



Request for Proposals for Research Projects – Year 5
National Center for Sustainable Transportation

RFP Issued: 02/01/2021

Proposals Due: 03/02/2021



Table of Contents

Table of Contents	1
Introduction	2
Funding for this RFP	2
Eligibility	2
Research Program Themes and Topic Areas	2
Caltrans Topics	3
Selection Criteria for All Proposals	3
Funding Guidelines and Restrictions	4
White Papers	5
Proposal Instructions	7
Selection Criteria	8
Budget Instructions	8
Submission Instructions	8
Further Information	9
Appendix A: Caltrans Priority Research Topics	10
Appendix B: USC Budget Form	22
Appendix C: CSULB Internal Clearance Process Instructions Using Cayuse SP	23
Appendix D: PSR Center Proposal Evaluation Form	24

Introduction

The [National Center for Sustainable Transportation](#) (NCST) provides national leadership in advancing environmentally sustainable transportation through cutting-edge research, direct policy engagement, and education of our future leaders. The Institute of Transportation Studies at the University of California, Davis (ITS-Davis) leads the NCST in partnership with the University of Southern California; California State University, Long Beach; the University of California, Riverside; Georgia Institute of Technology; and the University of Vermont.

Funding for this RFP

This is an RFP for Year 5, and it will allocate our remaining Year 4 research funding for USC and CSULB. Funding available under this RFP is approximately \$500,000 from US DOT and \$300,000 from Caltrans.

The amount awarded under this RFP will be determined by the quality and relevance of proposals received. Given the anticipated competition for these funds, prospective applicants should carefully consider their expertise relative to the thematic areas and topics.

The remainder of this RFP describes eligibility requirements, research topics, selection criteria, funding guidelines and restrictions, project requirements, and proposal instructions as well as budget instructions and sample budget sheets for both USC and CSULB. Submission instructions and a proposal template are also provided.

Eligibility

Full-time tenure track and research faculty members eligible to serve as Principal Investigators at USC are eligible to serve as Principal Investigators on NCST grants. At CSULB, those eligible to serve as Principal Investigators in the Colleges of Business Administration, Liberal Arts, and Continuing and Professional Education are eligible to serve as Principal Investigators on NCST grants. Proposals may include multiple investigators. Proposals may also include research faculty and non-tenure track faculty from USC and the eligible CSULB colleges as Co-Principal Investigators.

Research Program Themes and Topic Areas

The goal of the NCST is to produce research that directly supports the efforts of policy makers and professionals to improve the sustainability of the transportation system. Proposed projects must fall under one or more of the following research tracks:

- Environmentally Responsible Infrastructure and Operations
- Multi-Modal Travel and Sustainable Land Use
- Zero-Emission Vehicle and Fuel Technologies
- Institutional Change

The NCST is particularly interested in funding research in the following emphasis areas that cross-cut these three research tracks:

- **Sustainable Freight** – Examples of projects include but are not limited to strategies for reducing carbon and criteria pollutant emissions and increasing energy efficiency through vehicle technology, system operations, logistics, and land-use planning; and cost-effective strategies for increasing environmental sustainability in the freight sector.
- **New Mobility** (Including connected, shared, and/or automation of vehicles)– Examples of projects include but are not limited to behavioral implications of new mobility (who will use it and under what conditions); the potential for new mobility to meet the needs of rural areas and mobility disadvantaged travelers, as well as interregional travel needs; the potential to reduce vehicle use (by increasing load factors in cars, vans, buses, and rail); future funding scenarios that address new technologies and mobility services; and the potential synergies between ride-sharing, automation, and electrification that could lessen environmental impacts and improve access for disadvantaged riders while reducing transportation costs.
- **Environmental Review** – Examples of projects include more proactive approaches to identifying environmental justice issues and an understanding of what types of data should be collected; and strategies for incorporating environmental analysis and mitigation early in the planning process.

Applicants are encouraged to review NCST’s current portfolio of research projects and white papers <https://ncst.ucdavis.edu/projects> to gain a better understanding of the type of projects the NCST is interested in funding. Proposed projects may be in any discipline and multidisciplinary topics are encouraged when appropriate.

The primary METRANS focus area for NCST research is sustainable freight. Improvements may be achieved through technology, operational efficiencies, or policy incentives. All modes of surface freight transport are of interest. Possible topics include: 1) system management strategies to facilitate truck movements, 2) consolidation or other load management strategies, 3) more efficient fuels, vehicles, or modes.

Proposals addressing other sustainability topics that fall within the mission of METRANS – solving transportation problems in large metropolitan areas – are also encouraged. Proposals may address passenger or freight transport. Possible topic areas include: 1) spatial patterns and the sustainability of passenger and freight transport, 2) public transit management and productivity, 3) resiliency of urban transportation systems.

Funding for the NCST is from both the US Department of Transportation and Caltrans. Submission of proposals consistent with both the mission of METRANS and the mission of Caltrans and its research needs for the NCST is encouraged.

Caltrans Topics

Proposers are referred to Caltrans research program themes and topics, presented in [Appendix A](#).

Selection Criteria for All Proposals

Transportation researchers and practitioners will evaluate proposals. Proposals will be selected on the

basis of their evaluations along with programmatic priorities. Proposals will compete both within topics and across topics. METRANS does not guarantee that proposals will be funded in all topic areas or that any proposal will be funded.

Reviewers will evaluate proposals according to the following selection criteria:

1. Demonstrated relevance to the above research program themes (a requirement)
2. Quality and research significance
3. Student involvement
4. Reasonableness of budget and cost-effectiveness
5. Qualifications to perform work and likelihood of successful completion
6. Match funding and potential for attracting larger grant funding
7. Prior performance on grants (as applicable)

Proposals that involve collaboration between USC and CSULB, interdisciplinary proposals that cross school boundaries, as well as participation from outside organizations are encouraged.

Commitments of participation (for example data sharing or match funding) from outside of METRANS will be a consideration in making awards. ***Any project that involves data collection, access to facilities, or cooperation of a private or public entity must include a letter of participation from the entity in the proposal. Without such verification of participation, the proposal will not be considered for funding.***

Proposers are encouraged to include undergraduate students in the research project if appropriate. There are potential funding opportunities through various university programs that could support students working on METRANS projects, for example the USC Viterbi School of Engineering Merit Research Program, or the USC Gateway (formerly McNair) Scholars Programs. Proposers are strongly encouraged but not required by this RFP to explore such opportunities with their schools and universities.

Match Funding

The USDOT University Transportation Center program requires a non-federal match as a condition of the federal funds. Caltrans provides only a portion of the required match. Thus NCST encourages proposals that include match funding from non-federal sources. Proposals that include at least a 10% hard match (e.g. contribution to direct costs from external source) will receive priority consideration. For additional information, contact METRANS Associate Director of Administration Cort Brinkerhoff at mcbrinke@price.usc.edu.

Project Selection

The METRANS Executive Committee will make final project selections, taking into account reviewer evaluations, programmatic priorities, and prior project performance. For Caltrans funded projects, Caltrans will approve selected projects. Executive Committee members are allowed to submit proposals, but are not allowed to be present during deliberations and voting related to their proposals.

Funding Guidelines and Restrictions

Budgets should be conservative and cost-effective. Funding should be directed at new and original work. In some cases, METRANS will consider continuations of prior METRANS projects that have

achieved significant results and have a high potential for deployment, scholarly products or large grants. PIs may submit multiple proposals, though it is unlikely that any PI will be awarded more than one grant. PIs with current METRANS grants are eligible to apply. However, grants will not be awarded to PIs with outstanding deliverables (draft or final report; research brief) on prior METRANS grants.

Funds should be spent in a manner that provides publishable results, especially in refereed journals. In general, faculty salary (summer or academic year), student support, and tuition/fee reimbursement are allowed expenses. Proposers are encouraged to budget travel to one domestic conference to present project results. However, Caltrans will not fund travel to TRB conferences. Funding for students is expected in all projects, including research assistant salary and any additional costs for student presentations at conferences. Overhead and fringe benefits should also be included in the budget. A limited amount of travel for data collection purposes, materials, and supplies may be included, provided that they are a direct expense related to completing the work. International travel is not permitted.

Proposers are discouraged from budgeting for computers, equipment, support staff, outside consultants, or any salary that goes beyond normal academic or summer compensation. These may only be included if specific justification is provided as to why the work cannot be completed without the expense. In no case shall CSULB or USC employees be hired on a consulting basis.

METRANS funded proposals will be set up as satellite accounts in the proposers' departments at USC and as extramural accounts from the CSULB Foundation at CSULB. PIs *will not* have individual contracts or grants from the funding agencies (Caltrans and USDOT).

Funding Guidelines:

1. Research project awards have a maximum of \$100,000 per year, inclusive of indirect costs
2. The typical project duration is one year
3. **Note that conservative and cost-effective budgets are strongly encouraged.** METRANS reserves the right to reduce the budgets of submitted proposals. Projects should be budgeted to begin on August 16, 2021 and end by August 15, 2022.

Research Initiation Awards

Research initiation awards are available to tenure track Assistant Professors, with preference for faculty who have not been previously funded for research in transportation. These awards are limited to a maximum of \$35,000 for one year. These awards will receive priority consideration over regular awards. Research initiation proposals are subject to the same selection criteria and peer review process as regular proposals.

White Papers

NCST encourages proposals for white papers that offer a synthesis of the literature on a specific sustainability topic of critical policy interest. The white papers should summarize the state of knowledge and identify research gaps. White papers are aimed at a broad audience of professionals and policy-makers. The maximum funding for white papers \$25,000.

Project Requirements

All research projects have the following requirements:

1. Semi-annual progress reports conforming to METRANS/NCST guidelines (Quarterly for

- Caltrans projects)
2. A Draft Final Report, conforming to METRANS/NCST guidelines, which must be delivered 30 days prior to the completion date of the project. The Draft Final Report is subject to peer review. The Draft Final Report should include an executive summary, data management plan, document the research project, and be complete, original, well organized and accurate.
 3. A Final Report that complies with the review comments and requirements must be delivered within 30 days after the review of the Draft Report. Draft Final and Final Reports are distributed via the METRANS and NCST websites, and are submitted to METRANS sponsors and to various publications databases.
 4. A separate statement listing publications, presentations and inventions resulting from research; names of students supported along with their degree status; and a summary of project results. This statement is to be submitted with the Draft Final Report.
 5. A two-page Research Brief suitable for a general audience that summarizes the main findings of the research and its contribution to practice or policy. This brief is to be submitted with the Draft Final Report.
 6. A brief Biographical Sketch for each of the project's investigators to be submitted with the Draft Final Report. A template for the biographical sketch will be provided with the notification of award. The biographical sketch is to be submitted with the Draft Final Report
 7. At least one presentation of the funded project's research at a thematic conference organized by METRANS, and located in the Los Angeles region.
 8. Timely reporting of all information requested for the METRANS Annual Report
 9. Copies of all papers submitted to journals or conferences that are based on the project's research. Copies should be provided to the METRANS Administrator.
 10. Acknowledge METRANS support in all work that results from METRANS funding, including peer-reviewed publications and conference presentations.
 11. **NCST projects require conformance to new data management requirements imposed by DOT.** More information here: <https://ntl.bts.gov/public-access/faqs>
 12. **PI ORCID number.** PIs are directed to obtain and provide this number to the center administrator within 30-days of notification of project selection. Numbers can be obtained at <https://orcid.org/register>

White paper projects have the following requirements:

1. Semi-annual progress reports conforming to METRANS guidelines if the project exceeds 6-months of duration.
2. A Draft White Paper submitted 30 days prior to the completion date of the project. The Draft White Paper is subject to peer review.
3. A Final White Paper that responds to the review comments must be delivered within 30 days after the review of the Draft white paper has been received by the author. The white papers are distributed by NCST and METRANS, and are submitted to METRANS and NCST sponsors and to various publications databases.
4. A brief Biographical Sketch for each of the project's investigators to be submitted with the Draft white paper. A template for the biographical sketch will be provided with the notification of award. The biographical sketch is to be submitted with the Draft Final Report.
5. Timely reporting of all information requested for the METRANS Annual Report.

Projects funded by Caltrans have additional reporting and budget requirements. Principal Investigators of proposals selected for Caltrans funding will be informed of these requirements.

Proposal Instructions

Research Proposal Instructions

Research proposals should be succinct and clearly written for a mixed technical and non-technical audience. Proposals are limited to no more than 8 pages in sections 3-7. Budget and other forms are included in [Appendix B](#) for USC and [Appendix C](#) for CSULB. Each proposal must include the following sections:

Use the NCST Proposal Template to write your proposal:

https://www.metrans.org/assets/upload/NCST_Proposal_Template.pdf

1. Project title and basic info
2. Project abstract
3. Description of proposed research, including project purpose, and relevance to NCST themes
4. Methodology (the methodology by which project objectives will be accomplished)
5. Tasks, Schedule and Deliverables (steps that will be followed in executing the methodology, and when they will be completed)
6. Description of the expected research product and contribution to practice (e.g. peer-reviewed publication)
7. Description of how the PI will comply with the Data Management Plan (DMP). The DMP is available at <https://ncst.ucdavis.edu/research/data-management>.
8. Qualifications (the research team's relevant skills and experience that will help ensure success)
9. Budget justification (strong justification should be provided for unusual expenses, e.g., equipment). The extent of student involvement should be clearly stated
10. Reference List
11. Budget (1 page.) Use the form provided in [Appendix B](#) for USC and [Appendix C](#) for CSULB. For partner universities, use the budget that is used for the clearance process. Assume a start date of 8/16/20.
12. Letters of participation, or match funding commitment (attached, any number and length)
Letters of participation are required for any project that involves data collection from private or public entities, access to private or public facilities, or cooperation of private or public entities.
13. Short bios for all investigators and a list of recent (past 5 years or less) publications and funded research projects (2-page maximum)

White Paper Proposal Instructions

White paper proposals must include the following:

1. Cover page
2. One- to two-page description of the proposed topic
3. One-page bio that includes recent relevant publications
4. Budget. (Budget and other forms are included in [Appendix B](#) for USC and [Appendix C](#) for CSULB)

Proposals should demonstrate their responsiveness to METRANS selection criteria, according to the

following guidelines:

Selection Criteria

Relevance to research theme areas
Quality and research significance
Student involvement
Reasonableness of budget and cost-effectiveness
Qualifications
Match funding & potential for other grant funding
Prior performance

Most Relevant Section(s)

Background/Objective
Methodology/Tasks
Budget justification
Budget justification
Qualifications
Budget justification, Methodology/Tasks
Prior project accomplishments

Budget Instructions

For USC: Please use your School guidelines in preparing your budget. For the Price School, contact James Wang at jamestwa@price.usc.edu for budget assistance. For VSOE, contact your department grants administrators. Note that tuition cost share is limited to PhD students. Please show the cost share in your budget. Tuition charges are not subject to indirect costs. The indirect cost rate is 50%, and the difference from the audited rate is to be shown as a cost share. Caltrans has additional budget rules; Principal Investigators of proposals selected for Caltrans funding will be informed of these requirements.

For CSULB: Budget guidelines for CSULB faculty are contained in [Appendix C](#). Proposals submitted by CSULB faculty must be approved via the University's internal clearance process prior to submission. Early budget consultation with Office of Research and Sponsored Programs is essential. Once the budget is finalized, internal clearance will be initiated by the Office of Research and Sponsored Programs (ORSP).

Please note that all proposals must include a budget; proposals submitted without budget will be determined to be incomplete and rejected.

Submission Instructions

Please use the NCST Proposal Template to write your proposal. Templates can be found on the NCST Research page: www.metrans.org/NCST_research_overview

Email a pdf copy (max 10 MB) of each proposal to METRANS Associate Director of Administration Cort Brinkerhoff at mcbrinke@price.usc.edu **before 5:00 pm on March 2, 2021**. Please title your PDF file as last name, first initial, university, and a number if more than one is being submitted. For example, a first or single submission would be SmithJ_CSULB. A second submission would be SmithJ_CSULB2.

NOTE to PIs: Please do not submit more than one proposal per email. If more than one proposal is to be submitted, please send each in separate emails, noting the number of the subsequent proposal in the subject line of each email (for example, Second Proposal, Third Proposal, etc.). Proposals received later than the deadline will be rejected. **It is the responsibility of the PI to deliver the proposal by the deadline and to confirm receipt.**

One copy of the proposal will be retained in the Associate Director's office, and must contain all information on the budget form. A second budget form may omit information that can be used to determine faculty salaries (e.g., months of effort). This budget will be included when the proposal is sent for review. If you submit a proposal with salary information omitted, be sure to provide one electronic copy of EACH budget. For CSULB proposals, include with your proposal the budget that is used for the clearance process.

METRANS will reject proposals that: (1) are received after the deadline, (2) do not conform to eligibility requirements, (3) are incomplete, or (4) do not conform to thematic requirements.

Further Information

For further information regarding research topics, METRANS Director Genevieve Giuliano can be reached at (213) 740-3956 or giuliano@usc.edu. For further information regarding program rules and procedures contact METRANS Associate Director of Administration at (213) 740-4297 or mcbrinke@price.usc.edu. In addition, check <https://www.metrans.org/> for information on current projects, center organization, and links to outside agencies.

Appendix A: Caltrans Priority Research Topics

One source of funds for this RFP to which PIs may apply is the California Department of Transportation (Caltrans). Priority for the use of those funds will be given to projects that help to implement and/or inform future activities associated with the priority research topics listed below.

Advancing transportation equity through transportation related tax credits for public participation

Research Need: Explore a transportation tax credit or other assistance for qualified low-income Californians to attend public meetings

Research Description: Is cost of transportation to public hearings or workshops a barrier for participation by disadvantaged communities? What level of incentive will increase attendance by low income households?

Potential for Implementation: Remove barriers to participation in transportation planning and decision-making within marginalized communities.

Assessing the role of Indian Reservation Roads in freight movement

Research Need: The Indian Reservation Roads (IRR) program, established in 1928, funds maintenance, construction, and improvement of IRR routes that do not receive state funding through federal-aid funding (CA IRR Tech Report). Currently, FHWA is assigned oversight of the Tribal Transportation Program (formerly the IRR program) and is responsible for determining available funding to allocate to the Bureau of Indian Affairs (BIA) for projects on the National Tribal Transportation Facility Inventory (NTTFI), formerly the IRR system (CA IRR Tech Report). Many of California's Tribal lands are accessed from or served directly by the State highway System, including routes identified within the State Highway Freight Network. Future study is needed to determine what role the NTTFI (formerly the IRR system) plays in the movement of freight to and from the Tribal lands of California.

Research Description: The objective of the proposed study would be to analyze California's NTTFI designated roads to identify which Tribal Transportation Program (TTP) routes (or portions of routes) are already on California State Freight Highway Network, to collect goods movement data on the IRR system, and to determine how the NTTFI system supports freight movement within the California as a whole.

Assessment of California climate change resiliency strategies

Research Need: Explore the deployment of resiliency strategies in the state's most vulnerable communities.

Research Description: Explore implementation of climate change policies that reduce GHG from transportation operations and projects. Explore impact of investments for climate resilient transportation infrastructure.

Potential for Implementation: Expansion of District Climate Change Vulnerability Assessments

Commodity flow survey for pass-through cargo

Research Need: More information is needed on the composition and volume of pass-through freight traffic, that with both an origin and destination outside of California, in order to better understand the related costs and benefits.

Research Description: Analysis of commodity flows to more accurately assess multimodal freight related travel with both an origin and destination outside of California. Also, the study may include an economic analysis of these freight movements, including environmental effects.

Digitizing corridor airspace for Advanced Air Mobility

Research Need: The vision behind Advanced Air Mobility (AAM) is for a safe and efficient aviation transportation system that will use highly automated, low noise, and low polluting/zero emission aircraft to transport passengers or cargo at lower altitudes within urban, suburban, or rural environments. This form of transportation will impact the airspace, existing transportation modes and networks, and underlying communities. Caltrans should initiate planning activities and research to better understand, anticipate, and plan for AAM integration as a new mode of transportation.

Research Description: Prepare a digital airspace corridor project that involves 3D digitization along a key transportation corridor and an existing airport airspace. Research will include:

- Identifying the proper software tools that can be employed for airspace digitization. Partner with software provider or airspace digitization provider as needed.
- Leveraging existing AAM literature, feasibility studies, and white papers
- Developing the airspace model over a selected geographical region
- Testing the model with AAM simulations
- Evaluating impacts including transportation corridor, airspace, and surrounding community
- Documenting findings and developing lessons learned

Potential for Implementation: Once this model and study is completed it can serve to inform Caltrans and local agency planners on the issues, challenges, and opportunities around AAM deployment in California regions.

Early consideration of tribal heritage sites and cultural landscapes in long range transportation planning

Research Need: During environmental review and project delivery phases of Caltrans projects, Native American tribes continue to express concerns regarding the effects of transportation and land use developments on tribal heritage sites and landscapes. Tribes indicate a desire for such heritage resources to remain intact/undisturbed, and the preservation of ‘sense of place’ is a key concern. The ability to avoid and minimize impacts to tribal cultural heritage resources at a large scale is limited during project delivery phases by the fact that state and federal historic preservation laws are not triggered until there is a programmed/funded project. These laws require the identification and

treatment of tribal cultural resources in consultation with tribes, but lack of appropriate planning leads to disjointed preservation efforts and project delays.

Since transportation planning, land use, and environmental considerations all intersect, the ability to engage with tribes about heritage resources and landscapes during earlier project phases would help inform larger local and regional efforts to promote the preservation of tribal heritage places.

In addition, the tribal values that call for the preservation of cultural heritage sites and landscapes are compatible with many of the State of California's goals around land conservation and climate resilience. Early engagement with tribes as part of long-range planning provides opportunities for mutually beneficial partnerships and more effective preservation of tribal cultural heritage in the state.

Research Description: FHWA's Planning Environmental Linkages Initiative provides a framework for early stakeholder engagement to promote the protection of environmental resources; however, the application of these concepts specifically to early engagement with tribes around tribal historic preservation issues is not in broad practice. More information is needed on how best to operationalize these planning and coordination principles with Tribes to achieve the intended goals. Caltrans requests research focused on identifying potential best practices for early engagement with tribes on cultural resource issues, as well as any limitations. This may be accomplished through interviews and case studies to help inform the Department's policies and programs and to help advance multi-benefit, cross-sector, cross-jurisdictional landscape scale collaborations for land use and resource stewardship (this white paper addresses landscape level collaboration in CA and would be helpful in this research effort).

Potential for Implementation: Earlier engagement with tribes about cultural heritage preservation concerns prior to project delivery scenarios, ultimately reduces conflicts during project delivery (which minimizes costs, delays), improves historic preservation outcomes, and fosters better tribal government diplomatic relations. See more Planning Environment Linkage references and source information on the Caltrans NACS Branch webpage.

Economic and environmental impacts of expanded short line rail service

Research Need: To shippers, the ability to use short line railroads means lower transportation costs, more flexible local service options, and a greatly expanded market reach for local products through their Class I railroad partners. In order to promote smart investments in short line rail service, it is important to understand and quantify the potential benefits of short line rail versus the cost of expansion.

Research Description: A paper outlining the current state of knowledge around suitable markets for short line rail, potential for modal shift to rail, cost of expansion or other barriers to entry, and expected travel related effects of different short line expansion scenarios.

Environmental impact avoidance in freight corridors

Research Need: While California sees significant economic benefit (such as jobs, sales tax) by serving as the nation's global gateway, there is an associated cost exerted by the significant pass-

through freight moving by truck and train. Research is needed to explore methods to reduce or eliminate negative externalities from freight movement, especially air quality effects.

Research Description: A white paper or small research project reviewing best practices or case studies around freight-related impact mitigation. Another potential product is a list of strategies with an assessment of their effectiveness in certain situations.

Equitably addressing issues arising from the use of State transportation facilities for shelter

Research Need: Caltrans faces the issue of equitably resolving safety, health, and operational issues that arise from people using the state right of way for shelter. What are the impacts of the presence of these individuals and what are the best ways for the State to fulfill sometimes competing responsibilities? What partnerships could facilitate improved efforts to meet the needs of California's homeless population?

Research Description: Caltrans seeks a study or white paper on best practices in resolving health, safety, operational, and other issues as a result of the unauthorized use of state owned land and facilities.

Expand remote access to jobs, goods, services, and education

Research Need: Outline how telework can reduce VMT and GHG. Refine the relationship between telework and VMT reductions, as there are conflicting thoughts on the effectiveness of telework as a GHG reducing tool. This can be further refined to define which strategies work together with telework to reduce GHG emissions.

Research Description: Study the implications of a variety of policies and incentives to reduce VMT and GHG through the promotion of telework. One particular area of inquiry may be whether or not the expansion of internet access can have VMT reducing effects.

Potential for Implementation:

- Incentive for telework policy expansion
- Support broadband deployment in projects
- Inclusion in CTP 2050 Implementation and future iterations of the CTP

Exploring Distributed Ledger Technology (DLT) for reducing friction in fare payments

Research Need: Existing options that California transit riders have in fare payments, such as cash, discounts, passes, etc., hinder efficient trip planning, especially for a multimodal trip. The non-standardized practice of accepting various fare payment options by transit agencies leads to confusion. It creates a negative perception of the State's transit systems, which ultimately impacts ridership.

Research shows that transit riders invest additional times in purchasing tickets if using cash, which adds to their existing waiting and riding times at transit stations. Payments through cash, which is popular among unbanked and rural residents, puts these groups of riders at a disadvantage – as these

riders depend heavily on the use of transit for commuting. For multimodal riders from these groups, cash payments for boarding a new mode for transfer, the whole experience of riding the transit is discouraging.

Therefore, a standardized fare payment structure could be planned to address these issues to increase California's transit ridership. A significant effort could be using a single ticket purchase of a multimodal trip and consolidating various fare payment types into a single transaction.

Distributed Ledger Technology (DLT), which is synchronized management of transactions across various parties, has recently emerged as a success in cashless payments being managed by transit agencies worldwide. The technology allows keeping the transaction fee to the bare minimum, is interoperable and scalable, and provides a safe and reliable financial environment of record-keeping assisting the unbanked riders. Further success of the DLT in this process has been enhanced through smartphone applications, thereby encouraging contactless payments during the current pandemic periods of COVID-19. The application further facilitates various travel planning needs and routes consisting of bookings, tickets, and payments for all the modes used in a multimodal trip.

However, the extent to which DLT could succeed in its application by California transit agencies is unknown. In this aspect, with a diverse network of transit agencies and systems, various modes, and fare payment structures and collection methods, California can serve as a perfect testbed to evaluate DLT in reducing friction in payments.

Research Description: The objectives of this research would be to identify challenges transit agencies and riders in California face with various fare payment structures and to explore the applicability of DLT in overcoming the identified challenges. Therefore, the research activity will involve the following: i) conducting literature reviews to document the application of DLT in public transportation systems, especially in the management of fare payments, ii) developing a questionnaire-based survey to gather inputs on using DLT from various transit agencies of California, iii) data collection using the survey execution, vi) data analysis and vi) recommending best practices for a successful implementation of DLT across the transit agencies of California.

Potential for Implementation: Recommendations will be made to overcome existing challenges in DLT implementation by various transit agencies in California, whether serving rural or urban riders. Further, transit service improvements primarily through reduced travel times, transaction fees and increased satisfaction levels of transit users can be assessed through DLT deployment as a pilot study.

Facility name assessment pilot for Caltrans District 4

Research Need: Caltrans is responsible for creating a safe, equitable and inclusive transportation system for all. As such, Caltrans must seek to understand its role in institutional inequity both historically and in the present. Named freeways, highways, structures and other appurtenances that are part of the California State Highway System may have equity, racial and representational justice issues associated with them; however, Caltrans currently lacks a comprehensive inventory of such facilities and a context for understanding issues of racism and equity that may be associated with them. In addition, a framework for identifying and addressing current concerns, issues and potential reasons why a facility may be associated with racism and negative equity issues does not exist. Finally, a decision-making protocol is needed to guide procedures surrounding the identification,

documentation, and resolution of such equity issues within the California State Highway System. Such a protocol is needed to provide guidance regarding compliance and possible removal, renaming or other such actions for facilities which may have equity issues and for Caltrans to act in an equitable manner.

Research Description: Conduct a pilot project in District 4 that meets the following objectives with the goal of applying the results Statewide.

- Identify and inventory Caltrans facilities within District 4 that are potentially associated with issues of equity.
- Develop a context statement documenting the methodologies and possible reasons, which would cause the name of a State-owned facility within the Caltrans District 4 right-of-way to be considered racist or hold negative equity impacts for the public .
- Create a decision-making protocol identifying the appropriate path forward once a State-owned facility with potential equity issues has been identified, and to address the documentation, compliance and possible renaming, removal or other action to resolve the equity issue associated with an identified facility.

Feasibility, and efficiency benefits, of dedicated truck lanes

Research Need: Separating freight from other traffic may reduce congestion and the chance of traffic incidents related to mixing commercial and non-commercial vehicles. What are factors that have led to successful truck only projects in the past, what are some current barriers in California, and what benefits could be expected from separating truck and non-truck facilities?

Research Description: Study looking at considerations in the planning of truck-only facilities, successful and unsuccessful cases of the past, and the creation of a methodology to accurately assess costs and benefits.

GTFS, wayfinding, and transit ridership

Research Need: The California Integrated Travel Program (Cal-ITP) has instituted the California Minimum General Transit Feed Specification (GTFS) Guidelines and GTFS-Real Time (GTFS-RT) guidelines. GTFS is a method of receiving information about transit routes and fares, among other information, for use in transit planning and management applications. GTFS-RT provides real-time information, such as vehicle location, for dynamic trip-planning and management services. As agencies are added to the system, it is vital to measure the benefits of being added to Google Maps, Transit et al on ridership, ease of use, and other aspects of transit ridership. Having this information will allow Cal-ITP and transit agencies to adjust their offerings to better serve transit riders. Both qualitative and quantitative approaches should be considered on the impact of being in and out of major app systems. The research need is to determine how “digital wayfinding” impacts ridership.

Research Description: The research will employ a mixture of qualitative and quantitative methods to document the state of digital wayfinding and develop a methodology to link to ridership, or lack thereof. The research will add a specific focus on real-time predictions. The researchers will focus on transit agencies within California and how they use digital wayfinding and linking that to

ridership. Rural agencies with sparse schedules are critical in this research because they have the fewest resources.

Potential for Implementation: The researcher will deliver a research paper and code repository as a final product. This research paper will help guide Cal-ITP and other transit decision makers in guiding transit infrastructure and programs in California. The code repository will assist in this.

Improved tools for "state of good repair" project prioritization

Research Need: Improve statewide risk and deteriorating modeling and life-cycle costing tools to minimize long-run maintenance costs and more efficiently manage assets.

Research Description: Identify at-risk infrastructure and apply life cycle cost assessments to hypothetical improvements, taking into account the cost of inaction.

Potential for Implementation: Identify at-risk infrastructure; identify expenditure of maintenance costs.

Infrastructure technology to improve travel safety for vulnerable road users

Research Need: Research is needed on infrastructure design that enhances safety for vulnerable roadway users such as bicyclists, pedestrians, scooters, people with disabilities, and other users of non-auto modes of transportation.

Research Description: Investigate technology applications to improve critical infrastructure security monitoring and reduce potential threats.

Potential for Implementation: Explore impact of investments for improved security monitoring applications. Provide real-time data to transit agencies for technology applications. Standardize Caltrans district road-user data.

Innovative technology and practice to improve goods movement and infrastructure post-COVID-19

Research Need: Over the last decade, the increased prevalence of ecommerce and home deliveries, autonomous trucking and warehousing, and innovative clean freight technologies have evolved the freight landscape. Consistent with the CFMP and Sustainable Freight Action Plan, the CTP 2050 aims to leverage these innovations to move goods more effectively.

Research Description: Explore infrastructure and operational strategies to meet demand for deliveries post-COVID-19, including research into the benefits and tradeoffs of drone deliveries, bike delivery services, staging areas, loading zones, and pick-up centers.

Potential for Implementation: Knowledge of how to navigate through or subvert challenges posed to goods movement when under external logistical challenges may lead to new policies or programs.

Inventory of the effectiveness of transit, rail, and shared mobility improvements

Research Need: Many policies and programs exist to improve access to transit, rail, and shared mobility options. What is the relative effectiveness of policies directed toward increased adoption of these modes?

Research Description: Study the implications of a variety of policies and incentives to increase options for transit, rail, and shared mobility ridership, including:

- Economic and travel impacts of tax benefits and subsidies for transit commuters or other non-auto modes
- benefits and tradeoffs of universal fare-free transit
- Improved integration of travel, such as through the California Integrated Travel Program (Cal-ITP), which creates statewide standards for fare integration, trip planning, and data reporting
- Modernization of transit systems through ITS elements like signal priority, automatic passenger counters, and real-time traveler information systems (Transit Performance measurement, fare integration)

Managing the adoption of connected and autonomous vehicles in disadvantaged communities

Research Need: Investigate potential policies that expand CAV access to aging and youth populations, underserved communities, unbanked and low-income users, and users with disabilities.

Research Description: Certain communities may be underserved by public transportation, exposed to a lack of social distancing in public transit, or are reliant in some way due to lack of access. How would fleet CAVs affect travel behavior in disadvantaged communities? This study would involve an investigation into whether or not increased access to Connected Autonomous Vehicles can improve access to important destinations.

Potential for Implementation: Information can be useful in the deployment of statewide policy on the adoption of CAV fleets.

Methods to expand access to safe and convenient active transportation options

Research Need: Highlight areas in which access can be improved for active transportation. Explore new methods and regulations to encourage active transportation.

Research Description: Study the implications of a variety of policies and incentives to improve access to safe and convenient active transportation. This could include safe, performance-based methods for setting speeds lower than the 85th percentile or demonstrate possible modifications to permitting policy to allow more active transportation in the state ROW.

Potential for Implementation: District Active Transportation Plans; CTP 2050 Implementation and future iterations of the CTP; Safety Plans.

Modeling truck/bus created fugitive dust on highway roadsides with narrow or absent shoulders

Research Need: Most of the existing fugitive dust studies found on a search of the literature investigated dust created by traffic on the paved highway surface. A study completed by the University of Nevada and the San Joaquin Valley Unified Air Pollution Control District in 2011, reports the first empirical estimate of particle emissions from unpaved shoulders of paved roads (H. Moosmüller, J. A. Gillies, C. F. Rogers, D. W. DuBois, J. C. Chow, J. G. Watson & R. Langston (1998) Particulate Emission Rates for Unpaved Shoulders along a Paved Road, Journal of the Air & Waste Management Association, 48:5, 398-407, OI:10.1080/10473289.1998.10463694). This study confirms the theory that large vehicles with poor aerodynamics traveling at high-speed result in significant dust entrainment. While not the source of the highest fugitive dust emissions for the basin, depending on conditions, shoulder generated dust could have significant effect on local air quality.

Research Description: The objective of the proposed study would be to model dust plumes to determine extent and volume of dust plume under expected climate change conditions (warmer, drier for longer periods) at different shoulder widths to determine optimal widths of paving necessary to alleviate the additional dust created by an ever-increasing number of large vehicles.

Opportunities for housing the unsheltered on State-owned right of way and associated costs and impacts

Research Need: With California facing an unprecedented crisis of homelessness, Caltrans has sought to use innovative strategies to meet temporary housing needs. What innovative methods of using state-owned right of way for shelter opportunities have worked at other times or in other regions? For instance, what are best practices in the transfer of unused land parcels to entities that are better equipped to provide services to the homeless? What are the associated costs and impacts?

Research Description: Caltrans seeks a study or white paper on potential innovative strategies to address homelessness through the use of state-owned right of way. This may draw on past literature, interviews, case studies, or models to identify methods to enhance feasibility of solutions and assess potential costs and impacts.

Racial equity and the LA Metro consent decree

Research Need: Caltrans and the State of California are prioritizing conversations about equity due in part to the expanding national discussion about race and privilege in the United States. Since transportation projects have impacted people of different races and economic classes differently in the past, and since Caltrans has prioritized equity moving forward, this project can help to analyze existing public transportation infrastructure through the lens of a past equity-based court case. Caltrans also may need to update their view and understanding of equity in the provision of public transit services as a result of recent race and equity discussions. This project could help us determine if any updates are required to the indicators that were used to prove that a local agency was discriminating against minority groups in the delivery of transportation services.

Research Description: First we will conduct a literature review of earlier research projects on this subject. This will help us secure data that may be usable for our project.

Our second step will be to analyze data presented in the court case, temporary injunction (September 1, 1994) and subsequent consent decree ordered by Judge Terry Hatter in August 1996 (decree was lifted, also by Judge Hatter, in 2006).

Third, we will seek out equivalent data from the current post-decree era. Along with the data, please collect interviews with and feedback from people and community-based organizations in the LACMTA service area, especially from community members with lived experience of discrimination.

After these data are collected, we will analyze the data to answer the following questions:

- How have the demographics of Metrolink customers changed?
- How have the demographics of LACMTA/LA Metro rail customers changed?
- How have the demographics of LACMTA/LA Metro bus customers changed?
- What are the demographics of Metro's Bus Rapid Transit customers (Orange Line, Silver Line)
- Regardless of race, is there a split between the low-income and high-income customers in the above transit modes?

A list of examples of the data can be provided, but the specific data must be identified by the researcher's analysis of the court case documents.

Potential for Implementation: Deliverable will be shared with Modal, CalSTA, Strategic Growth Council, and local Agencies. Depending on the results, a multi-level conference or seminar may be convened to determine need for future research or to write policy. This research may be developed into a policy guide.

Regional advance mitigation to expand protection of natural resources and ecosystems

Research Need: Investigate the benefits of establishing statewide priority development and conservation areas to enhance natural ecosystems and encourage preservation of agricultural lands, open space, and critical environmental areas. Study and deploy innovative construction practices that minimize the direct environmental impacts of transportation projects.

Research Description: As our population continues to grow, and our transportation system evolves to better serve it, we must continue to protect California's natural lands, waters, wildlife, and habitats by minimizing the direct environmental impacts of transportation projects. What are some best practices and innovative strategies to improve the effectiveness of natural resources mitigation? What are the actual or anticipated effects of these strategies?

Tolling lessons learned for road usage charge

Research Need: Tolling and road use charge (RUC) systems share many similar administrative issues. As the state considers the feasibility of RUC as a funding alternative, a thorough review of lessons learned from established systems such as Tolling is wise.

Research Description: A literature review of California and other states Tolling practices to determine lessons learned that can be applied to a California RUC. Literature topics include, but are not limited to: administration, enforcement, interoperability, privacy, data security, and liability.

Potential for Implementation: Administrative structures are the most practical and basic brick in the building of a new policy. The ability to avoid problems that occurred in similar policies will be key in setting up a potential road charge program for successful implementation, should elected officials decide to do so.

Tools and best practices in encouraging efficient land use

Research Need: Exploring efficient land use can expand mobility options, reduce travel times, and limit emissions, all while addressing California's housing shortage. Improving accessibility involves bringing origins and destinations closer together, such as housing, schools, shopping, parks, and entertainment. This can be achieved in urban, suburban, and rural parts of the state, not only by concentrating future housing and job growth, but also by improving the balance of different land uses.

Research Description: Provide data and technical tools to help State, regional, and local governments evaluate the transportation impacts of land use decisions. Identify and pursue opportunities in repurpose antiquated land uses such as gas stations, parking lots, and large shopping centers to support compact, mixed-use development and sustainable mobility options. Support local agencies in expanding transit-oriented development.

Potential for Implementation: Improving land use efficiency can lead to gentrification as accessible neighborhoods attract higher-income earners and displace low-income residents from their long-time communities. Policy can be implemented in the short-term to ensure tenant protections, anti-displacement, and housing affordability.

Tools for innovative transportation solutions and concept strategies for system planning

Research Need: Caltrans District Planners are now starting to create an updated version of individual corridor plans and other system planning products. System Planners will need to address new corridor planning issues and scenarios over the 20-year plan horizons. These issues include, but are not limited to, the advancement of new technologies, addressing climate change, reducing Greenhouse gas emissions, as well as social/demographic changes that will impact corridor performance. Further, CA Government Code 65086 directs Caltrans to carry out long-term state highway system planning, and the recently passed Senate Bill 1 requires preference to be given to comprehensive corridor plans that demonstrate collaboration between Caltrans and local or regional partners, and instituting performance measures concerning maintenance and rehabilitation of the state highway system.

Research Description: After determination of System Planning/Corridor Planning needs from the Caltrans Districts, researchers would compile a list of innovative alternative strategies/concepts, create a tool or set of tools that will assist System planners in the development of corridor plans (and

other system planning documents) and how best to address a host of innovative alternative strategies, including but not limited to, corridor plan format, graphics, narratives, and performance measures.

Potential for Implementation: As envisioned, the outputs of this research being fact sheets, graphics and citation notes, and would be available on Caltrans' intranet site and made available to all Districts. This would be a tech. transfer process: to make these tools more easily accessible for Caltrans planners and stakeholders.

Transit discount verification and barriers to transit access

Research Need: Getting verified for transit discounts is hard! California Integrated Travel Program (Cal-ITP) is in the process of launching an eligibility verification (EV) service. To do so successfully, it is critical to find out what the barriers and impacts to getting discounted fares are. This research would survey the existing process, identify barriers, and recommend best practices for ITP to follow in statewide EV services.

Research Description: Research the state of eligibility verification services and how best to implement transit benefits statewide. The researchers will survey these services here in California and in select other jurisdictions and then make recommendations for best practices based on the information gathered. The goal is to gain further knowledge on how transit benefits are allocated in CA and determine a path forward to a statewide service, including a documentation of how many riders are eligible but are denied or do not get benefits. The ultimate goal is to make this process easier for transit users. Knowing who gets benefits and who does not, along with a process for making sure that everyone who has eligibility for free or reduced-price transit increases equity.

Potential for Implementation: The goal is to develop guidelines for the transit agencies to use in making transit verification as simple as possible and widely used as possible. Transit agencies can then implement this on their systems, and the Cal-ITP project can implement these guidelines as well, making electronic verification across California much more convenient and feasible.

Appendix B: USC Budget Form

Category	Monthly Salary	%	of Time on Program	Number of Months	Budget (\$)
Faculty Salary	_____	x	_____	x _____ =	_____
Faculty Salary1	_____	x	_____	x _____ =	_____
Student Support	_____	x	_____	x _____ =	_____
Type of Student	_____				
Student Support*	_____	x	_____	x _____ =	_____
Type of Student	_____				
Fringe Benefits	Rate _____				Total _____
Tuition	Units _____	Rate _____			Total _____
Conference Travel	_____				
Conference Name/Date	_____				
Other Travel	_____				
Materials and Supplies	_____				
Equipment (list)	_____				

Other Direct Expenses (itemize)	_____				

Tuition cost share	Units _____	Rate _____			Total _____
Overhead (50%)	_____				
TOTAL FUNDS REQUESTED	_____				

*Use additional faculty and student lines only if more than one professor or student.

Appendix C: CSULB Internal Clearance Process Instructions Using Cayuse SP

Proposals and the proposal budgets submitted by CSULB faculty must be approved via the CSULB Office of Research and Special Program's (ORSP) internal clearance process prior to submission using Cayuse SP.

You can access Cayuse SP through the ORSP website - <http://www.csulb.edu/office-of-research-and-sponsored-programs/cayuse-internal-clearance-and-electronic-proposal>

Your Pre-Award Specialist will still need the PI to send their 700-U or Federal Conflict of Economic Interest form, project summary, budget and budget justification for review. These documents can also be uploaded in to the “Proposal Attachments” section in Cayuse SP.

All templates for the summary, budget, budget justification and Conflict of Interest forms are located on the ORSP Website at - <http://www.csulb.edu/office-of-research-and-sponsored-programs/forms-and-templates>

As the PI, you should have access to Cayuse SP under your single sign-on; if not, please let your Pre-Award Specialist know and they will have ATS add that to your SSO. When contacting your Pre-Award Specialist regarding SSO, please include your employee ID number.

For CSULB proposals, include with your proposal the budget that is used for the clearance process. Please note that all proposals must include a budget; proposals submitted without budgets will be determined to be incomplete and rejected.

If you have any questions on clearance, please contact ORSP

CNSM/CPIE: Lead PreAward, Ms. Nora Momoli (562) 985-1567 / Nora.Momoli@csulb.edu

CHHS/COE: Mr. David Smith (562) 985-5330 / David.Smith@csulb.edu

CED/CLA: Ms. Nazareth Lijiam (562) 985-2478 / Nazareth.Lijiam@csulb.edu

Appendix D: PSR Center Proposal Evaluation Form

(Provided for information only; form will be used by evaluators)

Proposal Title:

Area:

Principal Investigator:

Referee Number:

Evaluation Criteria:

Please rate proposals in each of the categories below, using the following rating scale:

1 = Well below expectations

2 = Below expectations

3 = Meets expectations

4 = Exceeds expectations

5 = Well above expectations

CATEGORY	RATING
Demonstrated relevance to themes of RFP (a requirement)	
Quality and research significance	
Student involvement	
Reasonableness of budget and cost-effectiveness	
Qualifications to perform work/likelihood of completion	
Match funding and potential for attracting grant funding	
Prior performance on PSR grants (if applicable)	

Referee's Funding Recommendation (Place an X on the line by your choice)

Highly recommended _____

Recommended _____

Not recommended _____

Referee Comments (add additional pages as needed):