI) project with Caltrans “Investigation of Truck Data Collection Using LiDAR Sensing Technology Along Rural Highways” has produced a viable technique for

advanced passive classification of truck types operating on California’s rural highways. The pending follow-on project is applying this technique to urban freeways in California to further refine the technique. Classifying trucks moving on highways is a critical input for calibrating commodity-based models of truck movements. Because freight is a critical component of transportation energy-use and GHG emissions, developing a detailed understanding of industry-specific heavy-duty truck movements is critical for developing effective policy to mitigate the negative externalities of freight movement and to move the country closer to a fully sustainable transportation system.

Professor Michael McNally’s (UCI) project “Analysis of Activity-Travel Patterns and Tour Formation of Transit Users” produced results showing that the changes in time usage and in the nature of jobs affect the tour choices of an individual. For instance, prior to the recession, people having multiple jobs made fewer work-only tours; during the recession, the contrary was true. The findings provide valuable insights on possible changes in worker’s tour choice during an economic downturn by identifying factors or effects that are sensitive due to recession or other disruptions like the COVID pandemic, which would contribute to building better pattern choice sets in tour-based models for such disruption years. Moreover, the terms that the researchers introduced to analyze the recession effects, such as old norms and new norms, can have broader applications to other studies related to trend analysis.

F. Other products

Patents: US11122425B2 (<https://patents.google.com/patent/US11122425B2/en>): Imam Uz Zaman, Anthony Bahadir Lopez, Mohammad Abdullah Al Faruque, Ozdal Boyraz (UCI). Systems and methods for encrypting communication between vehicles: A physical layer secret key generation scheme exploiting randomness of the road surface and driving behavior is described herein. A symmetric key generation scheme can be implemented in any existing V2V visible light communication. By analyzing and simulating numerous samples taken from NGSIM vehicle trajectory data, the natural driving behavior and road surface roughness can be exploited as a source of randomness to generate symmetric cryptographic security keys.

Datasets: Pahwa, Anmol; Jaller, Miguel (UCD; 2021), Cargo routing and disadvantaged communities, Dryad, Dataset, <https://doi.org/10.25338/B8934T>

Algorithms: Boriboonsomsin, Kanok (UCR): Low exposure routing algorithm for heavy-duty diesel vehicles

4. Outcomes

PSR's goal is to effectively and efficiently move research to practice so that new knowledge can be shared, acted upon, and contribute to a more efficient, sustainable, and equitable transportation system. We achieve our goal through technology transfer activities: events, communications, training, and client-based research. We define outcomes as any changes made to the transportation system, or its regulatory, legislative, or policy framework, resulting from research and development outputs. Examples include the full-scale consideration of a new technology technique, or practice, or the passing of a new policy, regulation, rulemaking, or legislation.

In a follow up to their PSR-funded Southeast Los Angeles (SELA) project, Professors Giuliano and Boarnet (USC) are working toward a demonstration of new mobility options that could enhance the options available to disadvantaged populations.

Researchers Wei and Giuliano's (USC) Cargo Handling Equipment research will be used by the California Air Resources Board in rule making.

Cyrus Shahabi's (USC) research on predicting on-time performance of bus transit has sparked interest with regional transit agencies and customers.

Kanok Boriboonsomsin's (UCR) research on the low exposure routing strategy developed in Project 17-10 and further evaluated in Project 20-20 will be pilot tested in real world as part of the new Objective Measurement/Monitoring/Mitigation of Emissions from Goods Movement and Impacts on Air Quality (OMEGA) initiative at UC Riverside.

All PSR research reports are peer-reviewed by at least one external academic to help ensure deliverables are of high quality. One reviewer of the recently completed PSR report, "Cargo Routing and Disadvantaged Communities" (Miguel Jaller, et al.), noted that once published, the report would be useful to their own freight transportation course and that they would be utilizing it as an example in their class.

NAU is continuing to work with the Maricopa Association of governments as independent evaluators for Smart Region Pilot deployments, contributing to the body of knowledge through independent assessment of novel smart transportation technologies. Additionally, we continue to work with the City of Phoenix to help address their pedestrian safety problem through development of a map-based tool to better understand where, when, how, and why pedestrian injuries and fatalities occur.

Education of public officials, policymakers through attendance

One major goal we have is the education of public officials and policymakers through attendance at PSR events. Our annual target for events is 150 attendees from public agencies and private industry. With over 2,500 such attendees at PSR events, we have far exceeded our target.

Some proposed solutions from the Port Solutions Summit (see SUCCESS Initiative explained in previous sections) include:

- **Capacity and Utilization.** Participants identified expanded capacity and utilization as a pre-requisite to increasing working hours, as chassis, equipment, and labor shortages, as well as limited warehouses, create immense challenges regardless of the number of hours being worked.
- **Hours of Operation.** The summit revealed a consensus that increasing efficiency necessitated expanding to 16-5 (rather than 24-7) operations for certain logistical sectors of the supply chain, including trucking, port operations, and warehousing. Other proposed solutions included shifting, rather than extending, hours earlier in the morning, later in the evening, or at night to avoid traffic congestion and speed up transport.
- **Buffer Zones.** Addressing capacity shortages may require expanding storage and buffer locations (e.g., a staging/logistics area) to fully utilize California’s significant desert space and reduce backlogs at the ports, warehouses, and other cargo-movement centers.
- **Data Sharing, Access, and Modernization.** In order to enable real-time situational updates to increase communication between carriers and truckers, optimize shipment routes, and eliminate blind hand-offs, data must be made significantly more accessible and modernized.
- **Freight Policy Coordination.** To respond to high levels of fragmentation across the supply chain, an independent, appointed policy director for the State could help manage policy issues, provide holistic advice for improvement, and focus on communicating to the industry on behalf of multiple state agencies.

Several other potential solutions emerged, including making trucking and warehouse jobs more attractive (such as by raising wages and eliminating training bottlenecks) to address labor shortages; advocating for 24/7 rail (rather than port/warehouse) operations; addressing the supply chain’s market failures and tendency to reward inefficiency (e.g., higher profit for sending containers back empty); fixing the trucking appointment system; doubling/tripling cargo loads for drivers and increasing weight limits; increasing chassis and equipment manufacturing, as well as warehouse storage space; and eliminating ‘free shipping culture’ when shipping is not free.

5. Impacts

PSR defines an impact as that which has an effect on the transportation system, or society in general, such as reduced fatalities, decreased capital or operating costs, community impacts, or environmental benefits. The journey of generating outputs and impacts is uncertain and happens over time. Therefore, performance with respect to outcomes and impacts are likely to be more a matter of judgement than of quantifiable metrics. Our contributions are judged by the PSR Advisory Council, and measured as significant or not significant.

All of PSR’s research products are made [available to the public](#). These products have an immeasurable impact on the body of scientific knowledge.

Professor Hyland’s (UCI) work has developed shared-used vehicle routing techniques that can potentially reduce both traveler waiting and in-vehicle travel time in certain circumstances—particularly the level of supply-demand imbalance. Improving the performance of shared-use systems is critical for elevating shared rides as a mode in the transportation marketplace that can realistically compete with

solo rides, which are known to effectively increase the total VMT in the system with respect to drive-alone trips, whereas shared rides can increase effective occupancy and ultimately reduce VMT.

The research project, “Bridge monitoring through a hybrid approach leveraging a modal updating technique and an artificial intelligence (AI) method” (UH) has adopted wavelet transform technique to process sensor-based structural response data from time-domain into frequency domain as AI training examples. Compared with the conventional feature extraction approach, the deployed method provides more accurate and effective solution for the proposed bridge monitoring project.

Impact on the adoption of new practices

Professor Giuliano and PhD student Sue Dexter (USC) participated in clean truck planning task force for LA Metro. In recent months, a plan was adopted and the first funds were allocated for implementation.

Dr. Stephen Ritchie’s (UCI) work on LiDAR truck classification has the potential to greatly improve the forecasting of freight flows, which has important implications for the design of policy related to freight transportation including, but not limited to, shifting heavy-duty trucks operations to zero-emissions and the development of the necessary energy infrastructure (chargers and hydrogen stations) to support that shift. Caltrans is closely monitoring Ritchie’s outputs on this project.

NAU’s project with the City of Scottsdale resulted in the first (to our knowledge) CMFs for the left-in left-out median treatment. Once disseminated, these CMFs may be used by agencies around the country who are considering installation of this treatment.

PI Shaffer (CSULB) chairs the City of Long Beach Technology & Innovation Commission (TIC) and this research will help inform implementation of the city’s data privacy guidelines. The City of Long Beach’s Technology and Innovation Department has agreed to purchase participant incentives (\$25 gift cards) to continue the research. PI Shaffer plans to design routes for 3 additional data walks in the Long Beach area. The findings elucidated in “Using artificial intelligence to improve traffic flows, with consideration of data privacy principles” (CSULB) are helping to inform a “surveillance ordinance” that the TIC will present to City Council for consideration.

Impact on transportation workforce development

Training courses and certificate programs have increased the expertise of transportation professionals. PSR carries out an extensive workforce development program as described in previous sections.

ITS-Davis provides support, via PSR, to the WTS UC Davis Student Chapter, the fourteenth WTS student chapter founded nationwide, to help women network and advance their professional careers.

The Port of Long Beach Academy of Global Logistics (AGL) at Juan Rodriguez Cabrillo High School is a partnership of the Port, Long Beach Unified School District and two units at CSULB’s College of Professional and International Education: CITT and the Office of Professional and Workforce Development. As an integrated approach to workforce development, it uses a Small Learning Community approach to combine academic curriculum with industry-relevant training and information, informed by research, to support academic and career development. AGL builds on the Long Beach College Promise by introducing high school students to career opportunities in global trade and logistics and showing them how to prepare for those careers through a wide range of training and education programs including certificates, certifications, and degrees offered by Long Beach City College and California State University, Long Beach. CSULB is currently developing a two-semester capstone course

for AGL's 12th grade CTE class that will give students an opportunity to apply knowledge learned from the program to an industry-specific problem. The course is being mapped to school district requirements and being submitted for review for transfer credit to the UC and CSU systems.

PCC's impacts on transportation workforce development:

- Increased public awareness of autonomous trucking
- Provided funding source personnel with increased awareness of opportunities available to their clients
- Creation of webinars to upskill staff on GIS
- Collaborations formed to move forward with bringing younger learners into the industry through dual enrollment efforts

6. Changes/Problems

Changes in approach and reasons for change

Covid-19 has left NAU with excess funds for travel, which have been diverted to fund undergraduate and graduate interns.

Problems and delays encountered during the reporting period

Delays in the award process for new Caltrans-funded PSR projects have delayed the start dates. A handful of projects were originally scheduled to begin in early fall, but are now anticipated to begin in December or January.

The International Urban Freight (INUF) conference and Town Hall have been postponed to May 2022 due to travel restrictions for the large proportion of international attendees.

Change of primary performance site location

Most PSR faculty, staff, and students have transitioned back to their work locations on campus on a hybrid schedule.

7. Special Reporting Requirements

Nothing to report.

8. Appendix A

This appendix includes lists (non-exhaustive) of PSR researchers' publications and presentations from the current reporting period. For a list of final reports published during the reporting period, see Table 1.

A. Publications

Peer-reviewed journal publications

1. Carlsson, John Gunnar and Liu, Sheng and Salari, Nooshin and Yu, Han, Provably Good Region Partitioning for On-Time Last-Mile Delivery (September 1, 2021). Rotman School of Management Working Paper No. 3915544, Available at SSRN: <https://ssrn.com/abstract=3915544> or <http://dx.doi.org/10.2139/ssrn.3915544>
2. Dingtong Yang, Navjyoth J.S. Sarma, Michael F. Hyland, and R. Jayakrishnan (2021). Dynamic modeling and real-time management of a system of EV fast-charging stations. *Transportation Research Part C: Emerging Technologies*, Volume 128, <https://doi.org/10.1016/j.trc.2021.103186>.
3. Gabbe, C., Manville, M., & Osman, T. (2021). The opportunity cost of parking requirements: Would Silicon Valley be richer if its parking requirements were lower?. *Journal of Transport and Land Use*, 14(1), 277–301. <https://doi.org/10.5198/jtlu.2021.1758>
4. Gehrke, S.R., & T.G. Reardon. (2021). Direct demand modelling approach to forecast cycling activity for a proposed bike facility. *Transportation Planning and Technology* 44(1): 1-15. 10.1080/03081060.2020.1849959.
5. Gehrke, S.R., B. Sadeghinassr, Q. Wang, & T.G. Reardon. (2021). Patterns and predictors of dockless bikeshare trip generation and duration in Boston's suburbs. *Case Studies on Transport Policy*. 10.1016/j.cstp.2021.03.012.
6. Gehrke, S.R., M.P. Huff, & T.G. Reardon. (2021). Social and trip-level predictors of pooled ride-hailing service adoption in the Greater Boston Region. *Case Studies on Transport Policy*. 10.1016/j.cstp.2021.05.004. Federally supported.
7. Gehrke, S.R., T.G. Reardon. (2021). Patterns and predictors of early electric vehicle adoption in Massachusetts. *International Journal of Sustainable Transportation*. 10.1080/15568318.2021.1912223
8. Giuliano, G., M. Dessouky, S. Dexter, J. Fang, S. Hu, M. Miller. Heavy-duty trucks: The challenge of getting to zero. *Transportation Research Part D: Transport and Environment*, Volume 93, 2021. <https://doi.org/10.1016/j.trd.2021.102742>
9. Jin, Wen-Long (2021). A Link Queue Model of Network Traffic Flow. *Transportation Science* 55(2):436-455.
10. Lu, Y., G. Giuliano, R. Habre. Estimating hourly PM2.5 concentrations at the neighborhood scale using a low-cost air sensor network: A Los Angeles case study. *Environmental Research*, Volume 195, 2021. <https://doi.org/10.1016/j.envres.2020.110653>
11. Kim, K., B. Wolshon, P. Pant, E. Yamashita and J. Ghimire. 2020. Assessment of Evacuation Training Needs: Targeting Instruction to Meet the Requirements of Local Communities and Agencies. *Journal of Emergency Management*, 18(6), 475-487.
12. Kim, K., E. Yamashita, and J. Ghimire. 2021. Factors Associated with Differences in Initial Pandemic Preparedness and Response: Findings from a Nationwide Survey in the United States. *Transportation Research Interdisciplinary Perspectives*, 11, 100430.

13. Kim, K., R. Chowdhury, P. Pant, E. Yamashita, and J. Ghimire. 2021. Assessment of ENSO Risks to Support Transportation Resilience. *Progress in Disaster Science*, 12, 100196.
14. Kim, K., Yamashita, E. and J. Ghimire. 2021. Bikeshare and Safety: Risk Assessment and Management. *Transportation Research Interdisciplinary Perspectives*, 9, 100276.
15. Matherly, D., J. Moberly, P. Bye, J. McDonald, W. Ankner, K. Kim, E. Yamashita, P. Murray-Tuite, A. Pande, J. Renne, and B. Wolshon. 2021. *Resilience Primer for Transportation Executives*. National Academies of Sciences, Engineering and Medicine, Washington, DC. National Academies Press. <https://doi.org/10.17226/26195>
16. Pooladsanj, Milad, K. Savla, and P. A. Ioannou (2021). Vehicle Following On A Ring Road Under Safety Constraints: Role of Connectivity and Coordination. arXiv, 2103.14142. <https://arxiv.org/abs/2103.14142>
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19. Rezwana Rafiq and Michael G. McNally (2020). "An Empirical Analysis and Policy Implications of Work Tours Utilizing Public Transit." *Transportation Research Part A*142, 237-259 [doi.org/10.1016/j.tra.2020.10.018].
20. Rezwana Rafiq and Michael G. McNally (2021). "Heterogeneity in Activity-travel Patterns of Public Transit Users: An Application of Latent Class Analysis." *Transportation Research Part A*152, 1-18 [doi.org/10.1016/j.tra.2021.07.011].
21. Rezwana Rafiq and Michael G. McNally (2021). Heterogeneity in Activity-travel Patterns of Public Transit Users: An Application of Latent Class Analysis, *Transportation Research Part A: Policy and Practice*, Volume 152, <https://doi.org/10.1016/j.tra.2021.07.011>.
22. Rivera-Royero, D., Jaller, M., & Kim, C.-M. (2021). Spatio-Temporal Analysis of Freight Flows in Southern California. *Transportation Research Record*. <https://doi.org/10.1177/03611981211004130>
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24. Shen, S. and K. Kim. 2020. Assessment of Transportation System Vulnerabilities to Tidal Flooding in Honolulu, Hawaii. *Transportation Research Record: Journal of the Transportation Research Board*, 2674 (11), 207-219.
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26. Steven R. Gehrke, Brendan J. Russo, Bita Sadeghinassr, Katherine R. Riffle (U), Edward J. Smaglik & Timothy G. Reardon. Spatial interactions of shared e-scooter trip generation and vulnerable road user crash frequency, *Journal of Transportation Safety & Security*, DOI: 10.1080/19439962.2021.1971813, 2021. Federally supported.

27. Wen-Long Jin (2021). Stable local dynamics for day-to-day departure time choice, *Transportation Research Part B: Methodological*, Volume 149, Pages 463-479. <https://doi.org/10.1016/j.trb.2021.05.013>.

Other publications

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2. Amberg, N., & Dasmalchi, E. (2021). Daylighting Public Funding Streams: Increasing Equitable Access to Public Transit Across California. *UCLA: Institute of Transportation Studies*. <http://dx.doi.org/10.17610/T6FP4H>, research report. Retrieved from <https://escholarship.org/uc/item/8c08844w>
3. Bento, A., N. S. Miller, M. Mookerjee & E. R. Severnini. Time is of the Essence: Climate Adaptation Induced by Existing Institutions. National Bureau of Economic Research, working paper; May 2021. DOI: 10.3386/w28783
4. Bhusal, S., Calderón Chiñas, B. L, Coutin, T. S, Daza García, L., Hiller, L., & Will, C. (2021). Transit-Oriented Development Without Displacement: Strategies to Help Pacoima Businesses Thrive. *UCLA: Institute of Transportation Studies*. <http://dx.doi.org/10.17610/T60K66>, research report. Retrieved from <https://escholarship.org/uc/item/3gr006rd>
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6. Brown, A. L, D'Agostino, M. C, & Fuller, S. J. (2021). Research Brief: Local Policies for Better Micromobility. UC Davis: Institute of Transportation Studies. <http://dx.doi.org/10.7922/G24X563K> Retrieved from <https://escholarship.org/uc/item/2512g04j>. Research Brief. Published by institute.
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11. DISSERTATION: "Developing Demand Model for Commuter Rail while Analyzing Underlying Attitudes of the System" De'Von Jennings, Civil and Environmental Engineering.
12. DISSERTATION: "Resilient Spatiotemporal Truck Monitoring Framework using Inductive Signature and 3D Point Cloud-based Technologies" Yiqiao Li, Civil and Environmental Engineering
13. Fuller, S., Fitch, D., & D'Agostino, M. C. (2021). Local Policies for Better Micromobility. UC Davis: Institute of Transportation Studies. <http://dx.doi.org/10.7922/G2FJ2F3B> Retrieved from

- <https://escholarship.org/uc/item/8mw5j82x>. White Paper. Published by institute. Acknowledges federal support.
14. Gabbe, CJ, Manville, M., & Osman, T. (2020). The Opportunity Cost of Parking Requirements: Would Silicon Valley be Richer if its Parking Requirements were Lower? *UCLA: Institute of Transportation Studies*. Retrieved from <https://escholarship.org/uc/item/6rp7j0qf>
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27. Ong, Paul. (2021). Mobility, Accessibility and Disadvantaged Neighborhoods: Assessing Diversity in Transportation-Related Needs and Opportunities. Pacific Southwest Region University Transportation Center, research brief. https://www.metrotrans.org/assets/research/psr-19-63_ong_research-brief.pdf
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B. Conference papers

1. Balisi, N., H. Jula, and A. Chassiakos, “Smart Cities: A Focus on Intelligent Transportation Systems,” IGESSC 2021, Long Beach, CA, Nov. 2021.
2. Barajas, Jesus. "Cycling Toward Mobility Justice in Latino Immigrant Communities." *Transfers Magazine*, Spring 2021. <https://transfersmagazine.org/magazine-article/issue-7/cycling-toward-mobility-justice-in-latino-immigrant-communities/>
3. Carlsson, John G. “The “sidekick” routing paradigm for VMT reduction and improved accessibility.” *INFORMS Annual Meeting*; Anaheim, CA; 2021.
4. Krallman, J., N. Balisi, M. C. Garcia, H. Jula, and A. Chassiakos, “Traffic Delay Modeling for an Intersection in the City of Long Beach, CA, using Vissim,” *IEEE Green Energy and Smart Systems Conference (IGESSC 2021)*, Long Beach, CA, Nov. 2021.
5. Liao, Y., Luo, J., Hao, P., Barth, M., and Boriboonsomsin, K. (2022). “Evaluating transportation system-level impacts of innovative truck routing strategy for mitigating the impacts of truck emissions on communities.” Accepted for presentation at the 101st Annual Meeting of the Transportation Research Board.
6. McCullough, Sarah, and Sequoia Erasmus. "Assessing Transportation Equity in California." 2021 PSR Congress, online. 12 April 2021. <https://its.ucdavis.edu/news-and-events/conferences/psr-congress/>
7. Rosas, C., J. Lee, H. Jula, and A. Chassiakos, “Neural Network Delay Estimation with Inclusion of Heavy Goods Vehicular Data,” *IGESSC 2021*, Long Beach, CA, Nov. 2021.
8. Shaffer, G. Tech Trek: Gauging Long Beach Residents' trust levels with smart technologies through "datawalking." *Telecommunications Policy Research Conference*, September 2021.

9. Shilling, Fraser. "Benefit-cost analysis to address wildlife-vehicle conflict hotspots." 2021 PSR Congress, online. 12 April 2021. <https://its.ucdavis.edu/news-and-events/conferences/psr-congress/>

C. Presentations

1. Carlsson, John G. "The "sidekick" routing paradigm for VMT reduction and improved accessibility." Presented at Shanghai University, Fall 2021.
2. Gehrke, S.R. Spatial equity implications and neighborhood factors of ridehailing trip frequency and vehicle miles traveled in the Phoenix metro region. Invited presentation [online] for Arizona Institute of Transportation Engineers University Research Meeting, Sept. 23, 2021.
3. Gehrke, S.R., B. Sadeghinassr, Q. Wang, & T.G. Reardon. Patterns and predictors of dockless bikeshare trip generation and duration in Boston's suburbs. Poster presentation at Transportation Research Board's 100th Annual Meeting, Washington, District of Columbia, Jan. 25-29, 2021.
4. Gehrke, S.R., B.J. Russo, B. Sadeghinassr, K.R. Riffle, E.J. Smaglik, & T.G. Reardon. Spatial interactions of shared e-scooter trip generation and vulnerable road user crash frequency. Poster presentation at Transportation Research Board's 100th Annual Meeting, Washington, District of Columbia, Jan. 25-29, 2021. Federally supported.
5. Gehrke, S.R., M.P. Huff, & T.G. Reardon. Adoption of pooled ride-hailing services in the Greater Boston region. Poster presentation at Transportation Research Board's 100th Annual Meeting, Washington, District of Columbia, Jan. 25-29, 2021. Federally supported.
6. Gehrke, S.R., T.M. McCremens, & A. Felix. Exploring the past and future impacts of ride-hailing services on bus riders. Poster presentation at Transportation Research Board's 100th Annual Meeting, Washington, District of Columbia, Jan. 25-29, 2021.
7. Jenn, Alan. "Charging Infrastructure Development for Transportation Network Company Electrification." California Air Resources Board meeting, online. 8 April 2021.
8. Kim, K., E. Yamashita, and J. Ghimire. 2021. Factors Associated with Differences in Pandemic Preparation and Response: Findings from a Nationwide Survey in the United States. Presented at the 100th Annual Meeting of the Transportation Research Board, Washington, DC.
9. Kim, K., E. Yamashita, and J. Ghimire. 2021. Pausing the Pandemic: Understanding and Managing Traveler and Community Spread of COVID-19 in Hawaii. Presented at the 100th Annual Meeting of the Transportation Research Board, Washington, DC.
10. Kim, K., G. Leong, E. Yamashita, and J. Ghimire. 2021. Impacts of COVID-19 Travel Restrictions on Paratransit Users in Honolulu, Hawaii. Presented at the 100th Annual Meeting of the Transportation Research Board, Washington, DC.
11. Rezwana Rafiq and Michael G. McNally (2021). "Defining Public Transit Commuters Based on Their Work Tour Choice." Presented at the 100th TRB Annual Meeting, 21-03193, Washington D.C.
12. Rezwana Rafiq and Michael G. McNally (2021). "Heterogeneity in Activity-travel Patterns of Public Transit Users: An Application of Latent Class Analysis." Presented at the 100th TRB Annual Meeting, 21-03013, Washington D.C.
13. Rezwana Rafiq and Michael G. McNally (2021). "Analysis of Activity-Travel Patterns and Tour Formation of Transit Users" Presented at the Caltrans Final Project Briefing. <https://www.its.uci.edu/~mmcnally/transit/PSR-McNally-FinalPPT-July2021.pdf>

14. Russo, B., “A Comparison of Freeway Median Crash Frequency, Severity, and Barrier Strike Outcomes by Median Barrier Type”, Presented at the 2021 In-Service Performance Evaluation (ISPE) Subcommittee of the Transportation Research Board (TRB) Standing Committee on Roadside Safety Design Spring Meeting, July 2021. Presented remotely due to Covid-19 Pandemic.
15. Russo, Brendan J. and Smaglik, Edward J. “Examining the Use of Microsimulation Modeling to Assess Bicycle-Vehicle Conflicts at Intersections: A Case Study Incorporating Field-Observed Conflict Data.” Presented at the 2021 ITE Annual Meeting (Virtual). July 27th, 2021
16. Sadeghinassr, B., A. Akhavan, S.R. Gehrke, Q. Wang, & T.G. Reardon. Mining dockless bikeshare data for deeper transportation planning insights: Evidence from the Greater Boston region. Poster presentation at Transportation Research Board’s 100th Annual Meeting, Washington, District of Columbia, Jan. 25-29, 2021.
17. Stephen Ritchie. “Investigation of LiDAR intensity for anonymous truck fleet characterization” Transportation Research Board Sponsored Innovations in Freight Data Workshop. 09/23/2021.
18. Ximeng Fan, Penghang Yin, and Wen-Long Jin, “Novel Approach for Correcting and Smoothing Longitudinal Trajectories of Individual Vehicles”, Ms. No. TRBAM-22-02118. Accepted for presentation.