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1. Accomplishments

METRANS UTC is a partnership of the University of Southern California (USC) and California State University, Long Beach (CSULB). Its purpose is to conduct a multidisciplinary program of research, education, and technology transfer to increase the economic competitiveness of large metropolitan areas through improved transportation system performance across all surface transportation modes.

1.1 RESEARCH

The METRANS research program aims to generate knowledge that makes a significant contribution to solving urban transportation problems. Our approach is uniquely integrative: we address passengers and freight across all surface transportation modes. By designing policy incentives to implement effective strategies to address the needs of freight and passengers, system efficiency outcomes are achieved

Research Program Themes

Theme 1 is Understanding Passenger-Freight Interactions, the basic forces underlying transport supply and demand, in three topic areas: relationships between spatial patterns and transportation, characteristics of freight and passenger demand, and better data for analysis of passenger-freight interactions. Theme 2 is Achieving System Efficiencies within and across modes and user classes and policy strategies that facilitate and promote these efficiencies. It includes two topic areas: integrated management across users and modes, and policies for more efficient urban transportation.

1.1.2 Research Program Selection and Management

Tables 1 through 3 list research projects from Years 1 and 2. All projects are completed and final reports are posted on the website. Given space limitations, we do not include descriptions for these projects.

Table 1: Pre-selected Launch Projects – all are completed and posted to website	
Theme 1	Understanding Passenger-Freight Interactions
Topic 1-1	Spatial Patterns and Transportation
1-1a	<i>Urban Spatial Structure, Employment Sub-Centers, and Passenger and Freight Travel</i>
1-1b	<i>The Freight Landscape: Using Secondary Data to Describe Metropolitan Freight Flows</i>
Topic 1-3	Better Data for Analysis of Passenger-Freight Interactions
1-3a	<i>Tracking Truck Flows with Programmable Mobile Devices</i>
Theme 2	Achieving System Efficiencies
Topic 2-1	Integrated Management Across Users and Modes
2-1a	<i>Efficiencies in Freight and Passenger Routing and Scheduling to Reduce VMT</i>
2-1b	<i>Design and Evaluation of Impact of Traffic Light Priority for Trucks on Traffic Flow</i>
Topic 2-2	Policies for More Efficient Urban Transportation
2-2	<i>Mitigating Urban Freight Through Effective Management of Truck Chassis</i>

Table 2: Year 1 Open Solicitation Projects, RFP – all are completed and posted to website	
Theme 1	Understanding Passenger-Freight Interactions
Topic 1-3	Better Data for Analysis of Passenger-Freight Interactions
14-06	<i>Development of Micro Wireless Sensor Platforms for Passenger-Freight Interactions.</i>
14-13	<i>Smart Truck Driver Assistant: Real Time Management of Container Delivery to Trucks</i>
Theme 2	Achieving System Efficiencies
Topic 2-1	Integrated Management Across Users and Modes
14-09	<i>A Dynamical Framework for Integrated Corridor Management</i>
14-11	<i>Vehicle-to-Vehicle Communications in Mixed Passenger – Freight Convoys</i>
Topic 2-2	Policies for More Efficient Urban Transportation
14-04	<i>Analysis and Prediction of Spatiotemporal Impact of Traffic Incidents for Better Mobility and Safety in Transport. Systems</i>

Table 3: Year 2 Open Solicitation Projects – all are completed and posted to website		
Theme 1	Understanding Passenger-Freight Interactions	Funding
Topic 1-1	Relationships Between Spatial Patterns and Transportation	
15-27	<i>Spatial Dynamics of Warehousing and Distribution in California</i>	Caltrans
Topic 1-2	Characteristics of Freight and Passenger Demand	
15-01	<i>Investigations of the Effect of Humid Air on NOX & PM Emissions of a CNG Engine</i>	Caltrans
15-10	<i>Route Choice Characteristics of Owner-Operated Trucks in Southern California Freeways</i>	Caltrans
15-15	<i>The Decline in Inter- and Intra-Urban Mobility and its Impact on Passenger Travel</i>	Caltrans
Topic 1-3	Better Data for Analysis of Passenger-Freight Interactions	
15-02	<i>Simulation of liquefaction-induced damage of the Port of Long Beach using the UBC3D-PLM model</i>	Caltrans
Theme 2	Achieving System Efficiencies	Funding
Topic 2-1	Integrated Management across Users and Modes	
15-03	<i>Development of an Economic Framework to Evaluate Resilience in Recovering from Major Port Disruptions</i>	Caltrans
15-04	<i>Integration of Passenger and Freight Rail Scheduling</i>	Caltrans
15-08	<i>Application of a Regional Multi-Modal Transportation System Performance Monitoring Framework</i>	DOT
15-12	<i>Optimum Routing of Freight in Urban Environments under Normal Operations and Disruptions using a Co-simulation Optimization Control Approach</i>	DOT
15-14	<i>Quantifying the Impact of Next-Generation Modes of Delivery</i>	DOT
Topics 2-1 and 2-2	Integrated Management across Users and Modes and Policies for More Efficient Urban Transportation	
15-13	<i>Developing Affordable Housing Guidelines Near Rail Transit in Los Angeles</i>	Caltrans

Table 4 lists the Year 3 projects and funding sources. All of these projects were completed during the current reporting period. The projects will be added to the website in October. Abstracts for the Year 3 projects were presented in the previous PPPR.

Table 4: Year 3 Open Solicitation Projects – all are completed, will be posted to website		
Theme 1	Understanding Passenger-Freight Interactions	Funding
Topic 1-2	Characteristics of Freight and Passenger Demand	
16-13	<i>Fine grained “automatic vehicle classification” system development for accurately measuring passenger-freight interactions</i>	Caltrans
Theme 2	Achieving System Efficiencies	Funding
Topic 2-1	Integrated Management across Users and Modes	
16-02	<i>A Cost Allocation Model for Horizontal Supply Chains</i>	Caltrans
16-05	<i>Evaluating Economic Mobility and Resilience of Multimodal Freight Operations in a Connected Vehicle Environment</i>	Caltrans
16-07	<i>Sustainable and Affordable Housing Near Rail Transit: Refining and Expanding a Scenario Planning Toll</i>	Caltrans
16-16	<i>A Computational Framework for Data-Driven Distributed Resilient Control of Traffic Corridors</i>	DOT
16-17	<i>Evaluating Freight Efficiency Metrics</i>	Caltrans
Topic 2-2	Policies for More Efficient Urban Transportation	
16-08	<i>Innovating on Job Accessibility with General Transit Feed Specification Data</i>	DOT
16-06	<i>Trajectory Data Mining for Performance Measurement of Public Transportation Systems</i>	Caltrans

We issued our Year 4 RFP (<http://www.metrotrans.org/research-projects/metrotrans-utc>) to allocate remaining research funding from the METRANS Tier 1 funds, both USDOT and Caltrans match, including remaining funds from previous years. The Year 5 RFP was issued on March 17, 2017, with proposals due April 19, 2017. We received 14 proposals and funded six of them. Table 5 lists the Years 4-5 projects. Abstracts were presented in the previous PPPR.

Table 5: Years 4-5 Open Solicitation Projects – all are completed, will be posted to website		
Theme 1	Understanding Passenger-Freight Interactions	Funding
Topic 1-3	Better Data for Analysis of Passenger-Freight Interactions	
17-11	<i>Smart Sensing System for Real-time Automatic Traffic Analysis of Highway Rest Areas</i>	DOT
Theme 2	Achieving System Efficiencies	Funding
Topic 2-1	Integrated Management across Users and Modes	
17-01	<i>Optimizing Combined Truck Routing and Parking based on Parking Availability Prediction</i>	DOT
17-02	<i>Investigating Impact of Crowdsourcing on Smart Freight Mobility</i>	DOT
17-05	<i>Socially Optimal Personalized Routing with Preference Learning</i>	DOT
Topic 2-2	Policies for more efficient urban transportation	
17-09	<i>Institutional Response to Transit Oriented Development in the Los Angeles Metropolitan Area: Understanding Local Differences Through the Prism of Density, Diversity, and Design</i>	DOT
17-14	<i>Measuring Congestion Costs of Car Commuters and Their Determinants: A Counterfactual Approach</i>	DOT

We added three additional match projects in late 2017 and early 2018. The projects were funded by Caltrans and have all been completed. We will upload the final reports to our website in October. Table 6 lists the additional projects. The abstracts appear below the table.

Table 6: Caltrans Match Projects – all are completed and will be posted to website		
17-15	<i>Economic Competitiveness, Definitions, and Onetries</i>	Caltrans
17-16	<i>California Freight Program Assessment Initiative</i>	Caltrans
18-01	<i>Goods Movement/Logistics Training</i>	Caltrans

USC 17-15 Economic Competitiveness, Definitions, and Onetries (Giuliano, USC) This project continues earlier work aimed at establishing performance measures for monitoring the economic competitiveness of the freight sector as part of the implementation of the California Sustainable Freight Action Plan (CSFAP). The purpose of this project is to define competitiveness in California’s freight sector, and work with industry, public and state and local government stakeholders to establish performance measures and targets relative to the implementation of the CSFAP. The project is in support of the Governor’s Office of Business and Economic Development (GO-Biz), which is taking the lead role

in establishing these new definitions and metrics in relation to the state's greenhouse gas (GHG) reduction goals and development of a sustainable freight system for California. The main objective of this research is to build on previous work with public agencies and industry groups to establish a set of measures that would accurately depict the competitive state of California's freight economy, and arrive at targets that could be used to evaluate competitiveness over time. In collaboration with the Economic Competitiveness Working Group, we defined competitiveness and the freight sector, evaluated data sources for potential metrics, and generated test metrics and comparable groups.

CSULB 17-16 California Freight Program Assessment Initiative (O'Brien, CSULB) The Caltrans Freight Program Assessment Initiative is intended to identify strengths, weaknesses, opportunities and threats of the Caltrans freight program and recommend best practices to improve Caltrans freight planning processes, programs and project delivery. This includes near-term and long-range assessments of the resources available to implement freight-related programs and how the department manages those resources; the identification of innovative freight planning and implementation practices and their applicability and transferability to Caltrans; the identification and definition of roles within the department that support innovation; and the development of an implementation strategy to help fulfill the freight program's mission.

CSULB 18-01 Goods Movement/Logistic Training (O'Brien, CSULB) Transportation planning at the state, regional and local levels is becoming increasingly complex. This includes planning for infrastructure projects tied to goods movement. The new federal transportation reauthorization bill contains a specific title on freight for the first time. The National Freight Advisory Committee has prepared a National Freight Strategic Plan, another first in federal guidance, and US DOT has released guidance for State Freight Plans and State Freight Advisory Committees. Under Governor Brown's Executive Order B-32-15, state agencies have collaborated to develop a statewide Sustainable Freight Action Plan. California issued a Freight Mobility Plan in late 2014. Its implementation (and updating) will require an understanding of how the supply chain works and the implications of trends in intermodal distribution and industry practices. The implementation of state laws on greenhouse gas (GHG) emissions reduction (including AB 32 and SB 375) has changed the skill sets needed for planners, bringing new emphasis on sustainability and integrating transportation and land use planning. Some foundation in goods movement and supply chain management will benefit those making decisions, projections, and assumptions about the transportation and warehouse sectors, among others, as part of the planning process. Under this Task Order, METRANS will design and implement two four-day training academies, one in the Inland Empire and one in Sacramento, for Caltrans staff from district offices and headquarters. The Inland Empire will have as its focus intermodal freight operations. The Sacramento session will include discussions of issues important to California's Central Valley, including agricultural supply chains. The classes will also inform and be informed by METRANS' work on the development of a freight capacity building study for Caltrans under Task Order 19. The classes will help test the effectiveness of training materials and at the same time provide an opportunity for Caltrans personnel from different parts of the State and from different units to provide input on the need for freight-related professional development.

1.1.3 Dissemination

Research reports are published to the METRANS website and presented at METRANS research seminars, open to the public. Preliminary results are often presented at conferences. All projects are expected to result in refereed publications.

Five papers were published in refereed journals:

Boarnet, M., A. Hong, and R. Santiago-Bartolomei. 2017. "Urban Spatial Structure, Employment Subcenters, and Freight Travel," *Journal of Transport Geography*, 2017, vol. 60, pp. 267-276.

- Giuliano, G. and S. Kang (2018) “Spatial dynamics of the logistics industry: Evidence from California,” *Journal of Transport Geography*, forthcoming.
- Giuliano, G. S. Kang, and J. Yuan (2017) “Using proxies to describe the metropolitan freight landscape”, *Urban Studies*, first published online: February 1, 2017, <https://doi.org/10.1177/0042098017691438>
- Li, S., M. Dessouky, L. Yang, Z. Gao. 2017. “Joint Optimal Train Regulation and Passenger Flow Control Strategy for High-Frequency Metro Lines,” *Transportation Research, Part B: Methodological*, 99, 113-137
- Rodrigue, J-P, L. Dablanc, G. Giuliano (2017) “The freight landscape: Convergence and divergence in urban freight distribution,” *Journal of Transport and Land Use*, 10(1), <https://jtl.u.org/index.php/jtl/article/view/869>.

Six papers are under review or under preparation for journal submission

- Bento, A.M., Gillingham, K. & Roth, K. “Cars that Kill You? The Effects of CAFE Standards on Vehicle Weight Dispersion”, *Journal of Political Economy*.
- Boarnet, M. & X. Wang, “Urban Spatial Structure and the Potential for Vehicle Miles Traveled Reduction: The Impact of Accessibility to Jobs Within and Beyond Employment Sub-Centers,” under submission at *Annals of Regional Science*.
- Hsu, H-P, M. Boarnet & D. Houston, “Gender and Transit Use: The Influence of Environmental Beliefs and Safety Concerns,” under submission at *Transportation Research A: Policy and Practice*.
- Painter, G., S. Chakrabarti. “Geographic mobility of recent immigrants and urban transit demand in the U.S.: New evidence and planning implications”.
- Webb Jamme, H-T., Rodriguez, J., Bahl, D. & Banerjee, T. “Transit Oriented Development: Evolution of a Concept”. *Journal of Planning Education and Research*.
- Zhao, Y., P. Ioannou, M. Dessouky. “Dynamic Multimodal Freight Routing Using a Co-Simulation Optimization Approach,” submitted for publication

Nine presentations were made at conferences:

- Boarnet, M. & X. Wang, “Urban Spatial Structure and the Potential for Vehicle Miles Traveled Reduction: The Impact of Accessibility to Jobs within and beyond Employment Sub-Centers,” presented at Transportation Research Board annual meeting, 2017.
- Chan, F.H. & Banerjee, T. “Comparing the Spaces of Kevin Lynch and Henri Lefebvre in the City”. The 2017 American Association of Geographers Annual Meeting, Boston, MA. April 4-7.
- Li, W., N. Rosenheim, H. Dong., M Boarnet, and H. Zhong, “Rail Transit and Economic Growth: Documenting Evidence from a Panel Data Analysis of Eighteen Metropolitan Areas in the United State,” presented at Transportation Research Board annual meeting, 2017.
- Molisch, A.F. “Modulation and multiple access for high-speed train communications”, *Chinese Research Center for Railway Safety and Control, Beijing, China*, invited keynote, July 3rd, 2017.
- Wei, D. “Economic Impact Analysis of Port Disruptions – Roles of Resilience,” Invited Presentation to the delegation of Singapore Ministry of Home Affairs, USC, June 1, 2017.
- Wei, D. “Evaluating the Role of Resilience in Recovering from Major Port Disruptions,” presented at 7th METRANS International Urban Freight Conference, Long Beach CA, October 17-20, 2017
- Wei, D. “Evaluating the Role of Resilience in Recovering from Major Port Disruptions,” presented at Transportation Research Board 96th Annual Meeting, Washington DC, January 8-12, 2017.
- Zhao, Y., P. Ioannou, M. Dessouky. “A Hierarchical Co-Simulation Optimization Control System for Multimodal Freight Routing,” *Conference Proceedings IEEE 20th International Conference on Intelligent Transportation*, 2017, Yokohama, Japan
- Zhao, Y., P. Ioannou, M. Dessouky. “Routing of Multimodal Freight Transportation Using a Co-simulation Optimization Approach,” *Conference Proceedings Transportation Research Board*, 2017 Washington D. C.

1.1.4 Plans for Next Reporting Period

All projects are complete and this is the final reporting period. Final reports and research briefs for projects completed during the current reporting period will be added to our website in October. Researchers will continue dissemination of research results via our website, other publications, papers, conference presentations, and our seminar series. We will comply with grant closeout procedures and submit all required documents within 90 days of grant termination.

1.2 EDUCATION AND WORKFORCE DEVELOPMENT

METRANS' education goal is to foster education and training to contribute to the development of the transportation workforce. Our approach is multi-disciplinary, multimodal, and incorporates both passengers and freight. Under this grant we have developed a series of education activities for levels K-12 to PhD. These programs build on the education and training programs available at both universities.

1.2.1 New and Continuing Activities Associated with Degree Programs

Graduate Research Assistantships: We continue to support PhD students on METRANS research projects. Since this grant is closing out, students are now supported on projects funded by our Pacific Southwest Region 9 UTC grant.

Postdoctoral Fellowships: Two postdoctoral fellowships were awarded for the 2017-18 academic year. Sanggyun Kang, 2017 USC PhD, conducted research on warehouse location and impacts, and on freight flow optimization. Yanbo Zhao, 2017 USC PhD, conducted research on freight flow optimization.

Graduate Courses: The CSULB Master of Science in Supply Chain Management Degree launched in the fall of 2015. The program has two parallel tracks, one for practicing professionals, which is an evening and weekend program completed in 24 months. The other is an accelerated track for those not working in the industry as well as for international students. This track is completed in 21 months. The first cohort of MSSCM (Professional) and the second cohort of the Accelerated track graduated in December of 2017. The second professional cohort graduated in August 2018. A total of 32 new students are enrolled in cohorts 3 and cohort 4 which are currently underway.

1.2.2 Facilitating Connections between Students and Employers

Professional Development: We continue to partner with WTS-LA to promote student participation in the resume book and to facilitate and sponsor membership and attendance at WTS events. METRANS Associate Director Victoria Deguzman is the WTS-LA chapter University Liaison and a Special Advisor to the President of Workforce Development, and conducts outreach for WTS to both high schools and institutions of higher learning throughout the greater LA region; a graduate level transportation student at USC serves as the chapter Student Liaison. We continue to offer career services to students interested in a transportation related career, and facilitate connections with students and industry. CSULB also designs the employer engagement programs for the Port of Long Beach Academy of Global Logistics at Long Beach Cabrillo High School.

METRANS Mentor Program: This program has been migrated to PSR UTC.

METRANS Lunch with a Practitioner Series: This program has been migrated to PSR UTC.

METRANS Internship and Employment Assistance: This program has been migrated to PSR UTC.

CITT Job and Internship Post: CITT has established a job and internship post on its website at <https://www.ccpe.csulb.edu/TheManifest/JobPostings.aspx> and works with the CSULB Career

Development Center matching students to employment and internships. CITT also includes trade and transportation-related job postings in its email blasts and news updates.

1.2.3 Non-degree Programs

Metropolitan Transportation Management Certificate (MTMC): Curriculum development was coordinated with LA Metro and designed to cover multi-modal transportation planning fundamentals, with a focus on passenger-freight conflicts. The success of the pilot program, which was conducted during the previous reporting period, has motivated the METRANS team to further develop its curriculum and share it as an educational tool for planning and transportation professionals around the country. In addition, the curriculum developed for the class will be modified for a class of professional transportation consultants to be held in the spring of 2019 in coordination with the South Bay Cities Council of Governments.

Caltrans Freight Academy: CITT offers a four-day freight academy designed for planners and engineers as part of a regular series of Caltrans-specific classes. During the reporting period, one workshop focusing on intermodal transport was held in Ontario CA; and a second workshop on agricultural supply chains was scheduled for April 2018 in Sacramento.

Introduction to Logistics and Supply Chain Management (CITT 180): a self-paced 30-hour online class that can serve as a gateway class for a number of CITT programs or as an independent self-paced training program was completed in 2016 and is now part of CITT's course offerings. Students who complete the class are eligible for a waiver of the introductory module in the Global Logistics Specialist program.

1.2.4 Research Seminars

METRANS Transportation Research Seminar Series: This serves as a forum for faculty, guest presenters, and advanced graduate students to present their research. Seminars take place during the fall and spring semesters, are open to the public, and are often a collaborative effort of METRANS and cosponsors such as student, academic, and professional groups. Most are recorded and made available through social media. Seminars are well attended. The research seminars held during this period were funded through the Pacific Southwest Region (PSR) UTC and reported in the PSR PPPR for this period.

1.2.5 Educational Enrichment

METRANS offers support to groups who represent and serve underrepresented, female, and transportation-related student populations to assist them with education and skills training, strategic planning, event planning and execution, membership recruitment and retention, awards, scholarships, and operations. These groups include WTS-LA, WTS-OC, USC and CSULB Student Chapters of the Institute for Transportation Engineers (ITE), USC Student Chapter of the American Planning Association (APA), Price Sol Global (graduate-level students of planning policy), Associated Students of Planning and Development (ASPD), Price Women Leading Policy, Planning, and Development (WLPPD), Young Professionals in Transportation (YPT), Price Partnership for an Equitable Los Angeles (PELA), International Public Policy and Management Program (IPPAM), CSULB Society for the Advancement of Management (SAM) and Graduate Business Association, the USC student chapter of the National Society of Black Engineers (NSBE) the USC and CSULB student chapters of the Society of Women Engineers (SWE), USC Asian Pacific Islander Caucus (APIC), Price Latino Student Association (PLSA) and the Price Graduate Policy and Administration Community (GPAC), USC Women in Management, and the Girl Scouts of Los Angeles and Orange Counties. We also provide opportunities for students to experience transportation outside the classroom, such as field trips, resource and guest speaker referrals, and opportunities for publication of their written work and accomplishments.

Field Trips and Site Visits: These are a regular component of our enrichment programming. The field trips are now being offered as part of the PSR UTC.

1.2.6 Attracting New Entrants to Transportation

Academy of Global Logistics: CITT partnered with the Port of Long Beach and Long Beach Unified School District to develop the Port of Long Beach Academy of Global Logistics (AGL) at Cabrillo High School. The AGL is a four-year small learning community, which combines an academic curriculum with industry-relevant training and information to support academic and career development. The Academy introduces high school students to career opportunities in global trade and logistics and shows 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 CSULB. CITT is responsible for developing an academy to prepare teachers to incorporate transportation and logistics-related materials into lesson planning. During the reporting period, CSULB partnered with Esri to develop a story map accompanied by a narrative video that introduces K-12 students to the supply chain. The video will be presented to students at the Academy of Global Logistics. We are currently working with the Esri's education team to build a comprehensive story map that depicts key topical aspects of global and domestic supply chains.

1.2.7 Dissemination

Dissemination is via courses and certificate programs, assistance regarding internships, employment opportunities, and professional development, seminars and educational series, our website, student research opportunities, support and outreach to student groups, research and career fair support and presentations, and our mentor program. We use CITT's Facebook, LinkedIn, and Twitter accounts to disseminate information and our podcasts to highlight our programs. This reporting period we had 640 Twitter followers and 45 tweets. We had 410 Facebook "Likes" and 69,812 Facebook visits, as measured by "impressions" (the number of times people have encountered a post from CITT or the page itself). Our LinkedIn page has grown to 1,139 members. We also feature METRANS related events at the CITT blog, which is available at <https://www.ccpe.csulb.edu/citt/blog/blogposts.aspx?pid=125>.

We also use METRANS social media accounts to disseminate information. This reporting period, we had 657 Twitter followers and 25 tweets. We had 413 Facebook "likes" and 13,685 visits.

1.2.8 Plans for Next Reporting Period

This is the final reporting period. All continuing education and workforce development activities will be reported under the PSR UTC.

1.2.9 TECHNOLOGY TRANSFER

The goal of the technology transfer program is to broaden our reach and disseminate research results. All technology transfer activities were transitioned to PSR as of Fall 2017. These include:

- Continuation of signature events: In 2019, the CITT Town Hall will be held in conjunction with the METRANS International Urban Freight Conference scheduled for October 16-18, 2019.
- Outreach: Working and Living in a Port City Series
- Media and Communications: METRANS News, Research Briefs, website and social media; METRANSInfo, ContainterCasts, TransCasts, Student podcasts, YouTube, and Trade Talks

These activities are now reported in the PSR UTC PPR.

1.3.1 Dissemination

Dissemination is achieved through the events, media, and communication channels described above.

1.3.2 Plans for Next Reporting Period

This grant is closing out, and this is the final reporting period.

2. Products

2.1 PUBLICATIONS

In this reporting period, the Tier 1 projects resulted in 5 peer-reviewed publications (with 6 under review) and 9 presentations. See Section 1.1.3.

2.2 WEBSITES

Our website is at <http://www.metrotrans.org>.

2.3 TECHNOLOGIES

Petros Ioannou (USC) developed a mathematical model that includes parking availability and the USA Hours-of-Service regulations in the scheduling of long-haul truck shipments. The model can be solved by using Mixed Integer Programming software. The model resulted from his Tier 1-funded research project, “Optimizing Combined Truck Routing and Parking based on Parking Availability Prediction.” PhD student Filipe de Almeida Araujo Vital, who was supported by Tier 1 funds, assisted Ioannou on the project.

John Carlsson (USC) designed new algorithms as part of his project, “A Cost Allocation Model for Horizontal Supply Chains.” The California Department of Transportation funded this as a match project. Two PhD students in Industrial and Systems Engineering assisted Carlsson on the project. Carlsson will perform more research and development to further test and refine the algorithm.

2.4 INVENTIONS

Nothing to report.

2.5 EDUCATIONAL PRODUCTS

Nothing to report.

2.6 OTHER PRODUCTS

Other products are 1) podcasts of METRANS seminars; 2) internship and employment database; 3) Long Beach Business Journal column publications and related podcasts; 4) podcast of Industry Outlook; 5) METRANS news, and 6) expansion of the Monitoring the Ports database.

3. Participants and Collaborating Organizations

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

3.1 PARTICIPANTS

Table 8: METRANS UTC Partners and Contributions		
Name	Location	Contribution
AAA (The Auto Club)	Los Angeles	Financial contribution
BNSF Railway	Long Beach	Financial contribution
Caltrans	Sacramento	Match fund sponsor, financial contribution of full
Ceres Terminals	Los Angeles	Associate, financial contribution
CITT	CSULB	Home of CSULB METRANS, training and prof programs
Economics Dept.	CSULB	Participating faculty, education programs, students
Engineering (COE)	CSULB	Participating faculty, education programs, students
Foothill Transit	West Covina	Associate, financial contribution
KOA	Monterey	Financial contribution
LA Customs Brokers & Freight Forwarders Association	Los Angeles	Financial contribution
Majestic Realty	Industry	Associate, financial contribution
Metro	Los Angeles	Assoc., financial contribution, internships, research
Metrolink	Los Angeles	Associate, financial contribution
Nixon Peabody	Los Angeles	Legal consulting, financial contribution
Port of Long Beach	Long Beach	Assoc., financial contribution, internships, scholarships
Port of Los Angeles	Los Angeles	Assoc., financial contribution, internships, scholarships
SCAG	Los Angeles	Assoc., financial contribution, internships, data sharing
SCAQMD	Diamond Bar	Financial contribution
Sol Price School of Public Policy	USC	Home of Center, education programs, financial contribution for admin; indirect cost share; offices, labs
Viterbi School of Engineering	USC	Participating faculty, education programs, students; indirect cost and tuition cost share, METRANS labs
Volvo Research and Educational Foundations	Gothenberg, Sweden	Financial contribution, match fund sponsor
Watson Land Co.	Carson	Financial contribution
WTS LA Chapter	Los Angeles	Financial contribution

Caltrans is the major funding partner. Additional financial support is provided by METRANS Associates Partners, and by individual corporate contributions.

3.2 COLLABORATING ORGANIZATIONS

METRANS has extensive relationships with other universities, public agencies, and private industry. The METRANS UTC has access to these relationships.

3.2.1 Advisory Organizations

METRANS Advisory Board: The board meets annually, and provides overall policy guidance for the Center. It suggests research priorities, identifies funding opportunities, assists in student job placements, and participates in outreach activities. Members are leaders and serve as liaisons to their agencies and industries. They are appointed by the Director with the advice of the Executive Committee. Gold and Silver level METRANS Associates Partners are members of the Board; others are appointed to represent

the broad constituency of stakeholders. A list of members is available at <http://www.metrans.org/advisory-board>. The Board met in November 2017. The METRANS Advisory Board will continue after the close of this grant; it provides overall policy guidance to all of METRANS' activities.

The Center for International Trade and Transportation (CITT): CITT is dedicated to delivering education programs, innovative research, and community outreach in goods movement and is the Long Beach home for METRANS. CITT Executive Director, Thomas O'Brien serves as a METRANS Associate Director. The CITT has several noteworthy educational programs directly related to the Tier One Center, including the Academy of Global Logistics teacher course and the recently launched Introduction to Logistics and Supply Chain Management, a 30-hour online class that can serve as a gateway class for a number of CITT programs or as an independent self-paced training program.

CITT Policy and Steering Committee: The CITT Policy and Steering Committee (PSC) consists of representatives from modal transportation sectors, units of government, organized labor, and other individuals in international trade and transportation, as well as from academia. The PSC helps direct the outreach activities of CITT, including those sponsored by METRANS. The PSC also serves as the advisory body on the development of the structure and content of the Town Hall Meeting.

Other Relationships: We have extensive relationships with industry and government. SCAG provides regional planning and transportation modeling data. LA Metro funds a major research project to develop a data archive from real-time transportation system monitoring data and develop applications for planning and system management. Several trade organizations offer scholarships and other assistance, including the Los Angeles Transportation Club (LATC), Harbor Transportation Club (HTC), Harbor Association for Industry and Commerce (HAIC), and Council of Supply Chain Management Professionals (CSMCP). The HAIC, LATC and HTC have endowed scholarship funds for students in CITT-related programs. During the reporting period, the Foreign Trade Association established another scholarship for students at CSULB in trade and transportation-related programs. O'Brien serves as a Board member for the Southern California Roundtable of the CSCMP, LATC, Foreign Trade Association, HAIC and National Transit Institute. He also serves as Chair of the Southern CA Regional Transit Training Consortium.

3.2.2 Relationships with Other Universities

Council of University Transportation Centers (CUTC): Giuliano is a past president and executive committee member. O'Brien is Secretary and lead for the CUTC workforce development efforts. MetroFreight (MF) Center of Excellence: METRANS is the home of the Volvo Research & Educational Foundations (VREF) Center of Excellence on urban freight. The consortium includes the University Transportation Research Center (Region 2 UTC) in New York, the Institute of Science and Technology for Transport in Paris, and the Korean Transport Institute (KOTI) in Seoul.

National Center for Sustainable Transportation (NCST): METRANS is a partner in the NCST consortium, led by UC Davis, and including UC Riverside, Georgia Tech, and University of Vermont. METRANS' role is sustainable freight transport.

Southwest Transportation Workforce Center (SWTWC): The Southwest Transportation Workforce Center (SWTWC) seeks to connect and empower the 21st century transportation workforce through research, education, and industry engagement. SWTWC is led by CSULB, with USC, Texas A&M Transportation Institute (TTI), ICF International, and the National Occupational Competency Testing Institute as partners. The mission of SWTWC is to provide a more strategic and efficient approach to transportation workforce development. The SWTWC leads an FHWA-funded National Transportation Career Pathways initiative with partners from the other regional workforce centers at the University of Vermont, University of Memphis, University of Wisconsin, and Montana State University.

4. Impact

As the METRANS Tier 1 UTC approaches completion, it is appropriate to identify the impacts the UTC has had on knowledge creation, training of the next generation, public policy, and professional practice.

4.1 DEVELOPMENT OF THE PRINCIPAL AND OTHER DISCIPLINES

METRANS is a multi-disciplinary research center that includes engineering, social sciences, urban planning and public policy. Our impact has been on developing interdisciplinary courses and degree programs. At USC, most graduate transportation courses are cross-listed between public policy and engineering. At CSULB, the masters level MS-SCM is an interdisciplinary degree. Employers recognize the value of our graduates' multidisciplinary training, which is reflected in high placement rates of our graduates. Regarding fields of research, METRANS has contributed to development of routing and scheduling methods to improve rail and truck efficiency; development of simulation models for truck and passenger flows; and establishing urban freight as a field of research within urban planning/public policy.

4.2 DEVELOPMENT OF HUMAN RESOURCES

Student Support: Student support is an important component of research project selection. At USC, active METRANS UTC research projects fund 36 student positions. Of those hired, there is one undergraduate, 6 master's, and 29 PhD students. At CSULB, METRANS UTC research funds 13 research assistants: eight undergraduate students and four master's students, and one doctoral student on research projects being undertaken by CSULB professors. In addition, 10 graduate students and undergraduate student are employed at CSULB's Center for International Trade and Transportation (CITT) on a variety of METRANS projects including social media, web management, conferences, non-credit training programs, and workforce development-related programs. We provide financial and administrative support to allow students to participate in transportation conferences and competitions.

Support for Underrepresented Groups: We are committed to promoting diversity. Of the eleven student administrative assistants at USC directly supported by METRANS funding, ten are members of underrepresented groups, nine are both female and a member of an underrepresented group. Of the eighteen research and student assistants at CSULB directly supported by METRANS funding, four are female and six are members of an underrepresented group. Of the 17 student and professional groups supported by METRANS, six are specifically devoted to women, and three are specifically devoted to underrepresented groups. The Academy of Global Logistics at Cabrillo High School in Long Beach serves a largely minority population.

Scholarship Opportunities: METRANS regularly disseminates information regarding opportunities for scholarships to students and the general public via our website, social media, announcements at courses and events, and our email distribution list of over 3,000. Scholarships are generally awarded at the end of each academic year to facilitate the students' following year. Four endowments are dedicated to students in CITT-related programs, most of which serve professional students in non-credit programs who do not qualify for many other scholarship programs limited to degree granting programs.

New Educational Materials, Programs, and Opportunities for Teaching: We began development of the third session of the LBUSD Academy of Global Logistics teacher academy course offered in June 2018.

4.3 RESOURCES AT UNIVERSITY AND PARTNER INSTITUTIONS

We continue support of transportation student and professional organizations, and to improve our Goods Movement Database, the Manifest Industry Outlook calendar, and the internship and employment databases. METRANS continues to develop the METRANS InfoShop/Blog. At USC, research facilities

include staff offices, high capacity computing, spatial analysis laboratory, secure data servers, and a variety of statistical software.

4.4 TECHNOLOGY TRANSFER

Tech transfer is via reports, briefs, papers, and presentations.

Marlon Boarnet's (USC) white paper on VMT reduction with Susan Handy (UC Davis) resulted in recommendations that were included in the current California AB 32 scoping plan for greenhouse gas (GHG) emission reduction. The result is Appendix C of the revised scoping plan, which is based on the input provided to state officials, see last five pages of:

https://www.arb.ca.gov/cc/scopingplan/app_c_vibrant_comm_vmt_measures.pdf

Genevieve Giuliano is working directly with the California Governor's Office of Business and Development (Go-Biz) and the Economic Competitiveness Working Group to implement Action 6 of the California Sustainable Freight Action Plan. Action 6 calls for identifying targets and strategies that consider commercial viability and promote the competitiveness of the state's freight sector.

4.5 SOCIETY BEYOND SCIENCE AND TECHNOLOGY

Our faculty are editors and on boards of several scholarly journals, and are members of state or local committees and task forces, providing advice on transport policy and practice. Giuliano is a former member of the National Freight Advisory Committee and contributed to recommendations for a national freight strategic plan, and for the freight provisions in the FAST Act. She is a member of the California Freight Advisory Committee, which provides advisement at the state level. Giuliano and O'Brien are members of the TRB Intermodal Freight Transport Committee. O'Brien is also a member of the Urban Freight Committee. O'Brien helps to raise the profile of transportation workforce development at the regional and national levels and brings together stakeholders from the public sector and private industry as Director of SWTWC and as Vice President of the Council of University of Transportation Centers (CUTC).

Tyler Reeb serves on the TRB Education and Training, and Native American Transportation Issues Committees. Reeb was promoted to Director of Research and Workforce Development in the Center for International Trade and Transportation at CSULB.

Marlon Boarnet was elected a fellow of the Regional Science Association International (less than two percent of the members of the association currently have fellow status.) Boarnet was also appointed a National University of Singapore (NUS) Society visiting fellow through nomination and evaluation via a competitive process at NUS. In 2016, Tom Sanchez ranked Boarnet the 16th most cited planning scholar in North American in his analysis of planning faculty citations, and in the 2017 citation analysis Boarnet ranked 18th. (See <http://tomwsanchez.com/2018-urban-planning-faculty-citation-analysis/> and <http://tomwsanchez.com/category/citation-analysis/>).

5. Changes

There are no changes in the scope or objectives of this grant. This grant is scheduled to close out September 30, 2018. All projects are complete, and this is the final progress report.

6. Special Reporting Requirements

No special reporting requirements.