



CALIFORNIA STATEWIDE TRANSIT STRATEGIC PLAN Recommendations for Caltrans



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Prepared for:



Prepared by:



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Caltrans Project #64A0228

About the UCLA Institute of Transportation Studies

Consultant for: Caltrans Project #64A0228 (Statewide Transit Strategic Plan)

The UCLA Institute of Transportation Studies (ITS) is one of the leading transportation policy research centers in the U.S. Each year, dozens of ITS faculty, students, and research staff collaborate on a wide array of transportation policy and planning studies, ranging from analyses of travel trends and transportation needs of immigrants and low-income workers, to sustainable transportation policies, to identifying innovative transportation finance mechanisms for both highway infrastructure and transit service.

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The Institute is supported by the UCLA Lewis Center for Regional Policy studies; many faculty, researchers, and students are supported by research and education grants from both public and private sectors.

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California Statewide Transit Strategic Plan (STSP) Advisory Committee Roster

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Preface: About the Statewide Transit Strategic Plan

The Caltrans Division of Mass Transportation engaged researchers at the University of California to assist with research and analysis in support of Caltrans' efforts to develop a Statewide Transit Strategic Plan. This research project (#64A0228) has produced in four primary deliverables. The first report, released in summer of 2011, "Baselines: Current and Future Transit and Demographic Trends," highlights past, current, and future demographic factors which affect transit service consumption in California. The second report, "One State, Many Visions: Transit Stakeholder Views on Planning for the Future of California's Mobility," provides an assessment of the goals and objectives held by various California transit stakeholders, which the research team synthesized from a number of in-depth interviews and surveys. In that second report, UCLA researchers also identified the breadth and depth of support for various strategies to improve transit in California. This third deliverable is a web resource that will help transit planners and other stakeholders identify and pursue cost-effective strategies to improve transit service. This final deliverable is an overview of the research team's research findings and recommendations for Caltrans based on work conducted over the course of this project.

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Introduction

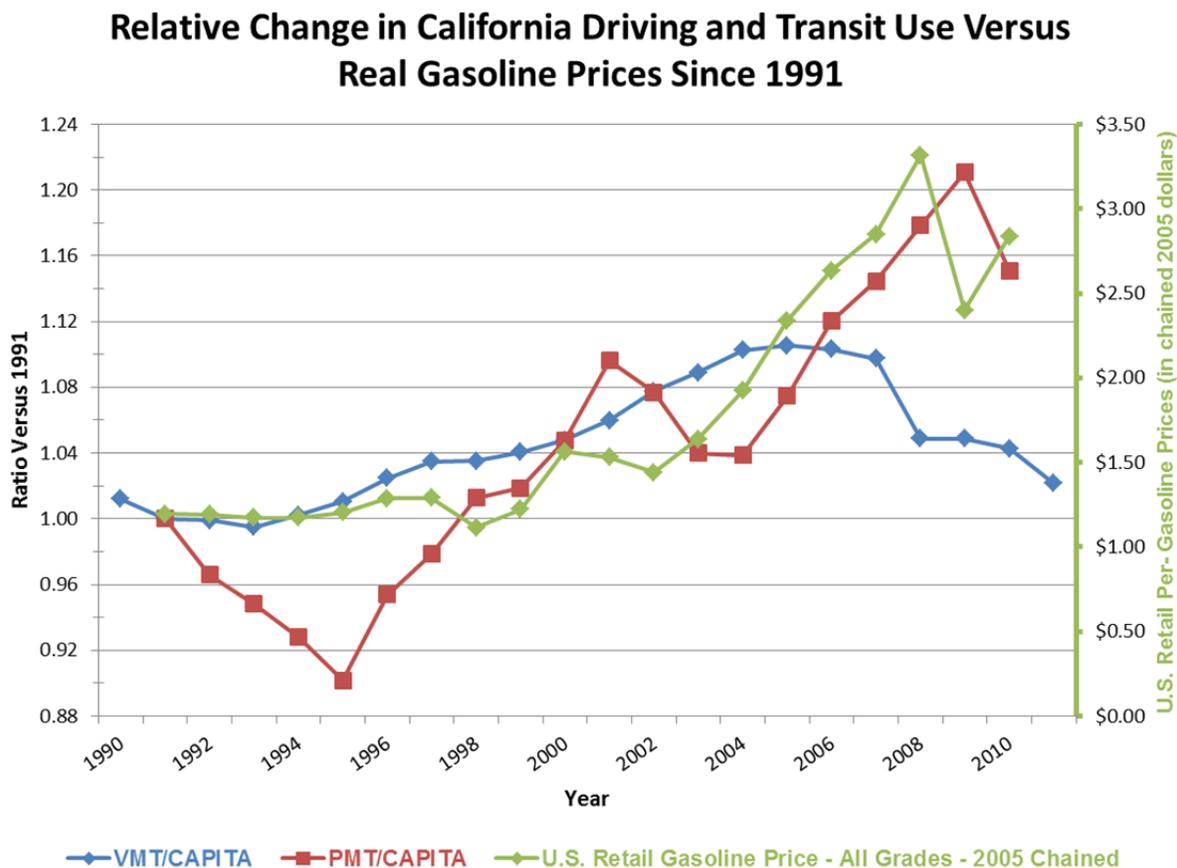
In SB 391 (Liu, 2009), the California Legislature found that “[t]he state lacks a comprehensive, statewide, multimodal planning process that details the transportation system needed in the state to meet objectives of mobility and congestion management consistent with the state’s greenhouse gas emission limits and air pollution standards.” Although SB 391 is the impetus for the California Transportation Plan, it followed other bills that seek greenhouse gas emissions reductions that result from a mode shift to transit. California’s Climate Change Scoping Plan pursuant to AB 32 (Pavley, 2006) and the Sustainable Communities Planning Act SB 375 (Steinberg, 2008) identify the critical role transit is expected to play in reducing the state’s greenhouse gas emissions. In implementing its Sustainable Communities Strategy, the Southern California Association of Governments (SCAG) region expects a 36% increase in total transit and rail boardings by 2035.¹ This is nearly double the 18.5% statewide increase in transit trips experienced between 1991 and 2010.

While the need to reduce GHG emissions 25% from 2009 levels by 2020 may have been the impetus for SB 391, the State must grow transit ridership in order to achieve a wide variety of statewide economic, environmental, and social goals. In SB 391, the Legislature found that “[r]ecent increases in gasoline prices resulted in historic increases in ridership on public transportation, including transit, commuter rail, and intercity rail, and in historic reductions in vehicle miles traveled by private vehicles.” Thus, increasing transit use is vital to maintaining a vibrant state economy during times of volatile fuel prices, while reducing transportation greenhouse gas emissions. Figure [1] below notes the relative change in driving (blue) and transit use (red) compared to fluctuations in gasoline prices (green) since 1991. Increases in real gasoline prices during the 2000s correlate with an increase in transit ridership.

¹ Southern California Association of Governments. *Final 2012-2035 RTP/SCS: Transit Appendix*. 2012

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Figure 1: California Trends in Driving and Transit Use



Note: All transit ridership and financial statistics appearing in this document were downloaded from the National Transit Database².

California must continue to increase transit ridership in order to meet policy mandates and provide Californians with affordable mobility options amidst increasing gasoline prices. At the same time, growing transit ridership in California faces considerable financial, political, and bureaucratic challenges.

While Caltrans Division of Mass Transportation is involved in statewide planning and funding distribution, it has limited influence over the many, varied, and autonomous transit operators, which are charged with providing cost-effective services to meet both local needs as well as state objectives. Nevertheless, Caltrans Division of Mass Transportation is in a unique position to focus on external factors like creating a transit-supportive environment in the state, encouraging collaborative planning, and disseminating best practices throughout the state. This document summarizes the key findings of our research projects, with particular attention to the need for transit services in California, the challenges that face both local operators and state planning agencies like Caltrans, and the various operational, programmatic, and business

² Federal Transit Administration. National Transit Database. Retrieved January 19, 2012. Available at <http://www.ntdprogram.gov/ntdprogram/data.htm>.

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opportunities available to the many stakeholders necessary for addressing the urgency of transportation reform. Our findings are intended to enable Caltrans to better understand the financial challenges of expanding transit service in California, to demonstrate transit's value to California, to identify strategies and tactics for cost-effective transit investment in California, and to leverage local successes around the state. The recommendations are based on our meetings, interviews, and research on transit in California; these are not the authors' personal recommendations. These recommendations focus on popular, cost-effective strategies for Caltrans Division of Mass Transportation, in conjunction with agencies, to improve transit in California. Broader strategies identified by interviewees and commenters — such as policies that primarily affect automobile usage — are beyond the scope of this document.

The price of expanding transit service in California

While transit operators across the state have succeeded in growing transit use over the last twenty years, costs and subsidies per passenger trip have increased faster than the rate of inflation. In particular, growth in ridership has come in large part through expensive capital investments in public transportation infrastructure. The resulting trend has been one in which attracting additional “choice” riders has become increasingly expensive and financially unsustainable. While investments in subways, light rail, and other capital-intensive projects will continue to play an important role in promoting non-auto-based metropolitan mobility, the state will need to deploy additional cost-effective means to increase transit ridership in support of the state's goal of boosting ridership and reducing carbon emissions from the transportation sector. Fortunately, California's transit operators have served as a veritable proving ground for many cost-effective transit enhancements.

Despite various attempts to alleviate their financial problems, transit operators have experienced a repeated history of fiscal instability for better than a century³. In the early 20th century, private companies throughout the country provided most transit services. In the next half-century private transit operators experienced a series of financial setbacks that undermined their ability to cover costs and make capital improvements. Ridership dwindled as housing and employment suburbanized and auto ownership proliferated, leaving private transit operators with less revenue to spend on years of neglected repairs. Suburbanization did not just affect private transit providers; despite years of investment, entire downtown business districts suffered as jobs and housing shifted out of urban areas. Efforts to attract new riders were stymied by contentious labor disputes, which limited transit systems' ability to raise fares to compensate for ridership losses and to replace outdated and failing equipment. To reduce costs, private transit operators transitioned from streetcars to buses, whose lower capital costs created immediate financial benefit but long-term operating and maintenance expenses. In the longer run, transit operators were left in no better financial condition.

Facing bankruptcy and years of neglected capital investments, coalitions of downtown business interests, industry advocates, and the private transit systems themselves turned to cities, states,

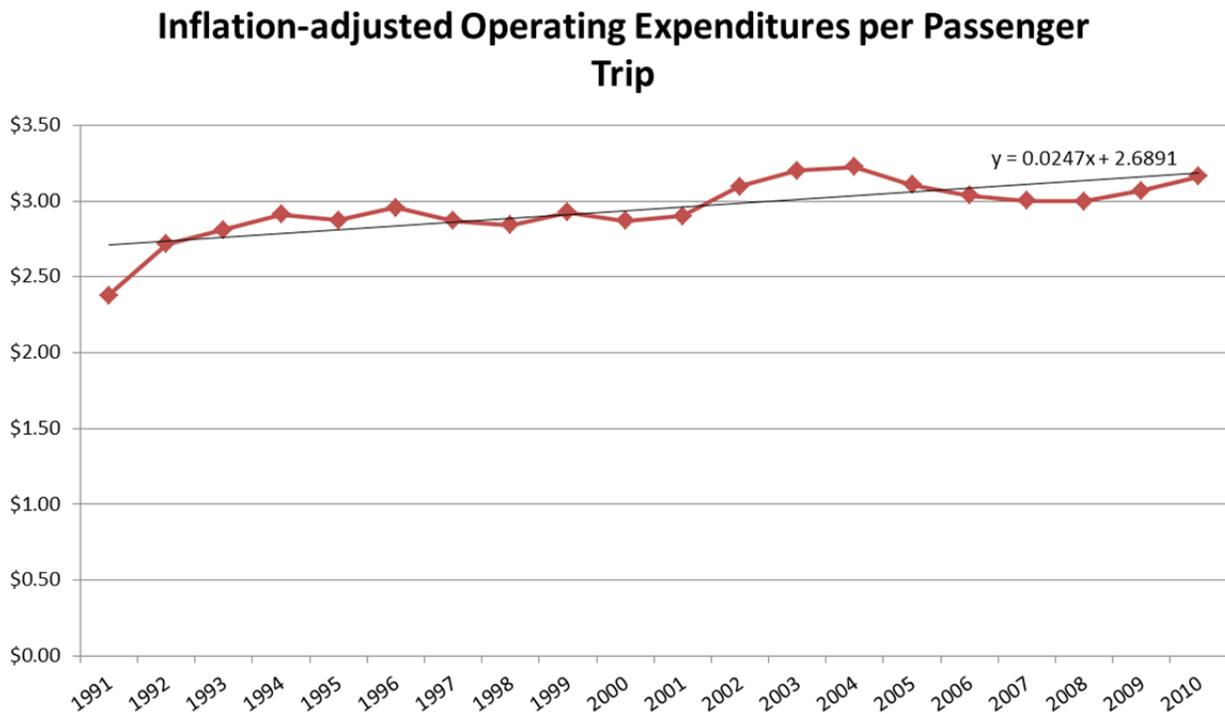
³ Jones, DW. *Urban Transit Policy: An Economic and Political History*. Englewood Cliffs, NJ: Prentice Hall. 1985.

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and the federal government for financial relief. A series of federal legislative efforts, including the Urban Mass Transit Act of 1964 and National Mass Transit Act of 1974 provided funding to update fleets, modernize facilities, and subsidize operations. Despite the influx of federal funding, ridership continued to drop into the early 1970s. Federal policies generally favored capital-intensive highway projects, often to suburban destinations that lacked the ridership base to support the high cost of operating service⁴. In a trend that continued into the early 1990s, rapidly increasing operating costs and continued ridership losses created more financial problems for transit systems.

Throughout the past 20 years, California transit agencies' inflation-adjusted operating costs per trip have steadily increased. One reason has been an increase in the length of the average trip, as passenger miles traveled per unlinked passenger trip have steadily increased while inflation-adjusted operating expenses per passenger mile have decreased slightly.

Figure 2: Cost per trip in California

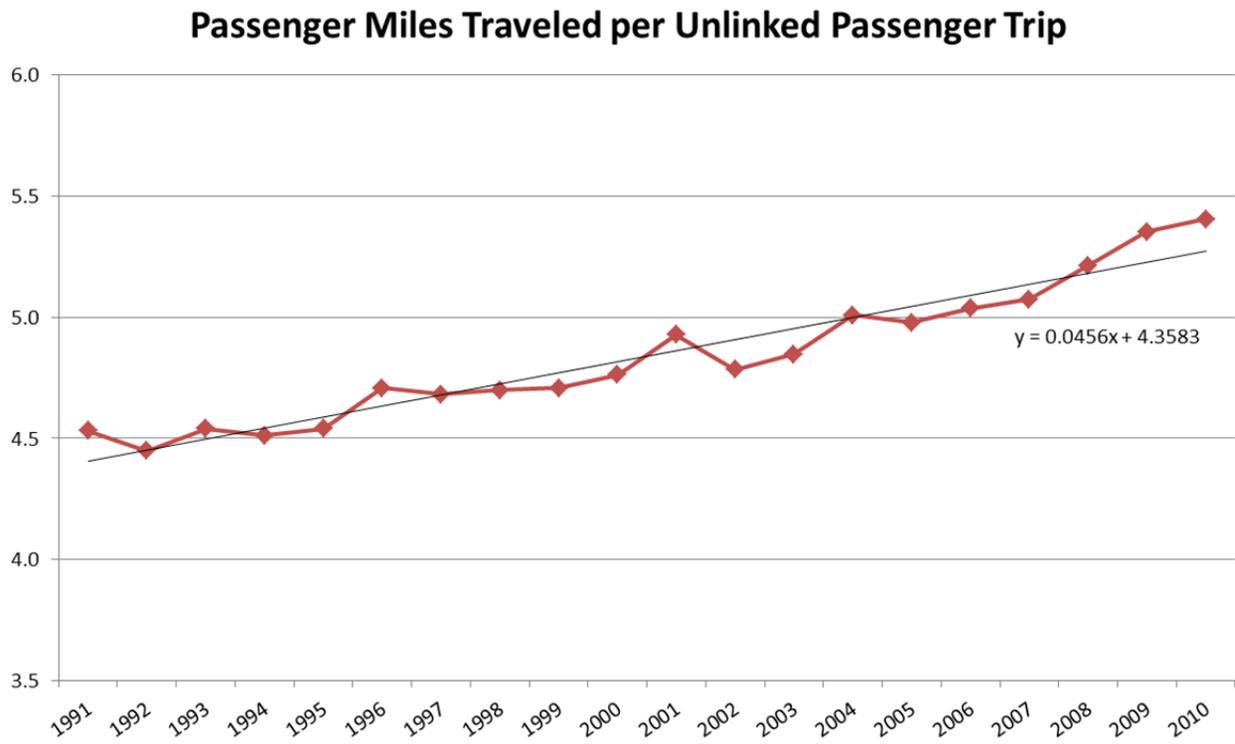


Note: Inflation adjustment using BEA Table 1.5.4 - Price Indexes for GDP (State & Local Consumption Expenditure)

⁴ Jones, DW. *Ibid.*

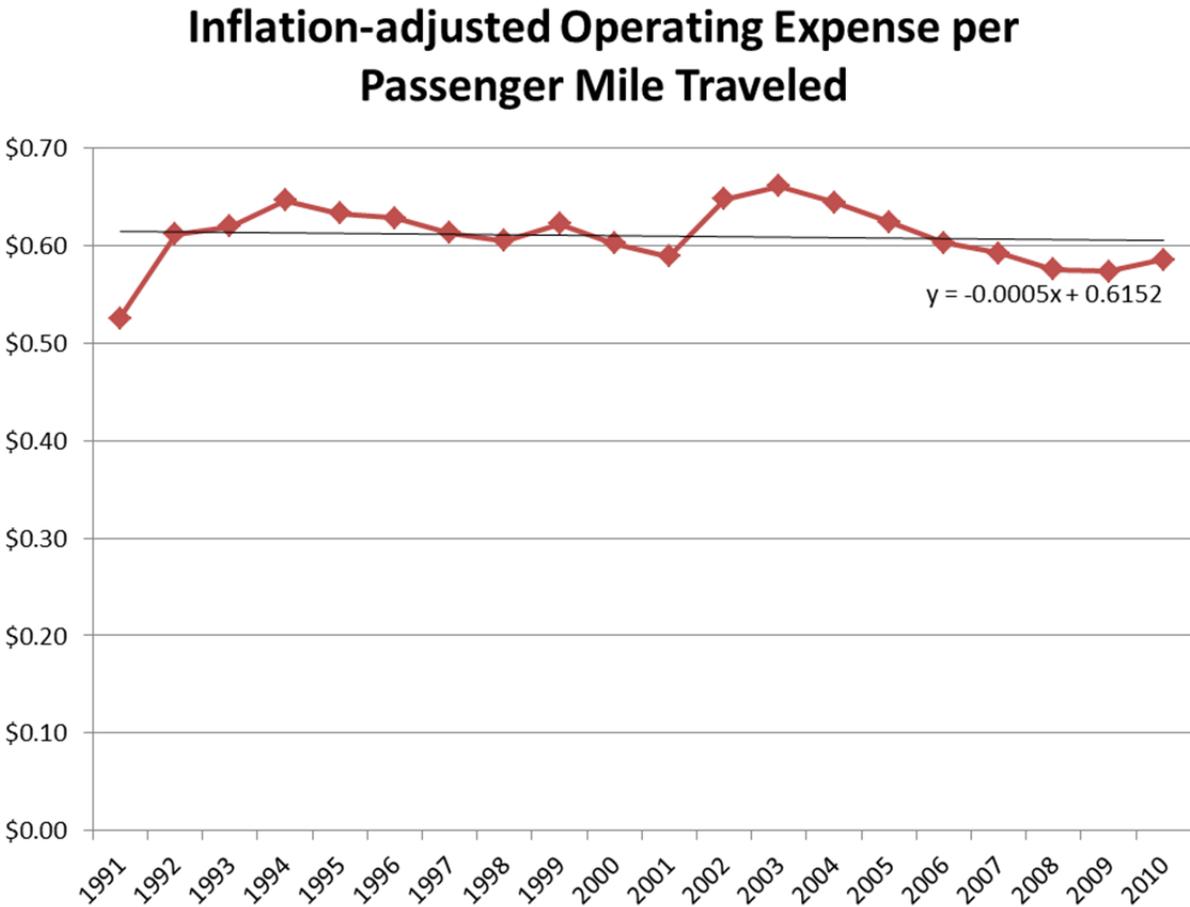
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Figure 3: Distance per Transit Trip in California



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Figure 4: Cost per Transit Passenger Mile Traveled in California

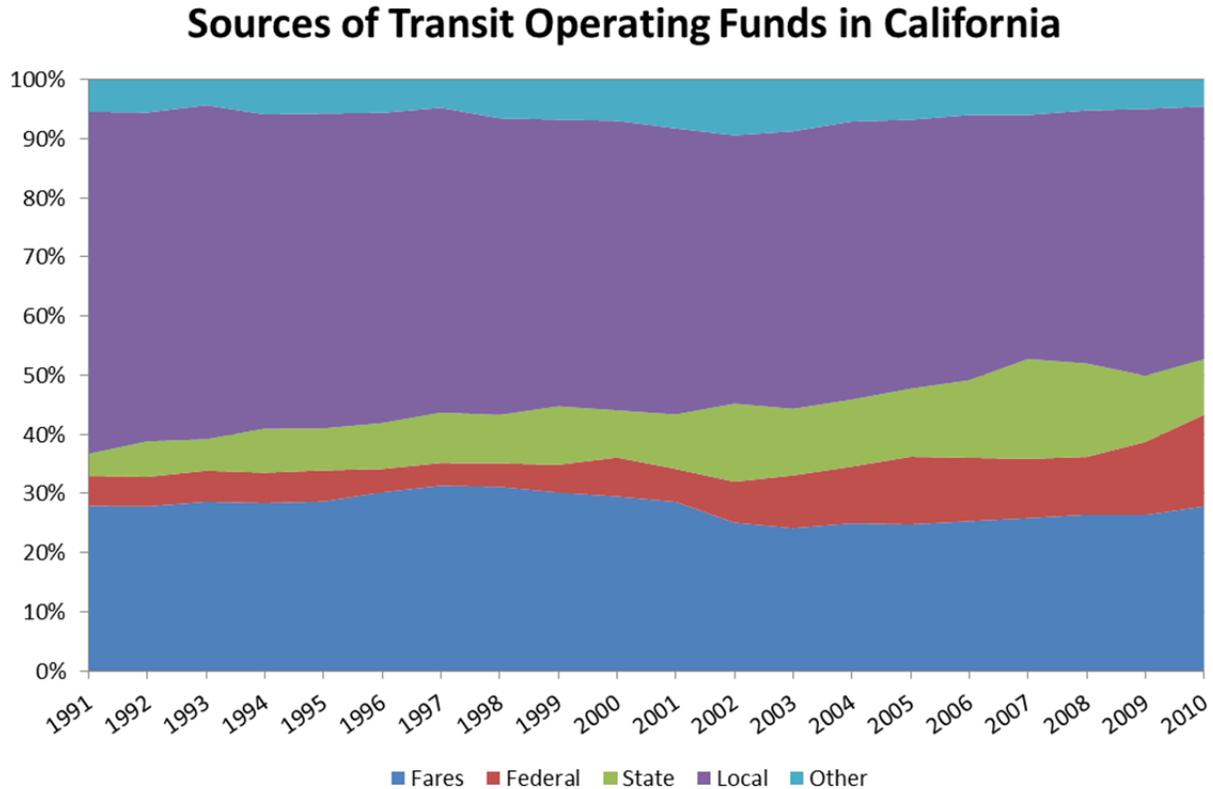


Note: Inflation adjustment using BEA Table 1.5.4 - Price Indexes for GDP (State & Local Consumption Expenditure)

Even if operators stave off an increase in operating costs per passenger trip, they will still require additional operating subsidies from state, local, and federal sources to serve the additional ridership operators hope to attract. Figure 5 below shows that fare revenues have made up only 20-30% of operating funds in California, with the balance of funding requirements coming from other sources. Most transit stakeholders interviewed for the project were opposed to relying solely on fares to produce additional revenues due to the effect this would have on economically disadvantaged populations, a core constituency for transit service in California.

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Figure 5: Sources of Operating Funds, 1991-2010

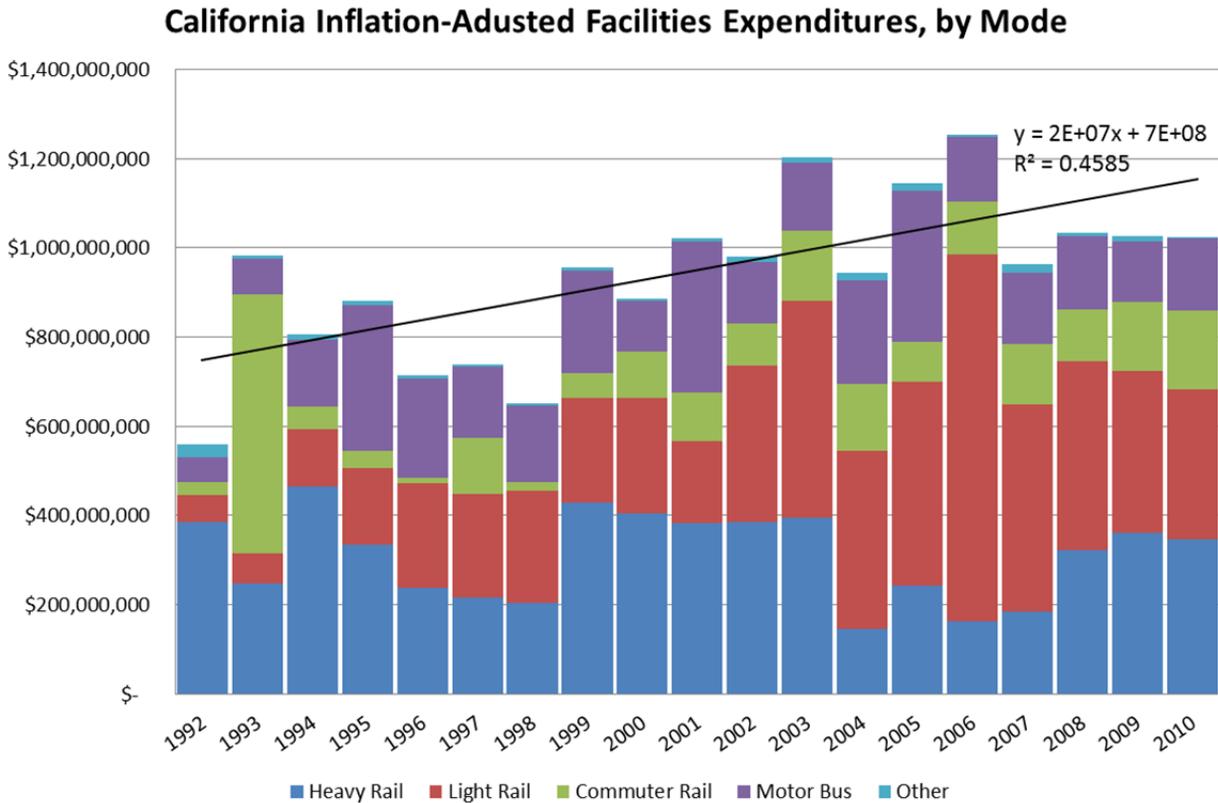


While inflation-adjusted operating costs per passenger mile traveled have largely remained steady in the past 20 years, inflation-adjusted capital costs for transit facilities in California have increased by an average of \$20,000,000 per year as operators introduce new rail and busway services. Capital expenditures for transit facilities in California have increased substantially over the past quarter century and are now roughly ten percent of capital expenditures for the construction of new highways and roads.⁵

⁵ In 2008, the most recent year for which both transit and highway data are available, California's transit agencies reported \$1,033,484,363 in capital expenditures for facilities (National Transit Database) the state reported \$10,251,996,000 in disbursements for highways and roads from all units of government (Federal Highway Administration. Highway Statistics 2008. Table HF-2. Available at <http://www.fhwa.dot.gov/policyinformation/statistics/2008/hf2.cfm>)

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Figure 6: Facility Capital Expenses, by Mode



Note: Expenditures are higher in 1993 because of startup costs for Coaster, Caltrain, and Metrolink. Inflation adjustment using BEA Table 1.5.4 - Price Indexes for GDP (State & Local Gross Investment)

Some California transit agencies have invested in rail extensions into suburban areas. While these expenditures have attracted new transit riders, they have done so at a high cost, especially due to the large investments in expanding transit capital infrastructure. Trips made on suburban rail extensions tend to be of longer distances, with lower ridership at the ends of routes. Thus, segments of these routes often require a higher operating subsidy per passenger mile traveled than urban bus or rail service. Future funds needed to build and operate these extensions may be limited by local and state budgetary constraints. Even when funds do exist, the multi-year lag between identifying a transit need and opening a new rail facility may mean that the benefits of a project will not be realized before 2020, a key milestone in AB 32 and SB 375 greenhouse gas targets.

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With the State Legislative Analyst's Office forecasting continued general fund deficits, it is unlikely that California transit operators can rely on the state to increase discretionary spending for operating or capital funds in the next five years.⁶ Given the state's fiscal constraints, transit agencies have limited options available to grow ridership:

1. Lobby for new sources of state and federal funds
2. Expand revenues from existing sources of local funds
3. Develop new sources of local funds
4. Reduce the costs of attracting new riders
5. Increase the cost-effectiveness of existing operations

The recommendations detailed in this document center on strategies that meet the latter two criteria. Furthermore, and based on discussions with both Caltrans and transit operator staff, we focus on measures that are both (1) **cost-effective**, given current resource constraints and the need to expand operating subsidies to meet increases in ridership; and (2) **implementable and effective in the short-term** in order to meet 2020 greenhouse gas goals.

I. Inventory Transit's Critical Role for the Future of California

Government at all levels asks a lot of transit. Local governments seek congestion reduction and local employment. The state wants transit to pave the way to environmental sustainability, though both mode shift and by reducing the environmental impacts of transit vehicles themselves. Federal objectives include equal access to jobs, disabled access to transit vehicles, and support for domestic manufacturing jobs. It may be difficult for policymakers and legislators, who balance multiple goals among resource constraints, to keep track of all that transit is asked to accomplish. A thorough inventory of these policy goals and legal mandates can help communicate transit's value to California. Table 1 below is a basic outline that Caltrans can expand in the future.

⁶ California's Fiscal Outlook. Available at: http://www.lao.ca.gov/reports/2011/bud/fiscal_outlook/fiscal_outlook_2011.pdf

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Table 1: Transit's Value to California

Environmental	Economic	Social
<ul style="list-style-type: none"> ● SB 375 - transit is an integral part of a region's Sustainable Communities Strategy to reduce per capita GHG emissions from transportation by 2020 and 2035. ● AB 32 - GHG reduction ● ARB's Fleet Rule for transit vehicles ● Transit provides service base which triggers CEQA streamlining, density bonuses etc., including SB 226 ● Increases in density, increased demand for land-use mix by transit users who seek to capture trips within walk-shed of a station ● Shorter trips by all travelers due to increase in density 	<ul style="list-style-type: none"> ● Congestion reduction ● Access to employment ● Transit service availability provides alternative to constructing costly subterranean and structured parking in economically vibrant urban areas ● Increases nearby land values due to improvements in accessibility and mobility 	<ul style="list-style-type: none"> ● Social safety-net for individuals who cannot or choose not to drive because of economic, physical, mental, legal or other reasons ● Social safety-net for drivers with access to automobiles who are affected by increases in costs of automobile ownership and operation (including fuel price increases, parking fees, and tolls)

II. Accelerate Transit's Growth in California

Caltrans and other departments and agencies can work to accelerate transit's growth in California through statewide strategies and actions that cost-effectively support transit service.

II A. Understanding market and demographic changes

Growth in transit ridership will not occur uniformly across the state. The demographics, socioeconomics, and psychographics of future transit users will vary between regions. Because of changes in demographics, socio-economics, and even consumer preferences, individuals responsible for growth in transit ridership may differ significantly from current riders. The state can employ a systematic approach to segment future ridership groups in order to better understand how to cost-effectively identify, attract, and maintain new riders. By commissioning statewide market research analysis, Caltrans can provide a base level of analysis from which individual agencies can build when developing local plans and communications. Table 2 below is a sample of what a transit planner might learn from a market study.

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Table 2: Sample segmentation of future riders and non-riders:

<- less costly to acquire and maintain ----- more costly to acquire and maintain ->		
Existing High-Propensity Transit Users	New High Propensity Transit Users	Low-Propensity Transit Users
<p>Existing high-propensity transit users will make up the base of ridership. These current “transit-dependent” users lack viable substitutes for transit trips. This can be due to an inability or unwillingness to drive, or lack of regular access to a vehicle. Because these users lack alternatives, they are less sensitive to service quality than other groups.</p> <p>Market segmentation may also reveal that transit dependents and “choice riders” have similar needs, and that investment to capture more choice riders will simultaneously improve existing riders’ levels of satisfaction (and thus improve retention).</p>	<p>New high-propensity transit users will make up the bulk of ridership increases. Individuals may have a high propensity to use transit for three reasons:</p> <p>Economic motivation: Current and future economic conditions may increase the proportion of the “transit-dependent” population that lacks viable substitutes because they cannot afford to own or operate a vehicle. Continued economic challenges coupled with increases in gasoline prices could increase the number of Californians in this group. Growth in this group is counter to statewide goals and objectives, and should not be relied upon to meet transit ridership goals.</p> <p>Demographic motivation: Changing demographics will expand California’s “transit-dependent” population. According to department of finance data, the 65+ population will increase by 162% by 2050. Aging Californians will increase the utilization of costly paratransit services, unless other alternatives are developed. The number of individuals below the driving age is expected to grow 42.5% by 2050.</p> <p>Psychographic motivation: Psychographics is a marketing term for to attributes relating to personality, values, attitudes, interests, or lifestyles. Riders who choose transit for psychographic reasons may have the economic means to own and operate an automobile, but might prioritize saving or consumption of other goods and services over transportation. These “choice riders” might explicitly seek to reduce automobile use by locating in urban environments with pedestrian-oriented design for local trips. They may seek passive travel modes in order to engage in work or entertainment (mobile computing, reading) on commutes and longer trips. These riders might expect complementary policies that increase the value of the transit network, including dense mixed land uses, pedestrian & bike amenities, and car share in high quality transit corridors. Because these users have alternatives, they are more sensitive to service quality than existing high-propensity transit users.</p> <p>Market segmentation may also reveal that these groups may be willing to pay for premium services if reliability and frequency are improved.</p>	<p>Low-propensity transit users might use transit occasionally for trips to parking-constrained neighborhoods or for special events, but these trials are unlikely to lead to regular transit use. Most low-propensity transit users will continue to drive. They might consider carpools and vanpools if the service quality is high. Additionally, this group may oppose the implementation of measures to improve transit service relative to automobiles because they do not perceive personal benefits. These riders can be very expensive to acquire.</p>

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II B. Work with other state agencies to improve the perception of transit within California

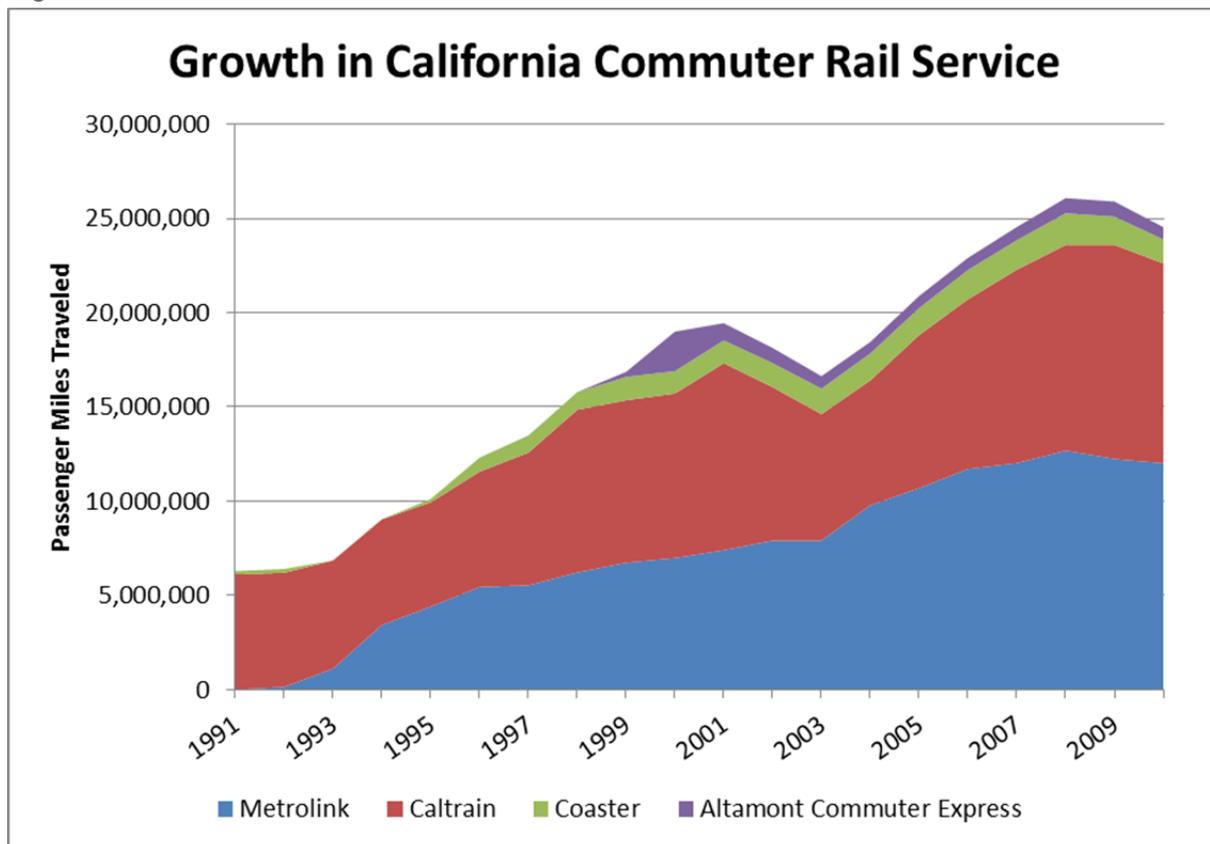
As the sole state-level agency charged with supporting transit, Caltrans can coordinate with local and state agencies and departments that have an interest in transit service expansion and improvement. One area with high potential for successful coordination is a public-facing marketing campaign to promote alternatives to single occupant vehicle travel, including transit. Such a campaign could follow the lead of two successful statewide campaigns that seek behavioral change as a means to resource conservation: *Flex Your Power* and *Save Our Water*. *Flex Your Power* is a partnership of utilities, state agencies, and other stakeholders working together to promote voluntary energy efficiency and conservation. The program is funded by a Public Goods Charge on utility bills. *Save Our Water* is a partnership between the Department of Water Resources and the Association of California Water Agencies to promote water efficiency and conservation. A statewide marketing campaign focused on inducing voluntary behavioral change in transportation to reduce congestion, emissions, and household transportation expenses could learn from the successes of other statewide programs in connecting individuals with local resources (e.g. regional 511 programs). The campaign should target high-propensity transit users, particularly those who might choose transit because of psychographic attributes such as environmentalism, thrift, or other interests.

II C. Continue to coordinate among Caltrans modal divisions

California has invested heavily in improved and expanded commuter rail services and, auspiciously, travel on commuter rail has grown 390% from 1991 to 2010, while miles traveled on all transit modes increased by only 141% in the same period.

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Figure 7: Commuter Rail Miles Traveled



Commuter rail ridership in California will almost certainly continue to grow, and the state must plan for this growth. However, commuter rail exists within a fragmented planning environment that can complement single mode and multi-modal planning:

- Caltrans Division of Rail plans intercity rail
- Individual Joint Powers Authorities plan commuter rail
- Caltrans Division of Mass Transportation supports local operators, which plan for transit.

Nearly all commuter rail users use multiple modes for their trips. For example, twenty-three percent of Caltrain passengers take transit to their originating station.⁷ In order to better serve these users and capture additional users, the state needs to increase its emphasis on integrating planning for various modes. Comprehensive planning should consider how a choice rider can go from their local transit stop and travel across the region or state on various non-auto modes. What level of service would the choice rider expect for interagency and intermodal transfers? How can the individual reach employment destinations from suburban commuter rail stations? Bottom-up consideration of user impacts will help Caltrans and agencies identify and prioritize opportunities for interagency coordination.

⁷ <http://www.caltrain.com/Assets/Public+Affairs/pdf/ji-2.pdf>

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II D. Leverage private investment in intercity bus service

The state should seek to leverage private sector investment in alternatives to automobile-based mobility, including intercity bus service. Currently, Greyhound, Amtrak, and small private operators⁸ operate in the state. Significant increases in gas prices mean changing market conditions, which could make an expansion in intercity bus service viable in the state. Recent entrants to the national market for intercity bus service have or have had a presence in California. Bolt Bus is part of a joint venture with Greyhound, whose sister company, First Transit, operates fixed route, paratransit, and shuttle service in California. Megabus operated in California for about 1 year in 2007-2008 but withdrew service because trips from Los Angeles did not meet ridership expectations.⁹ These companies have been growing nationally and may consider the California market again in the future.

New entrants may be seen as competitors with Caltrans Division of Rail's Amtrak California rail and Thruway bus service. Caltrans can leverage private sector investment by reducing subsidies for service routes with private sector entrants and focusing state subsidies on low-volume routes that are needed for lifeline service.

III. Provide state-wide expertise

Some tasks, such as research and analysis, scale efficiently. For example, research and analysis done by Caltrans or a local agency can be used by all agencies in the state. Caltrans should work to ensure that agencies are up-to-date on statewide best practices for providing cost-effective transit.

Experimentation and evaluation through pilot projects can create new knowledge about successful strategies and potential pitfalls, which can lead to a set of best transit practices for the State. The identification and dissemination of best practices information can greatly enhance the implementation of successful projects across the State. In addition to best practices, Caltrans Division of Mass Transportation can also identify and disseminate lessons learned from projects that were unsuccessful or could be improved if other agencies implement something similar. With better information about what works and what does not, transit operators will devote fewer resources to researching new strategies, and governing boards may view thoroughly studied strategies as less risky.

Transit operators that regularly interact with other operators or local jurisdictions could benefit from assistance in developing and maintaining these often complex and multifaceted relationships. Given its unique role within state government as a provider of funding and technical assistance, Caltrans's Division of Mass Transportation is in a position to create or identify model interagency or inter-jurisdictional agreements and procedures. While a given agency in California may engage in few interagency or jurisdictional agreements, Caltrans's

⁸ including Lux Bus, California Shuttle, USAsia, Hoang Express operate service

⁹ <http://articles.latimes.com/2008/jun/21/business/fi-megabus21>

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Division of Mass Transportation can compile information on agreements around the State in order to provide examples or identify best practices to interested transit operators.

The project team has developed an internet-based venue for sharing of transit planning and policy information, analysis, and data. Through this venue, Caltrans can leverage existing and future studies by connecting transportation planners throughout the state with research, tools, best practices, and a robust network of individual transit knowledge.

Table 3: Examples of tools, past, and future research include:

Web-based Tools	Past Caltrans Studies	Possible Future Studies
<p><u>Caltrans Funded</u></p> <ul style="list-style-type: none"> ● PATH BRT Information Clearing House ● Tool for Analyzing Station Characteristics <p><u>Funded by Others</u></p> <ul style="list-style-type: none"> ● Fehr & Peers LOS+, Ridership+ 	<ul style="list-style-type: none"> ● “State & Federal Project Development Procedures for Bus Rapid Transit: Managing Differences and Reducing Implementation Delays”¹⁰ ● “Assess the Trade-Offs between People Through-put and Level of Service Degradation in the Conversion of a Mixed Flow Lane to a Bus Only Lane on US 101”¹¹ ● “Authority for Use of Freeway Shoulders by Transit Buses”¹² 	<ul style="list-style-type: none"> ● Best practices for community engagement on bus priority projects. ● Study legal ramifications value-capture finance strategy specific to the contemporary California policy landscape. ● Statewide evaluation of RFID credit/debit transactions for cash fare payment ● Fuel procurement strategies to leverage buying power and reduce fuel price risk ● Case study on early implementation of real-time arrival and routing information ● Information about how value-added amenities affect ridership (e.g. WiFi service on Santa Clara VTA)

III A. Streamlining funding and reporting processes

The Division of Mass Transportation can streamline processes required to apply for funding and meet reporting requirements at the State level. The Division of Mass Transportation can work

¹⁰ By Mark Miller. Available at http://www.dot.ca.gov/research/researchreports/reports/2011/path_final_report_ucb-its-prr-2011-08.pdf

¹¹ By Yue Irene Li, Jing-Quan Li, Mark. A Miller, Wei-Bin Zhang

¹² By Richard Land, Deputy Director Project Delivery and Michael Miles, Deputy Director Maintenance and Operations.” (2008),

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with other divisions of Caltrans and with other State agencies to align California application and reporting requirements with federal requirements, or develop and deploy information technology tools that operators can use to prepare and deliver reports that meet state and federal requirements. The application and reporting burdens on public transit operators are substantial, especially for smaller operators with limited staff. Reducing the bureaucratic burdens on these staff will allow transit managers and planners to devote more time and resources to strategic projects and planning.

III B. Provide expertise in strategic planning

While Caltrans will play a role in statewide strategic transit planning, it can also fill a critical gap in local transit planning by offering strategic planning workshops. Caltrans can also support intra- and inter-agency coordination through programs that enhance an agency's ability to plan for and implement change. Most operators create short-range transit plans, but not all create their own long-range plans. Many operators and agencies may benefit from Caltrans-convened statewide or regional workshops and programs in connecting their Short Range Transit Plans to their long-range visions, goals, and objectives.

III C. Statewide resources for customer service improvements

Previous Caltrans-funded research documented the effects out-of-vehicle experiences have on the transit experience.¹³ Passenger information systems that provide users with static information about routing and schedules are useful in reducing the burden of learning about trip options. The General Transit Feed Specification (GTFS) is a standard for sharing information about public transit. Google Maps and other internet-based services use GTFS feeds published by each operator to provide a single interface for trip planning services across multiple operators.

In the past, Caltrans has provided technical assistance to operators interested in publishing their scheduling and routing data in the GTFS format. The proliferation of California transit operators publishing their data in the GTFS format has created network effects — users making trips across multiple service areas can use a single system to identify an appropriate route. In one example, a blogger from the *SF Weekly* newspaper used Google Maps transit directions to identify and travel on a route from San Francisco to Los Angeles using seven transit operators and fifteen transfers.¹⁴

Google is currently working with San Francisco Municipal Railway and the San Diego Metropolitan Transit Service to test the next iteration of the standard, GTFS-realtime, which includes vehicle arrival predictions, positions, and service alerts. Real-time transit arrival information is important to reducing perceived wait times and increasing perceived service quality. A study that considered fare levels, service quality, and external factors found that real-

¹³ Brian D. Taylor, Hiroyuki Iseki, Mark. A. Miller, Michael Smart. "Thinking Outside the Bus: Understanding User Perceptions of Waiting and Transferring in Order to Increase Transit Use." 2007.

¹⁴ http://blogs.sfweekly.com/thesnitch/2011/06/sf_to_la_public_transit.php

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time arrival information was responsible for a small but measurable increase in transit ridership.¹⁵ If real-time arrival and alert information can lead to ridership gains in California, then it can be a cost-effective option to expand ridership by increasing the utilization of existing service.

Just as Caltrans Division of Mass Transportation has played a role in expanding the use of the GTFS standard in the state, it can assist operators in introducing real-time passenger information systems. Caltrans can provide technical assistance to help operators understand their options regarding real-time passenger information systems and offer catalyst grants to help offset the initial costs of creating and publishing data. Caltrans should also examine cases where scale economies exist — translation of data from proprietary formats, quality control, and serving published data to the internet — where a statewide resource would be more cost-effective than having each operator independently implement a local solution.

IV. Leveraging California's Successes

California's local transit operators have used their autonomy to experiment with strategies to improve transit in their areas. The authors identified a number of successful strategies during the research process. By disseminating these strategies, Caltrans can help statewide operators leverage the successes of their peers to accelerate the adoption of cost-effective transit-improvement measures.

IV A. Publicly-sponsored vanpool service

Miles traveled on publicly-sponsored vanpool service reported to the Federal Transit Administration increased 8,600% between 1991 and 2010, making vanpooling the fastest-growing public transit mode in California. Vanpools can be a highly cost-effective option to expand transit service because of a high level of service and willingness to pay versus low vehicle, labor, and administration costs. Transit agencies that report service metrics for publicly-sponsored vanpool service to the National Transit Database are eligible for Section 5307 formula funds for operations, which can make the already cost-effective service a net revenue generator for transit agencies. For instance, during the first four years Los Angeles County Metropolitan Transportation Authority sponsored vanpool service, the agency has subsidized vanpools an average of \$1.48 per passenger trip, but has received \$6.88 per passenger trip in federal formula funds.¹⁶

The California Vanpool Authority (CalVans) is a public Joint Powers Authority that directly operates vanpool service. The direct operations model gives CalVans two distinct advantages

¹⁵ Tang, Lei and Piyushimita Thakuriah (2012). "Ridership effects of real-time bus information system: A case study in the City of Chicago." *Transportation Research Part C: Emerging Technologies* (22: 146-161)

¹⁶ "Metro Vanpool Program Funding." Memorandum Presented to Operations Committee. Feb 17, 2011. Available at http://www.metro.net/board/Items/2011/02_February/20110224RBMItem8.pdf. (Accessed March 30, 2012).

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over purchased transportation. First, CalVans is able to accept the 30-40% applicants who would be declined by a private vanpool operator because of poor credit.¹⁷ Second, CalVans can use depreciated vehicles for low-revenue service applications that serve the public interest, such as agricultural worker transport.

Expansion of vanpool service can be a strategy to connect rural and exurban residential communities with employment centers. In such an application, vanpool service can mitigate the effects of fuel price increases on vulnerable populations who commute long distances. Because they are cost-effective and lower capacity relative to other forms of transit, vanpools can help build markets for transit in advance of commuter bus or rail service. Once several vans travel similar routes at similar times, it may become viable to replace some service with regularly scheduled commuter buses.

IV B. Station vans

Many of California's commuter rail stations serve low-density suburban areas with dispersed employment. While a station's park-and-ride lots can serve residents within the station catchment area, serving employment trips to suburban destinations within the catchment area can be challenging because of a lack of last-mile alternatives. Some larger California employers and transportation management associations offer shuttle service between transit stations and campuses. Station-based vanpools that connect to workplaces may be an alternative last-mile connection for self-organizing groups considering transit for the primary leg of their trips. While the low vehicle utilization rates over short distances may make such service cost-prohibitive with new vehicles, planners can study the possibility of using high-mileage, depreciated vanpool vehicles for these shorter, low-revenue routes.

Among commuters who have regular access to a vehicle, vanpooling is most competitive with automobile travel for longer trips. For long trips, the time involved in traveling to a park and ride location and boarding the van is short relative to the in-van travel time. Station vans that connect residents to commuter rail may be effective for longer connections to commuter rail; for example Victorville to San Bernardino Metrolink.

IV C. Re-purpose underutilized space to transit

Representatives from transit operators throughout the state thought that increasing the speed of transit vehicles would be the most effective strategy to make the mode more attractive relative to automobile travel. Traffic congestion is costly for transit operators, and it drives away customers when transit services operating in congested areas have no operating priority vis-à-vis private vehicles. Reduced vehicle speed increases the ratio of vehicle hours to miles traveled, increasing the costs of each end-to-end trip along a route. Additionally, maintaining headways under reduced speed conditions requires that an operator add vehicles to a route. As congestion typically occurs during peak periods, assigning additional busses to a route may increase the number of vehicles operated in maximum service and the operator's peak-to-base

¹⁷ Interview with CalVans Executive Director Ron Hughes on September 9, 2011.

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ratio — meaning that to serve peak demand the operator must purchase additional transit vehicles that are not needed outside of the peak period.

Bus-Only Lanes

It may not be obvious that a congested traffic lane is underutilized. However, slow vehicle speeds through congested segments substantially reduce vehicle throughput versus uncongested speeds. Restricting the lanes use can increase vehicle speeds and the lane's effective vehicle capacity. High Occupancy Vehicle and Transit-Only restrictions are common treatments used to increase the speed of traffic through congested corridors. These strategies can carry the additional benefit of significantly increasing the flow rate of people through a lane, effectively increasing the capacity of a congested right-of-way.

While bus-only treatments are popular among California's transit operators, it is challenging to re-purpose existing mixed-flow and parking lanes to transit vehicles. These challenges arise from community opposition, unmitigated environmental impacts, and difficulty obtaining permissions from the authority responsible for the transportation facility. Caltrans Division of Mass Transportation and other departments within the state can greatly assist operators looking to implement transit priority or bus-only lanes. First, the Division of Mass Transportation can work with other transit stakeholders in the state to learn from Market Street, Van Ness, Wilshire, East Bay BRT, and other projects to identify and disseminate best practice in community engagement and bus-only lane project-related outreach and communications. Second, the Division of Mass Transportation can work with the Governor's Office of Planning and Research to help local governments identify the extent to which the vehicle-based transportation network impact methodology and thresholds they have chosen in their General Plans can cause forecast traffic impacts from bus-only lane projects to trigger thresholds of significance in the California Environmental Quality Act review process. Lastly, Caltrans can develop statewide guidance for bus-only lane implementations and adopt an internal policy to expedite review and implementation when an operator and local government request a transit priority treatment on a state transportation facility.

Bus-on-Shoulder

Allowing transit vehicles to use shoulders of controlled access highways is a highly cost-effective strategy to reduce travel times and add to the relative attractiveness of transit versus automobile use. A mid-2000s bus-on-shoulder pilot project on CA-52 in San Diego County yielded valuable experience that could inform studies and projects elsewhere in the state. After ten months, transit vehicles operating on the shoulder achieved 99% on-time performance, and the project had improved travel times and increased customer satisfaction levels.¹⁸ The pilot program is a prime example of how Caltrans divisions other than Mass Transportation can work to introduce cost-effective strategies to improve transit service in California. However, a

¹⁸ Bob Leiter. "Freeway Transit Lane Demonstration Project Status Report." Oct. 6, 2006. Available at http://www.sandag.org/uploads/newsid/newsid_427_5940.pdf (accessed November 3, 2011).

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Caltrans internal decision document on shoulder bus operations¹⁹ has not been made publicly available, and transit operator representatives that the research team interviewed saw no clear path to implementing new bus-on-shoulder projects in the state.

IV D. Consolidation and coordination of non-core functions

Transit operators in California employ a range of operating models. Transit agencies in California can conduct planning, maintenance, operations, training, and administrative support with internal resources or work with an external service provider. External service providers can be either private or public organizations. The Southern California Regional Transit Training Consortium is an eight-year old 501(c)(3) non-profit organization governed by member transit agencies and educational institutions. The program promotes local workforce development goals while providing transit agencies with a cost-effective local option for training maintenance employees. Other opportunities for interagency coordination with procurement, back-office functions, or maintenance may exist in the state. However, without outside seed money, no one agency may take the lead to support the initial consortium formation. Caltrans can support the voluntary formation of multi-agency consortia through interagency planning grants and other assistance.

IV F. Support local efforts to implement congestion pricing

In interviews with transit stakeholders, the UCLA research team found conditional support for congestion pricing as a locally-administered policy used in limited applications. The Bay Area, Southern California, and San Diego have implemented some degree of congestion pricing on at least one transportation facility in their regions. Reducing or eliminating traffic congestion on roadway segments will increase the speed of transit vehicles operating on those segments. In addition, transit becomes more attractive relative to automobiles as drivers pay a toll to access the uncongested roadway, but transit users do not. Finally, congestion pricing implementation can be a new source of revenue for transit capital and operations funding.

Conclusions

Stakeholders in California ask a lot of transit because it can be a tool to address a range of policy goals. Increases in ridership are necessary to meet a range of environmental, social, and economic goals. However, the cost of increasing ridership falls squarely on the shoulders of California's public transit agencies, making the policy goals difficult to achieve in a time of fiscal constraint. Agencies must increase ridership cost-effectively in order for the state to achieve its broader policy goals. From our meetings and focus groups with public transit stakeholders around the state, we have found broad support for the following strategies to cost-effectively increase transit use in the Golden State:

¹⁹ "Authority for Use of Freeway Shoulders by Transit Buses" (2008), Richard Land, Deputy Director Project Delivery and Michael Miles, Deputy Director Maintenance and Operations.

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- Understand the implications of changing markets and demographics
- Work with other state agencies to improve the perception of transit in California
- Continue to coordinate between Caltrans modal divisions
- Share state-wide successes and lessons learned in order to accelerate the implementation of cost-effective strategies to improve transit
- Streamline state and federal funding and reporting processes
- Provide statewide resources for customer service improvements like passenger information systems
- Report publicly-sponsored vanpool service data in order to attract federal operating funds
- Re-purpose underutilized space to transit
- Support voluntary efforts to consolidate and coordinate non-core functions among multiple agencies

Perhaps the most cost-effective option to improving transit service in California is to better leverage what has already been put into place. Transit operators throughout the state have experienced both successes and failures in identifying and implementing cost-effective means to increase patronage. Caltrans and University of California researchers have also studied roadway treatments such as bus-on-shoulder, bus-only-lanes, as well as case studies that result in lessons learned. By building from this experience, California's transit operators can avoid the costs of additional studies and the risks associated with uninformed experimentation. Access to such studies can greatly assist agencies looking to identify and implement strategies to improve transit and achieve future ridership goals.

The Division of Mass Transportation needs the support of other Caltrans divisions and relevant state agencies to assist local transit operators in implementing cost-effective measures to increase ridership. While transit operators have many options at their disposal that do not require trade-offs with automobility, some measures will require that Caltrans and local governments prioritize transit and high occupancy vehicles over single-occupant automobiles. These measures are likely to be a source of conflict throughout California as the state moves toward a sustainable transportation future in pursuit of its social, environmental, and economic policy goals. Caltrans can support local governments and regions that have chosen to prioritize transit by accelerating the implementation of transit-priority measures on state-administered facilities.