CSUTC California State University Transportation Consortium

SB 1 Research Activities Summary / Research Plan for 2021-2022

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1. Overview

The California State University Transportation Consortium (CSUTC) unifies and focuses the efforts of four outstanding CSU campuses that represent and support the geographical, cultural, racial, and socioeconomic diversity that makes California, and the CSU system, strong: (1) CSU Chico – California Pavement Preservation Center; (2) CSU Fresno – Fresno State Transportation Institute; (3) CSU Long Beach – Center for International Trade and Transportation/College of Engineering; and (4) San José State University – Mineta Transportation Institute. CSUTC is led by the Mineta Transportation Institute (MTI) at San José State University, a federally-funded University Transportation Center since 1991.

CSUTC researches safe, reliable solutions that increase the mobility of people and goods and strengthen California's economy. CSUTC research focuses on high priority areas as identified by SB1. These high priority areas include: congestion relief (including traffic management systems), trade corridor enhancements, improved transit and rail, pedestrian and cyclist safety projects, as well as maintenance and rehabilitation for California's road and bridge infrastructure. More information about SB 1 can be found at: http://rebuildingca.ca.gov/.

2. Summary of Research Activities

This section summarizes research projects and publications across the Consortium since 2018. To date, ***140 research projects have been funded across the CSU system***, including projects selected for Year 4, which are described in detail.

Table 1. Summary of Research Activities Across the California State University Transportation Consortium, by Year

Description	Number
Year 1 Funding: 2018-19	
Number of projects funded	34
Number of CSU campuses represented (based on PI's home campus)	10
Number of projects published	34
Year 2 Funding: 2019-20	
Number of projects funded	38
Number of CSU campuses represented	10
Number of projects published to date	36[a]
Year 3 Funding: 2020-21	
Number of projects funded	36
Number of CSU campuses represented	6
Number of projects published to date	11[b]
Year 4 Funding: 2021-22	
Number of projects funded	32
Number of CSU campuses represented	8
Number of projects published to date[c]	0

[a] Two projects in peer review and/or editing.

[b] Fourteen projects in peer review and/or editing, eleven projects in progress.

[c] One project in editing, thirty-one projects in progress.

To date, 81 white papers and research reports have been published to the CSUTC website. This work demonstrates the breadth of research undertaken system-wide funded through the Consortium. Research reports are peer-reviewed, professionally edited, and formatted with a consistent style to represent CSUTC. ***A total of 13 unique CSU campuses have received project funding*** (based on PI's home campus).

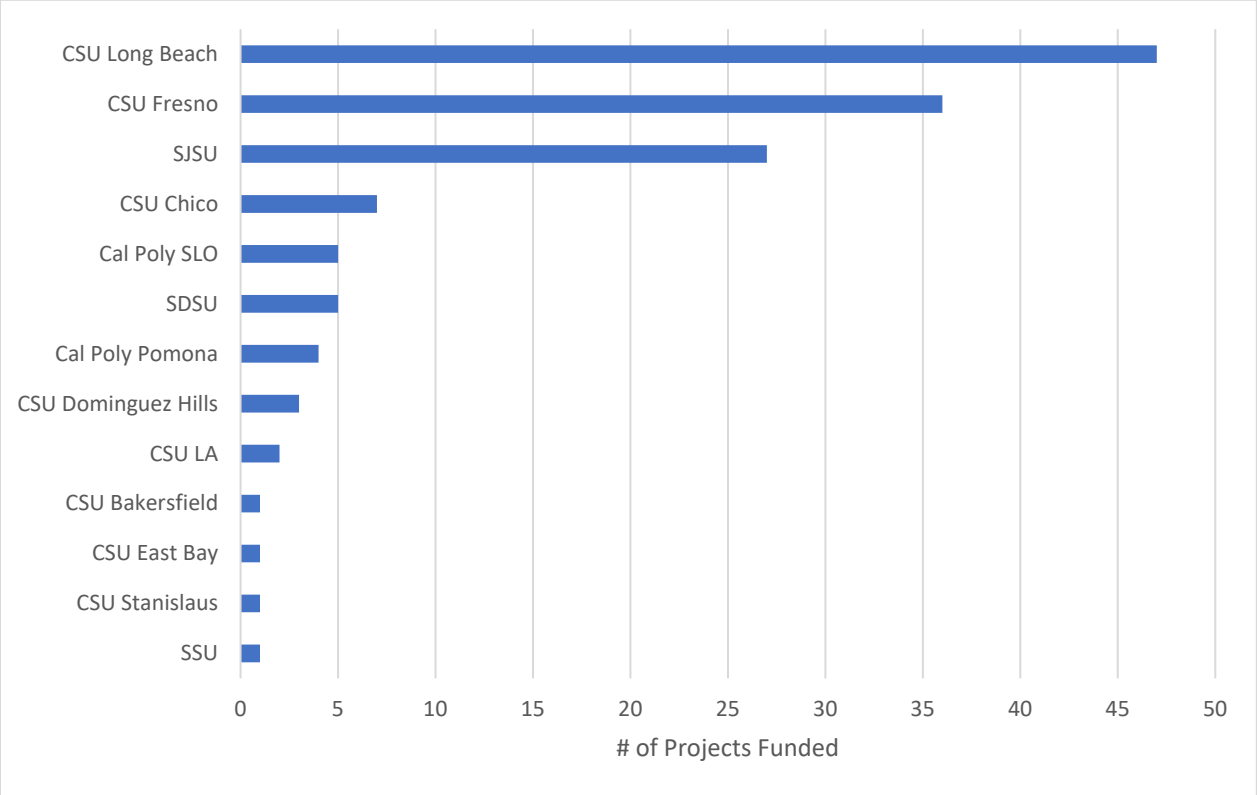

Figure 1 Summary of Funded Projects by Campus

3. Consortium Highlights

Developing a transportation workforce that possesses the skills needed to plan, design, deploy, operate, and maintain transportation systems that may not even exist today presents a unique and exciting challenge. As a Consortium, we engage with industry leaders on an ongoing basis to identify emerging career pathways, continually review and revise our existing K-12 and workforce development programs, find creative ways to attract potential entrants, and not only provide participants with the skills they need today but inspire them to lead the way into the future.

Technology Transfer

Faculty and students affiliated with CSUTC engage in a wide range of technology transfer activities including conference presentations, journal publications, media outreach, briefings,

and other efforts to ensure that research is accessible to practitioners. Since inception in 2018, there have been ***more than 104 presentations by CSUTC researchers at conferences and professional meetings*.**

During this past year, CSUTC researchers and executive leadership have been called upon to share their expertise and knowledge. Dr. Karen Philbrick provided testimony to the California State Assembly Committee on SB 1351 and transportation job creation. She also presented the CSUTC Senate Bill 1 Research Program Update to the California Transportation Commission (CTC). Similarly, many CSUTC researchers presented to the CTC, topics included MTI's California-focused public opinion survey, performance metrics on access to jobs, and the impact on state gas tax revenue due to zero-emission vehicles. Additional briefings were provided to the California Department of Finance on road user charging and zero-emission vehicles and to the Rhode Island Education Operations Center on our CSUTC-funded research on COVID-19 virus circulation on buses.

An important goal for the Consortium is to ensure that research moves into practice. This year, CSUTC partnered with the City of San Jose's Department of Transportation on a research pilot program led by Cal Poly Pomona faculty member, Dr. Wen Cheng to assess the viability of big data and new technologies to make smarter, data-driven decisions. The City has indicated that this pilot has "generated a lot of excitement within SJDOT and with other City departments who are all hungry for this type of around-the-clock data collection." In addition, CSUTC research on transit training needs assessment is being used as part of the Southern California Regional Transit Training Consortium to priorities a scope of work for the new Executive Director.

Journalists seek out CSUTC researchers experts on a number of hot transportation topics. One example is research by Dr. Aly Tawfik at CSU Fresno. His research, COVID-19 Transit Bus Air Circulation and Virus Mitigation Study was reported on by several news outlets, both local and international, including ABC30 News, California KSEE24/CBS47, GV Wire, and Golos Ameriki (Russia). In addition, CSU Fresno produced a video highlighting Dr. Tawfik and his students who worked on this study.

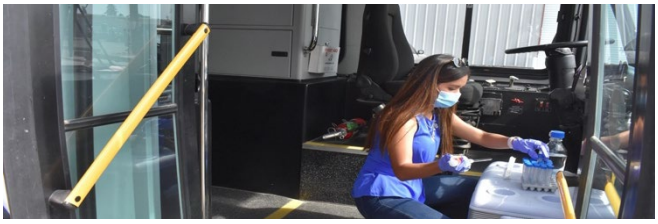

Figure 2 Dr. Tawfik's research assistant conducts test aboard a transit bus

Another advantage of the CSU-wide emphasis of the Consortium is the opportunity to engage researchers from across the 23-campus system. Recently, Dr. Hovannes Kulandijian, from CSU Fresno, was selected to serve as Guest Editor for a Special Issue of *Journal of Sensor and Actuator Networks* on Advanced in Intelligent Transportation Systems. Dr. Kulandijian was able to tap into the CSUTC network of researchers and invite several faculty to participate in this special issue.

As part of CSUTC's tech transfer program, a concerted effort is made to respond to specific requests from transportation professionals to provide knowledge transfer. At the request of the City of San José's Department of Transportation, MTI hosted a ResearchSnaps webinar for city staff on the CSUTC-funded project, Comparing Twitter and LODES Data for Detecting Commuter Mobility Patterns.

Leadership

CSUTC partners bring an outstanding record of state, national and international leadership and success in advancing transportation policy and generating solutions. Since forming, we have advised our state's policy makers through such diverse venues as testimony; conference panels; briefings of senior policy makers and through board and committee service. Thought leadership and the representation of the CSU SB1 funded research and workforce development portfolio in multiple venues is critically important. To that end, following is a table of CSUTC Executive Director activities, some are continuing while others are new.

Item Number	Organization	Service Role: Karen E. Philbrick, PhD
1	American Public Transportation Association (APTA) High-Speed and Intercity Passenger Rail Committee	Director Committee Member
2	APTA Mobility Restoration and Recovery Task Force (a COVID-19 Response)	Task Force Advisor
3	American Road and Transportation Builders Association (ARTBA)	Board Member and Executive Committee
4	ARTBA Research and Education Division	President
5	City and County Pavement Improvement Center, UC Davis Institute of Transportation Studies	Executive Committee
6	Council of University Transportation Centers (CUTC)	Past President
7	The International Level Crossing Awareness Day (ILCAD 2022)	Committee member Secretary
8	LA Metro Office of Extraordinary Innovation (OEI)	Advisory Board Member
9	Rotary Club of San Jose	Board Member
10	San Jose Spotlight	Transportation Columnist
11	TCRP Panel F-29: Mental Health, Wellness, and Resilience for Transit System Workers	Chair
12	Transit Advisory Committee for Safety (TRACS)	Committee Member (appointed by Secretary Chao)
13	Transportation Learning Center	Board Member
14	Transportation Research Board AR010 Committee: Passenger Rail	Committee Member, Research Subcommittee Chair, and CRC Chair

Item Number	Organization	Service Role: Karen E. Philbrick, PhD
15	Transportation Research Board AP080 Committee: Transit Safety and Security	Committee Member
16	Women in Transportation Seminar (WTS) Foundation Board	Board Member Secretary

Awards

CSUTC research and researchers continue to receive awards and recognition for their accomplishments. CSU Fresno's Dr. Aly Tawfik received the ASCE San Francisco Section's Research Project of the Year award for his research, COVID-19 Transit Bus Air Circulation and Virus Mitigation Study. CSU Long Beach's Dr. Jinwon Kim received the best paper award from the International Transportation Economics Association 2021 conference for a paper based on his SB1-funded research. Dr. Vahid Balali, also a CSU Long Beach faculty member, received a Regional Teaching Award from the Associated Schools of Construction as well as the CSULB Early Academic Career Excellence Award.

Students affiliated with CSUTC have also been recognized for their accomplishments. David Corona, an undergraduate student at CSULB and a student research assistant working on CSUTC-funded research, was selected as one of 25 students from across the U.S. as part of the Transportation Research Board's 2021 Minority Fellows Program. Students at CSU Chico, with their faculty advisor, Dr. DingXin Cheng, received the Capstone Project Award from ASCE Region 9.

A major emphasis of Senate Bill 1 is on road repair and rehabilitation, and CSUTC has completed a number of pavement-focused studies in addition to the significant CSU-UC partnership, the City and County Pavement Improvement Center (CCPIC). Pavement specifications developed by CCPIC helped the City of Santa Rosa win the Overall Prize from the 2021 Outstanding Local Streets and Roads Project Award program. The same project also received awards from the American Concrete Institute (ACI) as the regional award winner in the "Infrastructure" category. It also received the Engineering News Review (ENR) regional Project of the Year Award for the "Transit/Airport" category. Each of those submittals and award summaries recognized the CCPIC specifications and contributions.

Workforce Development

CSUTC engages with the future of the transportation workforce in a number of different ways, including through research opportunities. Specifically, all of the Consortium's full-scale research projects are required to include students on the research team. These students benefit from working closely with faculty mentors. As an example, Linda Lim received her undergraduate at CSU Fresno and worked as a research assistant for Dr. Aly Tawfik on a CSUTC-funded research project. She has gone on to pursue a Ph.D. in civil engineering and environmental systems at the University

Figure 3 Linda Lim, CSU Fresno alumna and past CSUTC research assistant

of Virginia where she is also Secretary for the University of Virginia's chapter of the Institute of Transportation Engineers. Lim was recently awarded a prestigious National Science Foundation Fellowship Award.

The CSUTC-UC partnership to establish the City and County Pavement Improvement Center has **trained over 850 pavement professionals around the State**. In the past year, 185 individuals attended classes available online, including three new courses developed this year. In addition to classes, CCPIC, has developed software tools for local agencies, which are available for free download. This multi-campus partnership involves CSU faculty from SJSU, Cal Poly SLO, CSU Chico, and CSU Long Beach along with UC Davis and UC Berkeley.

A key workforce development highlight this year was the establishment of the Pavement Preservation Academy (PPA) by CSUTC partner, CSU Chico. This certificate program, which consists of four 3-hour modules, was held in March 2021 for the first time. A total of 48 attendees, from 23 state and local agencies, representing 19 California counties, participated. Eighty-one percent of attendees successfully completed the program. As a direct result of participating in the PPA, the City of Chico is now collaborating with CSUTC researchers on integrating pavement preservation into its pavement management program.

CSUTC also provides opportunities for students to learn more about professional organizations in the transportation field and engage in networking. MTI partnered with WTS-SF Bay Area to host "Make the Connection: Next Stop Your Career." At this event, students studying transportation were introduced to several professional organizations including Women's Transportation Seminar (WTS), American Planning Association (APA), American Public Works Association (APWA), Association of Environmental Professionals (AEP), Conference of Minority Transportation Officials (COMTO), Institute of Transportation Engineers (ITE), Latinos in Transit (LiT), Young Professionals in Transportation (YPT).

CSUTC partner at CSU Long Beach, the Center for International Trade and Transportation, has produced several research reports focused on workforce development. Their recent research focusing on critical issues in trucking workforce development was highlighted by the National Academies of Sciences.

Leveraging Funding

An important focus for the Consortium is to secure additional funding to support transportation research. Recent examples of how CSUTC-funded research has led to additional funding include MTI's 2020 study, Investing in California's Transportation Future: Public Opinion on Critical Needs. Angel Pyle, SB-1 Program Manager, was so supportive of the research that MTI secured an additional $100,000 in funding from Caltrans to conduct a follow-up survey. In addition, CSUTC-funded research was instrumental for enabling a research team from CSULB to secure funding from the California Energy Commission and the Governor's Office of Business and Economic Development to conduct additional research on workforce development competencies.

4. Year 4 Detailed Research Activities

Consortium activities for Year 4 followed a similar pattern as the previous three years. First, each partner received a modest amount of funding to complete high-priority research projects aligned with SB1. CSU Fresno and Long Beach both ran internal competitions, while CSU Chico focused on high-priority pavement research through the California Pavement Preservation Center. SJSU/MTI focused on high priority projects that were identified by key stakeholders – including transit agency CEOs, members of the California State Legislature, and others. Second, a CSU-wide competitive RFP process was led by MTI/SJSU. Selected projects are summarized below.

A. CSUTC Partner Research

1. CSU Chico

CSU Chico, through the California Pavement Preservation Center (CPPC), is focusing their Year 4 research efforts on two major areas: professional development training through the Pavement Preservation Academy and development of a new concrete pavement preservation manual with associated online learning modules. Key personnel include: DingXin Cheng, R. Gary Hicks, Lerose Lane, and Roger Smith.

2. CSU Fresno

CSU Fresno, through the Fresno State Transportation Institute (FSTI), conducted an internal competitive RFP, which funded seven research projects. The table below lists project titles and principle investigators.

Project Title	PI
A GIS-Based Network Analysis to Investigate the Vulnerability of Accessibility to Emergency and Lifesaving Facilitates Under the Threats of Natural Hazards	Chihhao Wang
AI-based Pedestrian Detection and Avoidance at Night using IR Camera, Radar and Video Camera	Hovannes Kulhandjian
An Extension of Spatio-Temporal Analysis of the Roadside Transportation-Related Air Quality (StarTraq 2021): A Characterization of Bike Trails and Highways in Fresno/Clovis Area	Jaymin Kwon
Contracting Strategies: A Different Approach to Address Long Term Performance in Road Projects	Maria Calahorra-Jimenez
How Developing Regional Air Mobility Services Can Improve Ground Transportation Connectivity in the San Joaquin Valley	Julio Roa
Protecting our Community from the Hidden Vulnerabilities of Today's ITS	Shahab Tayeb
The Impact of the Source of the Message on Effective Communication Strategy to Enhance Traffic Safety in Fresno County: The Role of Credibility, Trust, Relevance, and Appeal	Samer Sarofin

3. CSU Long Beach

CSU Long Beach ran an internal competitive RFP through TRANSPORT, Transportation Research & Training, a collaboration between the College of Engineering and the Center for International Trade & Transportation. Ten projects were selected for funding. The table below lists project titles and principal investigators.

Project Title	PI
Biological Hydrogen Gas Production from Food Waste as a Sustainable Fuel for Future Transportation	Pitiporn Asvapathanagul
Connected Simulation for Work Zone Safety Application	Vahid Balali
Development of Framework for Infrastructure Sustainability Rating System for California Highways	Joseph Kim
Evaluation of Polymer Binder TechniSoil G5® in Concrete Mixtures	Shadi Saadeh
Implementing Industry-Supported and Demand-Driven Talent Pipelines for the trade and Transportation Sector	Tyler Reeb
Increased Durability and Reduced Maintenance Cost of Road Surfaces via Recyclable, Dual Use Fiber Reinforced Asphalt	Daniel Whisler
K12 Special Investigation Project: Mapping E-Commerce Locally and Beyond	Deanna Matsumoto
Optimizing Multimodal Transportation Access to Support Commuting among Low-income Transit Riders with Social Distancing	Shailesh Chandra
Solid Wastes-Derived Hydrogen Fuel for Green Transportation Fuel	Maryam Haddad
Transient Wind Shear and Tail-Pipe Emissions from Passing Vehicles under a Freeway Overpass with and without Crosswind	Hamid Rahai

4. San José State University (Research and Workforce Development Activities)

SJSU, through the Mineta Transportation Institute, has undertaken two large-scale projects. The first is a multi-year collaboration with the University of California through the City & County Pavement Improvement Center. (CCPIC) This continues a partnership developed during the first three years of CSUTC activity. This partnership is unique in that the funds come from MTI, but are used to support researchers at three other CSU campuses (Chico, Long Beach and San Luis Obispo). In addition, to expand CSU campus involvement in pavement-related research and professional development, CCPIC will organize outreach meetings and provide technical guidance to increase campus engagement. MTI is partnering with SPUR to develop a comprehensive estimate of non-residential parking infrastructure in the Bay Area, understand how this infrastructure has grown over time, and how it relates to urban form, equity, and the environment. MTI has also retained a small component (~10% of funding) to respond to additional high priority research needs as identified by the California State Legislature.

In addition to these research projects, MTI once again hosted the annual Garrett Morgan Sustainable Transportation Competition. This year, nine teams from across the country entered the competition, four of which were California schools. California Montessori Project school won 2nd place for their project 'Making the Bike Bus Better,' which proposes using smart street technologies with sensors and a communication network similar to those used by AVs for a better, safer, greener, and more fun commute. The other California teams, STEAM Academy at Burke Middle School, Alta Vista Middle School, and Korematsu Middle School, received praise from the industry judges for their sustainable ideas and creativity.

MTI again hosted the Mineta National Transportation Policy Summit in partnership with the Commonwealth Club of California on June 11, 2021. This year's theme was Electrifying the Transportation Future and our special guest was U.S. Department of Transportation Secretary Pete Buttigieg. Preliminary remarks were provided by Senator Alex Padilla, and the keynote address was provided by Caltrans Director Toks Omishakin. The program focused on electrifying the nation's vehicle fleet and re-establishing a stable source of federal and state revenue for transportation. Panelists included: Dr. Asha Weinstein Agrawal, Director of MTI's National Transportation Finance Center and SJSU professor; Carlos Braceras, Executive Director, Utah Department of Transportation; Carl Guardino, Executive Vice President, Bloom Energy; and Dr. Dan Sperling, University of California at Davis. The panel was moderator by Therese McMillan, Executive Director, Metropolitan Transportation Commission.

As lead institution for CSUTC, MTI also works to engage, connect, and promote research and researchers across the Consortium. To more effectively identify research expertise, MTI developed a new section of the Consortium website to highlight the wide range of expertise and CSU campus involvement.

B. CSU-wide Competitive RFP Process

MTI/SJSU, in collaboration with the CSU Chancellor's Office, implemented the Year 3 CSU-wide RFP process using the following approach.

- Research needs statements solicited from Caltrans, California Air Resources Board, California Transportation Commission, Cal-ITP, CSUTC partners, MTI's Board of Trustees, Safe Routes Partnership, and others. Fifteen targeted research needs were incorporated into the final RFP.
- RFP (available on InfoReady) distributed to CSU campuses on December 18, 2020 with a deadline to submit February 5, 2021.
- Evaluation rubric based on criteria and weighting listed in the RFP developed for reviews. *Proposals submitted based on targeted research needs received a 10% bonus on their rubric score.*
- Proposals categorized by objective and assigned to subject matter experts for initial review. A total of 29 non-CSU affiliated subject matter experts were identified for this first stage of review.

- Five proposals addressing targeted research needs were ranked in the top 10 of all proposals received. After a final review by the stakeholder submitting the research need, and an agreement that the stakeholder would serve as an external project advisor, those five proposals were selected for funding.
- An additional nine high-scoring proposals were then reviewed by panel of five professionals composed of two non-CSU-affiliated academics and three professionals representing Caltrans, the California State Transportation Agency (CalSTA) and the California Transportation Commission (CTC). The panel met via video conference on April 5, 2021.
- Three proposals were selected for funding and announcements regarding funding decisions were sent to PIs on April 7, 2021.
- One high priority research need was re-competed due to a request from the final review panel. Research teams who submitted proposals for that specific targeted research need were contacted to submit revised proposals with additional clarification. A proposal was selected for funding on June 23, 2021
- In addition, MTI was contacted by the California State Transportation Agency (CalSTA) regarding a high priority research need for Caltrans related to bridge monitoring of the Gerald Desmond Bridge in Long Beach. A research team from CSU Long Beach submitted a proposal which was reviewed and selected for funding.
- Subcontract agreements are being issued and some research teams, with fully executed agreemtns, have begun working.

Summary of Proposals Received

A total of 35 proposals were received from twelve CSU campuses (see Figure 4).

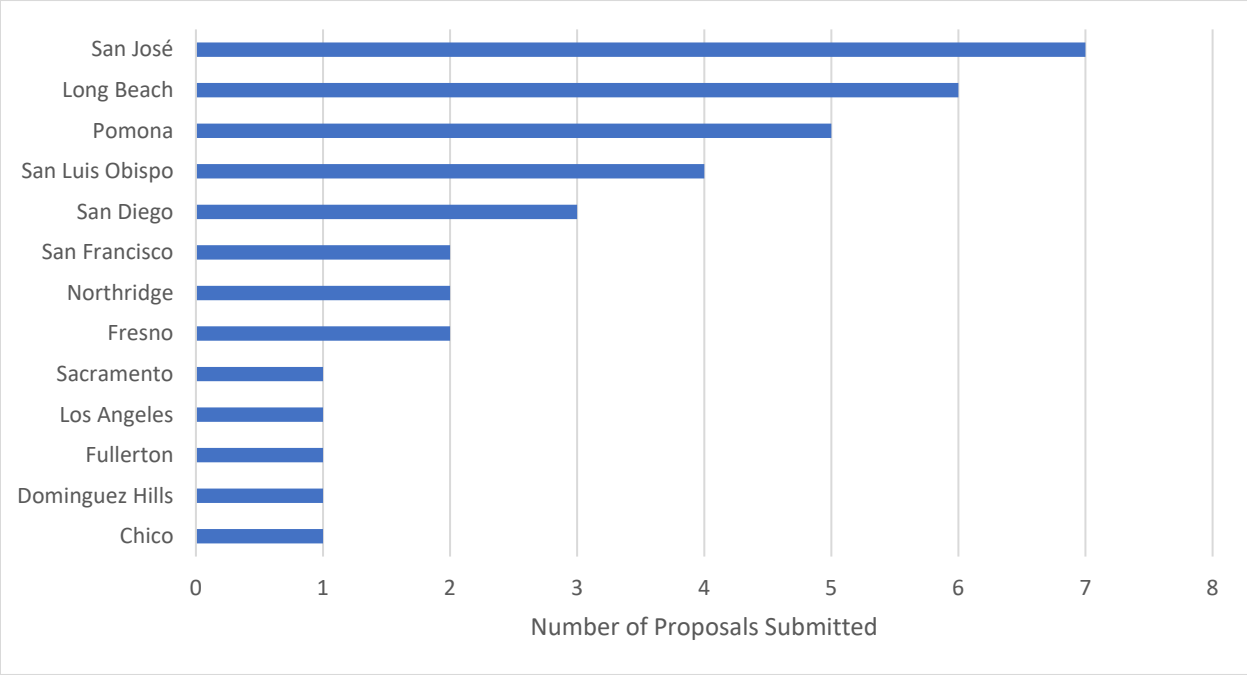

Figure 4 Summary of Proposal Submissions, by Campus

Summary of Proposals Awarded

Ten projects were selected for funding by the review panel and six CSU campuses are represented among the PIs. Subcontracts are in process between the SJSU Research Foundation and the respective campus Offices of Sponsored Programs. MTI held a kick-off meeting with each PI with detailed information regarding managing their project and submitting regular progress reports.

Title	PI	CSU Affiliation	Award $
Analyzing the Use and Impacts of Oakland Slow Streets and Potential Scalability Beyond COVID-19	Gordon Douglas	SJSU	$30,301
A Practical Framework for Component-Level Structural Health Monitoring of the Gerald Desmond Bridge	Mehran Rahmani	CSU Long Beach	$78,750
Development of Nanomaterials Additives to Improve Resistance to Moisture Damage in Hot Mix Asphalt (HMA)	Amro El Badawy	Cal Poly SLO	$69,933
Enhancing Older Adults' Mobility in Active Living and Tiered Living Communities	Yongping Zhang	Cal Poly Pomona	$75,000
Fragmented or Aligned Climate Action: Assessing Linkages Between Regional and Local Planning Efforts to Meet Transportation Greenhouse Gas Emissions Reduction Targets	Serena Alexander	SJSU	$74,719
Implementation Strategies and Rate Setting for Road User Charges in California	Asha W. Agrawal	SJSU	$74,962
Planning for Left Shoulder PartTime Travel Lane (LSPTTL): Workforce Training and Operational/Safety Considerations	Anurag Pande	Cal Poly SLO	$74,995
Preconstruction Support Cost Analysis	Nigel Blampied	SJSU	$70,924
Public Health Performance Indicator & SB 1 Transportation Funding Programs	Bruce Appleyard	SDSU	$75,000
"TELE-commuting" During the COVID-19 Pandemic and Beyond: Unveiling Statewide Patterns and Trends of Telecommuting in Relation to Transportation, Employment, Land use, and Emissions in California	Tianjun Lu	CSU Dominguez Hills	$74,223

C. Final Publication Process

All research projects undertaken as part of the CSUTC results in a final report. Research teams submit a draft version of the report to MTI and MTI manages a technical peer review, professional editing and formatting, and publication of the final report on the CSUTC website. Finally, to move research results into practice, a robust technology transfer program is used,

including promotion via press releases, social media, newsletters, as well as the CSU Transportation Research Spotlight in Sacramento.

CSUTC remains dedicated to addressing the complex nature of today's mobility challenges to advance the body of usable transportation knowledge and identify implementable solutions for California.