SJSU SAN JOSÉ STATE UNIVERSITY

MTI MINETA TRANSPORTATION INSTITUTE

The Future of Transit

Project 2608
April 2026

Adam Cohen

DOI: 10.31979/mti.2026.2608

Executive Summary

Santa Clara County's transit system is at a crossroads. Hybrid work, changing travel demand for public transit, and fiscal constraints have reshaped the operating environment for the Santa Clara County Valley Transportation Authority (VTA). At the same time, the proposed regional transportation sales tax measure presents an opportunity to stabilize operations, modernize service, and position transit for long-term ridership growth and financial resilience.

Public transit agencies, including VTA, have not yet fully adjusted service planning and operations to reflect post-pandemic travel patterns characterized by hybrid work, more dispersed trip-making, and increased off-peak demand. As a result, traditional approaches to transit planning—historically focused on peak-period commuting—are no longer sufficient on their own to drive ridership recovery or long-term growth.

In this context, reliability, travel time, and convenience remain the strongest predictors of transit ridership, but they must be part of a broader strategy. Investments that reduce delay, increase frequency, simplify transfers, and improve customer experience can produce ridership gains; however, maximizing impact today also requires addressing off-peak demand, untapped rider markets, multimodal integration, technological innovation, and creating transit-supportive land uses. This study draws on existing literature to examine these strategies and their implications for VTA.

Building on this synthesis, this paper discusses strategic considerations for maximizing ridership and generating taxpayer return on investment (ROI), while identifying service reliability, travel time, and customer experience as key operational levers for achieving these outcomes. While these findings reflect widely recognized best practices across the transit industry, this paper is specifically intended to contextualize them within VTA's current fiscal, governance, and operational environment—particularly in light of post-pandemic travel shifts, workforce constraints, and the opportunity presented by the proposed 2026 regional transportation measure.

Importantly, the primary challenge facing VTA is not a lack of awareness of these strategies, but the difficulty in implementing them within existing institutional, funding, and governance constraints. This paper places greater emphasis on fiscal sustainability rather than traditional service planning analyses by proposing to connect service, technology, and land use strategies to measurable financial outcomes. These considerations are intended to help VTA evaluate not only what improves ridership, but what is financially scalable and sustainable over time.

This perspective paper is based on a structured review and synthesis of existing research, policy documents, and industry reports related to public transit ridership, service design, transportation finance, and emerging mobility innovations. The analysis integrates findings from peer-reviewed

academic literature, government publications (e.g., Federal Transit Administration, Caltrans, Metropolitan Transportation Commission), and prior studies conducted by research institutions. In addition to the literature review, this paper incorporates descriptive statistics from publicly available data sources, including American Community Survey (ACS) and regional planning documents, to contextualize trends specific to Santa Clara County and the VTA service area. The paper also draws on case studies and demonstrations from transit agencies across the U.S. to highlight some key innovations. Expert interviews (n=10) with thought leaders and VTA staff were used to fill gaps in the literature and provide practitioner insights. These semi-structured interviews were used to contextualize research findings, validate key themes, and identify emerging challenges and opportunities not yet fully captured in published studies. These expert insights provide additional depth and real-world perspective to inform the strategies presented in this paper.

The paper is organized into five major sections:

1. **Background and Local Context** – Reviews changes in commuting behavior between 2019 and 2024 and frames the fiscal and operational implications for VTA.

2. **Evidence on Ridership Drivers** – Synthesizes research on reliability, frequency, transit signal priority, bus rapid transit, fare integration, traveler segmentation, and demand-side strategies.

3. **Innovation and Mobility Partnerships** – Evaluates emerging automated vehicle technologies, microtransit, ridehailing partnerships, and metrics for measuring fiscal performance.

4. **Land Use and Real Estate Strategies** – Examines transit-oriented development, station-area development, and long-term real estate revenue models as tools for financial sustainability and ridership growth.

5. **Performance Governance and Sales Tax ROI** – Proposes a scorecard linking operating metrics, capital investments, and sales tax ROI to ensure taxpayer accountability and measurable impact.

The overarching recommendation is for VTA to align future investments around three reinforcing priorities: (1) make transit faster and more reliable, and in high-demand corridors, more frequent; (2) carefully deploy innovation and targeted demand strategies; and (3) integrate land use, real estate, and transportation planning to strengthen VTA's long-term fiscal independence and more directly align with and advance its economic and community development mission. This paper recommends that VTA ensures that new revenues are strategically invested—not simply spent—to advance mobility, service equity, and long-term financial sustainability.

Background and Local Context

To understand how these strategic priorities apply in practice, it is necessary to examine the legislative framework, regional funding landscape, and evolving travel patterns shaping VTA's operating environment. Senate Bill 63 (SB 63) authorizes placement of a 14-year regional transportation sales tax on the November 2026 ballot in Alameda, Contra Costa, San Francisco, San Mateo, and Santa Clara counties. The measure would generate approximately $1 billion annually to sustain and improve public transit [1] [2]. The proposed sales tax measure is projected to generate $264 million annually for the Santa Clara Valley Transportation Authority (VTA). The bill presents an opportunity for VTA to develop an expenditure plan that prioritizes strategies that maximize system impact and return on investment (ROI), strengthen long-term fiscal stability, and expand ridership by delivering consistently high-quality, reliable, and integrated transit services.

Santa Clara County's suburban and exurban development pattern, wide arterial roads, and concentrated job centers influence the way people travel every day. Commuting patterns shifted substantially between 2019 and 2024 (Table 1). According to American Community Survey data, in 2019, the vast majority of Santa Clara County residents traveled to a physical workplace, with 84.9% commuting by car, truck, or van—including 74.4% driving alone and 10.5% carpooling—while only 4.9% worked from home. Public transportation accounted for 4.8% of commutes. By 2024, hybrid and remote work dramatically reshaped these patterns [3]. The share of Santa Clara County residents working from home increased to 14.7%, tripling its 2019 level and reducing traditional peak-hour trips. Among those still commuting, auto use remained high—76.1% traveled by car, truck, or van, with 65.2% driving alone and 10.9% carpooling—but trips post-pandemic are more dispersed throughout the day. Public transit commutes declined to 2.9%, reflecting both reduced commute trips and shifts toward off-peak travel.

Table 1. Santa Clara County Commuting Patterns and Transit Ridership, 2019 vs 2024

Mode	2019	2024	Percent Change
Car, truck, or van	84.9%	76.1%	−8.8%
• Drove alone	74.4%	65.2%	−9.2%
• Carpooled	10.5%	10.9%	+0.4%
Public transportation	4.8%	2.9%	−1.9%
Walking	2.3%	2.4%	+0.1%
Bicycling	1.7%	1.8%	+0.1%
Taxi / ride-hailing / motorcycle / other	1.4%	2.1%	+0.7%
Worked from home	4.9%	14.7%	+9.8%

Source: American Community Survey Table S0801 1-Year Estimates, Santa Clara County

In light of these changes, the proposed regional transportation sales tax measure presents an opportunity for VTA to adapt operations, capital planning, technology deployment, and land use strategies in ways that support both financial sustainability and long-term ridership growth in Santa Clara County. These shifts in commuting behavior underscore the importance of understanding what factors most strongly influence ridership in today's environment and where targeted investments are most likely to produce measurable returns.

What Drives Ridership: Evidence and Best Practices

Transit ridership is not the product of a single investment or policy decision; rather, it reflects the combined effects of service quality, network design, customer experience, market targeting, and the built environment. Existing research provides strong evidence regarding the service characteristics that most significantly shape rider behavior and long-term transit demand. This section discusses key operational drivers such as reliability and frequency; system-level strategies, including multimodal integration and fare simplification; demand-side approaches that target untapped rider markets; analytical tools such as traveler segmentation; and the long-term influence of land use, transit-oriented development, and walkability. This evidence base provides a foundation for prioritizing investments that are most likely to produce measurable ridership gains and strengthen network performance.

Importance of Transit Reliability and Frequency

Research consistently shows that frequency and reliability are the most powerful predictors of transit ridership and mode choice [4] [5] [6] [7]. Higher frequency service reduces waiting time and reliability ensures that riders can depend on the service [8]. Additionally, shorter travel times (compared to other modal options) are also key to attracting riders with access to private vehicles and other alternatives [9]. Unreliable service, long waits, limited hours, poor first- and last- mile access, uncomfortable places to wait, and complex transfers remain key deterrents to using public transit. In 2023, VTA adopted the Visionary Transit Network, a vision and framework for aspirational transit service in Santa Clara County. Key recommendations included: 1) weekday 10-minute Frequent Bus Network with expanded hours of operation; 2) weekday 10-minute Frequent Light Rail Network with expanded hours of operation; 3) weekend 15-minute Frequent Bus Network with expanded hours of operation; and 4) weekend 15-minute Frequent Light Rail Network. It was estimated that these and other enhancements as part of the Visionary Transit Network would cost $190M annually in FY2022 dollars [10].

Targeted investments such as dedicated bus lanes, transit signal priority (TSP), and bus rapid transit (BRT) can reduce the amount of time it takes bus transit to move through corridors, thereby increasing the attractiveness of fixed-route transit service [11] [12] [13] [14] [15]. For example, Research from the Federal Transit Administration (FTA) finds that BRT systems can be up to 55% faster than local bus service and increase ridership by 20% to 96% [16]. Another study conducted between 2013 and 2014 found that ridership increased 29% along routes where BRT was implemented [11]. Research also finds that real-time traveler information and basic amenities, such as bus shelters and lighting, directly impact perceptions of safety and wait times, and the likelihood riders will use transit [17] [18] [19] [20] [21]. While reliability and travel time form the backbone of ridership growth, the ease with which riders navigate and pay for transit across systems increasingly shapes whether they choose transit at all.

Role of Multimodal Integration and Simplifying Fare Payments

An increasing body of domestic and international literature has found that multimodal integration plays a key role in attracting transit riders by reducing the friction associated with transfers and modal connections [22] [23]. Research consistently shows that when riders can move seamlessly across systems—with unified fares, coordinated schedules, and integrated trip planning tools—they are more likely to use public transit [24] [25]. Integrated ticketing and mobility wallets, building on pilots like Clipper BayPass, can simplify fare payment and make multi-operator journeys seamless, directly influencing rider decisions [26] [27] [23] [28] [29]. In addition, contactless payment systems—allowing riders to pay directly using credit cards, debit cards, or mobile wallets—can further reduce friction by enabling customers to pay for transit in the same way they pay for other goods and services.

One study comparing domestic and international literature found that simplifying fares and allowing free transfers can increase transit ridership between 7% and 18% [30]. Coordinated schedules can also make public transit more competitive by shortening wait times. Integrated trip planning tools can also enhance the customer experience and allow riders to navigate transit networks with confidence [31] [32]. A recent survey by Caltrans District 4 found that infrequent service, lack of late night transit options, poor connectivity between routes and transit agencies, and inadequate first- and last- mile connections are key barriers to public transportation use in the Bay Area [33]. Beyond system design and fare integration, agencies must also consider who is not currently riding and why.

Beyond vehicle automation, public transit agencies can also leverage other innovative technologies to improve system performance and customer experience. Real-time operations management tools—such as predictive headway optimization, accurate travel-time predictions, and live crowding information—can enhance both perceived and actual reliability. Expanding Transit Signal Priority along major corridors has the potential to reduce delays and support increased ridership. Integrated mobility platforms that unify trip planning, fares, real-time vehicle tracking, and innovative mobility services can improve network connectivity and create seamless, multimodal experiences for riders.

Untapped Rider Markets and Demand-side Strategies

Transit agencies across the country are increasingly focused on identifying and attracting untapped rider markets. In addition to service and infrastructure investments, extending public transit services to include early-morning, late-night, and weekend hours can be important for enhancing accessibility, equity, and job access for workers with non-standard schedules. Pre-pandemic service planning that traditionally emphasized weekday peak periods frequently failed to meet the needs of shift workers, essential workers, and those without access to private vehicles. Transit riders employed in healthcare, hospitality, retail, manufacturing, and other essential sectors often start or end shifts before standard service begins or after it ends. Without off-peak service, these workers often have limited or no public transit options, which can lead to higher transportation costs, employment instability, and reduced access to job opportunities [34] [35] [36]. Recent research highlights the important role that late-night transit service plays in supporting regional economies and improving access to employment for shift workers [37] [38]. Demand-side strategies, such as employer partnerships for bulk passes, guaranteed-ride-home programs, and late-night service promotions, can directly address these gaps by incentivizing transit use for non-standard schedules [39] [40] [41] [42] [43]. Expanding the hours of fixed-route service and adding other types of services (e.g., ridehailing partnerships and microtransit) can also directly address barriers that these populations face in reaching employment and essential destinations outside the typical 7 am to 7 pm workday and commute window.

In addition to late-night transportation, there are several other potential untapped rider markets. Studies show that early K-12 and college student exposure to public transit and discounted youth fare programs increase ridership, often generating long-term riders [44] [45] [46]. Equity-focused fare programs that provide free or reduced fares for youth, low-income populations, and older adults can similarly remove financial barriers and support sustained ridership growth [47] [48] [49] [50]. More broadly, public transit plays a critical role in improving household affordability. Research from the American Public Transportation Association indicates that households with access to high-quality transit that are able to forgo vehicle ownership can save, on average, approximately $13,000 annually per vehicle avoided. As such, public transit not only represents a mobility service but also an important aspect of household financial stability and economic mobility [51].

Research has also found that older adults and travelers with disabilities may be another underserved market segment. Public transit accessibility for travelers with disabilities and older adults may be influenced by the walkability of transit stops, the availability of safe routes to transit (i.e., walking paths), and the general performance of ADA paratransit (e.g., policies around advance versus on-demand booking, wait time, on-time performance, door-thru-door assistance, etc.). Research has found that ADA improvements at stops and on-demand transit has the potential to expand transit use and traveler independence among these populations. The San Mateo County Transit District (SamTrans) has recommended several strategies to improve transit access for older adults and travelers with disabilities. A few key recommendations include: subsidizing ridehailing with telephone booking, supporting older adult walking groups, enhancing driver training, establishing safe routes to transit, and expanding both flexible-route and community-based transportation services [52]. Identifying these emerging travel patterns raises a broader strategic question: how can agencies tailor service and pricing to distinct rider groups rather than treating the market as uniform?

The Role of Traveler Segmentation

Research shows traveler segmentation has the potential to help transit agencies understand who their riders are, how their needs differ, and which service, pricing, and investment strategies will be most effective. Rather than treating riders as a single group, segmentation reveals distinct markets—each with specific travel patterns, constraints, and motivations [53] [54] [55] [56]. This allows transit agencies to design services that better match real-world demand. Lessons from the airline industry show the value of traveler segmentation to optimize revenue, loyalty, and service design [57] [58] [59]. While transit agencies operate under different goals, several airline practices provide lessons to grow ridership, enhance customer experience, and improve financial sustainability. Airlines segment passengers by purpose (business, leisure, visiting friends/relatives), price sensitivity, schedule flexibility, and trip certainty. Many transit agencies can do more to differentiate between commuters, shift workers, students, occasional riders, older adults, low-income riders, and non-work travelers. Demand-side strategies can then be tailored for each segment, such as targeted off-peak fare promotions, bundled mobility passes, and personalized service alerts via apps [60] [61] [62].

Public transit can also differentiate services through express or limited-stop services, fare passes, fare caps, and bundled mobility options (e.g., multimodal passes and fare products). Airlines use highly sophisticated demand forecasting—leveraging reservation systems, mobile apps, and loyalty accounts—to predict when, how, and why travelers fly. While the airline industry provides an analogy for segmentation and demand forecasting, an important distinction is that airlines rely heavily on dynamic, market-based pricing—offering travelers a range of price and service options based on willingness to pay. In contrast, public transit operates as a subsidized public service, where agencies often lose money on each trip and fare policies are typically shaped by equity goals and agency preferences rather than revenue maximization. As a result, transit agencies could have limited flexibility to implement dynamic pricing strategies.

These institutional and policy constraints mean that segmentation and demand-responsive strategies in public transit may require different tools—such as targeted discounts, fare capping, employer or institutional partnerships, and service design adjustments—rather than purely price-based differentiation. Public transit agencies can also build upon this approach using smartcard and app data to more dynamically schedule, target incentives, and deliver personalized marketing and service alerts [63]. Advancing these approaches may also require organizational, policy, and governance changes beyond the scope of traditional transit agency structures.

Public transit can leverage artificial intelligence (AI) and predictive analytics to optimize connection reliability. For example, an agency could implement "connection protection," using predictive models to track incoming bus and rail arrivals, identify passengers with tight connections through app data, and calculate the tradeoffs between holding a connecting vehicle versus maintaining the overall schedule [64]. Implementing such strategies could improve both actual and perceived reliability—particularly for late-night riders, those with limited alternatives, and populations responsive to targeted fare and service incentives. However, service design and pricing strategies operate within a broader physical context that ultimately shapes long-term travel behavior.

Impact of the Built Environment, TOD, and Walkability

Finally, planning research consistently finds that the character of the built environment around stations and corridors strongly influence travel behavior and transit demand. Transit-oriented development (TOD)—defined by higher densities, a mix of residential, office, retail and civic uses—creates environments where transit becomes a viable choice for a wide range of trips beyond just peak-period commuting. Both TOD and walkability support public transit ridership in several key ways. First, increased density locates more potential riders near public transit [8] [65] [66]. Second, mixed land uses can reinforce off-peak ridership beyond traditional commuting [65] [66]. Finally, synergies with the built environment such as complete streets can encourage walking and cycling, also reinforcing transit use [8] [67] [68] [69]. When combined with demand-side programs—such as integrated ticketing, fare incentives, and youth/low-income fare programs—TOD and walkable environments can maximize ridership growth across diverse populations [30] [70] [71] [72]. Beyond land use and the built environment, emerging technologies introduce new opportunities—and risks—for strengthening transit performance.

How VTA Can Leverage Technology & Innovation

Vehicle automation presents one of several opportunities for public transit agencies to leverage innovative and emerging technologies. Across the U.S., several transit agencies are exploring ways to integrate both automated driver assistance systems (ADAS) and automated vehicles (AVs) into their networks and operations. While these technologies cannot replace the fundamental importance of frequent and reliable transit service, they can strengthen operations and reduce costs when deployed strategically. SAE International, an organization in mobility standards, has defined five levels of automation, ranging from fully human-operated vehicles to fully autonomous systems [81]:

- **Level 1 automation** provides a single automated function, such as adaptive cruise control or self-parking, while the driver remains responsible for all other driving tasks.

- **Level 2 automation** can simultaneously control steering, acceleration, and braking. The driver must remain attentive and ready to intervene, as these systems function as driver-assistance features rather than fully autonomous technology.

- **Level 3 automation** manages all aspects of driving under specific conditions, allowing the driver to disengage and attend to other tasks. The driver must still be prepared to take over when the system requests intervention.

- **Level 4 automation** enables vehicles to operate autonomously within defined operational domains, such as specific geographic areas or controlled environments (e.g., low-speed urban zones). Human intervention is not required as long as the vehicle remains within these parameters.

- **Level 5 automation** represents full autonomy in all driving scenarios. Vehicles at this level operate independently without human input and may not even include conventional controls, such as a steering wheel or pedals.

ADAS (Levels 1–3) form the current foundation for automated driving, integrating features such as precision bus docking and automated emergency braking. These systems assist the human driver to improve safety but do not replace the driver. AVs (Levels 4–5) are capable of performing the driving task without human intervention under certain conditions, depending on the level of automation. While these technologies may play a role in mitigating workforce constraints, reducing operator fatigue, and improving job quality, they should be implemented in coordination with labor representatives and workforce transition strategies.

Transit Signal Priority:

Several operational and transit priority policies can make public transportation more reliable. For example, transit signal priority (TSP) modifies traffic signal timing or phasing when transit vehicles are present, with the potential to improve both reliability and travel time [73] [74]. TSP can leverage several strategies, such as: 1) extending the current green phase by a few seconds when a transit vehicle is approaching, allowing the bus to clear the intersection without stopping; 2) shortening the red time so that the bus receives a green earlier than scheduled; 3) adding a separate signal phase for transit vehicles; 4) temporarily changing the signal phases to serve transit earlier; 5) skipping a non-critical phase to give green time to an approaching bus; 6) giving transit vehicles conditional priority (e.g., when a bus is running late or carrying a high number of passengers); and 7) queue jumping (e.g., giving buses a head start ahead of general traffic) [75]. The impacts of TSP can vary depending on how it is implemented.

Several studies have used VSSIM, a microscopic, time-step and behavior-based simulation platform, to estimate the impacts of TSP. A study from Salt Lake City found that TSP and BRT upgrades resulted in a reduction in peak hour transit delay of 13%, with a savings in peak hour transit time of up to 9% [76]. Another study of a 10-mile corridor in South Florida estimated that TSP can reduce travel times by up to 8%, and up to 13.3 % reduction in average vehicle delay time for both buses and other vehicles [77]. A study from Los Angeles found that the combination of placing bus stops on the far side of intersections, low-floor bus boarding, and giving signal priority to buses reduced passenger travel times by as much as 29% and increased ridership by 40% [78]. The study also found that one-third of the increase in bus ridership was from new riders who had not previously used public transportation [78]. A study by the U.S. Department of Transportation provides a methodology that agencies can use to estimate the benefit-cost analysis and return on investment for TSP [79]. It is important to remember that transit signal priority can work synergistically with other transit investments—such as bus lanes and off-board fare payment—to improve overall service efficiency [80].

Advanced Driver Assistance Systems (ADAS)

As agencies adopt ADAS, applications such as precision docking, lane-keeping assistance, and automated safety systems can also reduce curb strikes, improve level-boarding consistency, shorten dwell times, and ease operator workload [82] [83] [84] [85]. The Kansas City Area Transportation Authority (KCATA) received a federal grant through the FTA Accelerating Innovative Mobility (AIM) program to test precision docking, an ADAS application, on its RideKC MAX Bus Rapid Transit [86]. The goal of the grant was to help drivers dock buses at BRT stops with consistent ADA-compliant gaps, ensure level boarding for passengers, reduce dwell times, and minimize curb strikes when the bus makes contact with the curb, often resulting in tire, wheel, or body damage [86].

Automated Vehicles (AVs): Opportunities and Limitations

In addition to ADAS, several transit agencies have explored using low-speed (i.e., <25 mph) automated shuttles in more controlled environments (e.g., business parks, senior communities, and college campuses). For example, the Contra Costa Transportation Authority (CCTA) received a USDOT Automated Driving System Demonstration Grant for two demonstrations [87]. The first demonstration used Olli shuttles equipped with an Oxa ADS operated by Beep to serve the Rossmoor senior community in Walnut Creek, CA [87]. The second demonstration used Toyota Sienna minivans equipped with ADS from May Mobility to provide a wheelchair-accessible microtransit service through Via to provide access to healthcare in Martinez, CA [87].

Several transit agencies have also explored the feasibility of full-size buses equipped with automation technologies that aim to operate without a human driver on public streets or dedicated busways. The Connecticut Department of Transportation (CTDOT) received an FTA Integrated Mobility Innovation (IMI) grant to test automated, electric New Flyer Xcelsior CHARGE 40-foot buses on the CTfastrak, a dedicated 9.4-mile BRT guideway [87]. The grant aimed to evaluate applications such as bus platooning and precision docking [87]. Similarly, in Houston, the Metropolitan Transit Authority of Harris County (METRO) received an AIM grant to test an automated cutaway bus providing service to Texas Southern University and the Third Ward community [87]. The METRO demonstration was cancelled before entering public service due to technology challenges [88] [89]. Several other transit agencies have raised labor and liability concerns associated with placing automated buses into passenger service. Yet automation is only one dimension of innovation; partnerships with private mobility providers represent another aspect many transit agencies are actively exploring.

The Role of Mobility Partnerships

In addition to these ADAS and AV applications, public transit agencies can also partner with third parties to provide AV and human-driven ridehailing, microtransit, and other transportation services.

Ridehailing (also referred to as transportation network companies or TNCs) provide prearranged and on-demand transportation services for compensation in which drivers of personal vehicles connect with passengers. Digital applications are typically used for booking, electronic payment, and ratings [90].

AV Ridehailing refers to prearranged and on-demand transportation services provided for compensation in which automated vehicles—rather than human drivers—transport passengers. These services operate through digital platforms that facilitate trip booking, vehicle dispatching, electronic payment, and customer feedback. Depending on the deployment model, vehicles may operate fully driverless or with remote supervision. AV ridehailing services such as Waymo and Zoox may offer opportunities to support first- and last- mile travel or late-night service; however, all mobility partnerships require clear governance frameworks, strong data-sharing agreements, and safeguards to ensure equity and accessibility [91] [92].

Microtransit is a technology-enabled transit service that typically uses shuttles or vans to provide on-demand transportation with dynamic routing. While many rides are requested and paid for via smartphone, most services also offer telephone booking options [93]. Some services accept cash payments and street hails (similar to taxis). Variations of microtransit may include fixed routes or schedules, as well as larger or smaller vehicles [93]. Typically, microtransit services are operated by, or provided on behalf of, a government entity or nonprofit organization, although privately operated programs also exist [93]. Microtransit can be effective in low-density areas—such as South San Jose and the southern parts of Santa Clara County—where fixed-route productivity is historically low [94] [95]. However, the long-term performance of microtransit remains an area of active evaluation. Many existing programs have relatively high costs per passenger and low passengers per revenue hour, underscoring the importance of carefully defining use cases, service parameters, and performance thresholds before scaling these services.

At VTA, mobility partnerships (including the use of innovative technologies) should also consider the context of labor agreements, potential workforce displacement concerns, and opportunities to complement—rather than substitute—core unionized transit services.

All three models—ridehailing, AV ridehailing, and microtransit—can serve a variety of use cases depending on local needs and the built environment, including first- and last-mile connections to public transportation; service in suburban, exurban, and other low-density areas; off-peak and late-night service; and transportation for travelers with disabilities, such as paratransit [93]. In general, these service models are most effective in areas where low ridership would make fixed-route transit inefficient or cost-prohibitive [93]. Coordination with TNCs, AV ridehailing, microtransit, and even private employer shuttles can reduce duplicative service, enhance multimodal connectivity, and support access to high-frequency corridors and major investments such as BART Phase II [96] [97].

In the case of paratransit, microtransit may be commingled with paratransit services. Commingled trips refer to shared rides that serve both paratransit and non-paratransit customers within a single service model [93]. Commingling can occur in several variations, including fleets, driver shifts, and trips [93]. Commingled fleets involve sharing vehicles between paratransit and microtransit services [93]. Commingled driver shifts allow operators to work across both services [93].

It is important to remember that the cost of these partnerships can vary widely depending on several operational and contractual factors (e.g., fare and subsidy structure; service area or zone size; urban density; hours of operation; parameters around route deviation, wait times, and vehicle occupancy; whether the transit agency or a service provider provides the drivers and vehicles; etc.). Although not an exhaustive list, common fare and subsidy structures can include: 1) flat per trip subsidy (e.g., if a trip costs $12 and the agency subsidy is $8, the agency pays $8 and rider pays $4); 2) full cost reimbursement (e.g., agency covers the full cost of a ride); 3) cost sharing with a rider co-pay (e.g., the agency and the rider have a percentage split or the rider pays a fixed fare and the agency pays the remainder); and 4) paratransit equivalent fare (e.g., paratransit riders are charged a fare equivalent to a fixed route transit fare for comparable service). Each structure can have different impacts on equity, financial risk, and the predictability of costs (for both the transit agency and riders).

Depending on service design and operational characteristics, mobility partnerships can provide services that are both complementary to and competitive with existing offerings, across a range of cost structures [98]. A pre-pandemic study of the Massachusetts Bay Transportation Authority's (MBTA) on-demand paratransit pilot with ridehailing reduced per trip costs by 85% (a reduction of $59.00 per trip to $9.10 per trip). MBTA concluded that a reduction in more costly ADA paratransit trips more than offset an increase in total trips, yielding a net savings for MBTA [99]. Broadly, mobility partnerships can serve many additional trips with fewer vehicle-hours than an underused fixed routes. However, the cost effectiveness of these partnerships can drop as demand density increases, so fixed route transit can win back cost-efficiency at high ridership densities. To support the responsible implementation of innovative and emerging mobility services, public transit agencies can adopt policies and organizational practices that guide short-term demonstrations and long-term operations. These include establishing data-sharing and cybersecurity requirements; requiring equity and accessibility assessments; and implementing workforce transition and upskilling plans to prepare operators for supervisory or remote-monitoring roles in automated driving systems. VTA could involve partnering with labor representatives to co-develop training programs for operators impacted by service changes, including pathways into dispatch, customer support, or safety oversight roles [100] [101] [102] [103].

To support decision-making, VTA could also develop a standardized evaluation framework applied to all pilots—such as microtransit or on-demand services—with clear performance metrics (e.g., cost per passenger, wait times, equity outcomes, and ridership productivity) and predefined thresholds for scaling, modifying, or sunsetting services. Additionally, to ensure these partnerships advance rather than undermine fiscal stability, public transit agencies should assess their financial performance, including conducting pilot-specific cost-benefit analyses and evaluating subsidy levels relative to fixed-route services within VTA's existing budget constraints.

Measuring the Financial Performance of AVs and Shared Mobility Partnerships

Public transit agencies can evaluate the fiscal performance of AVs and shared mobility partnerships in several ways. Traditional financial metrics include cost per passenger trip, subsidy per trip, and farebox recovery ratio [104] [105] [106]. In VTA's case, these metrics are heavily influenced by labor costs, which represent a significant share of operating expenses and are shaped by collective bargaining agreements, overtime requirements, and workforce availability. Cost per trip is a commonly used metric because it allows comparison with fixed-route bus, rail, and ADA paratransit service [104]. Subsidy per trip (i.e., operating cost minus fare revenue divided by trips) is an important metric when agencies cap public exposure in partnerships with private operators. Other important metrics include passengers per vehicle revenue hour and passengers per vehicle revenue mile, which can indicate how efficiently vehicles are being utilized and whether public funds are being used effectively [104]. Average trip length is also an important metric because longer trips can increase operating time and the amount of public subsidy, particularly in large service areas [104].

Common Metrics for Measuring the Performance of AV and Mobility Partnerships

$$\text{Cost per Passenger Trip} = \frac{\text{Total Operating Cost}}{\text{Unlinked Passenger Trips}}$$

$$\text{Subsidy per Passenger Trip} = \frac{\text{(Operating Cost} - \text{Fare Revenue)}}{\text{Trips}}$$

$$\text{Farebox Recovery Ratio} = \frac{\text{Fare Revenue}}{\text{Operating Cost}}$$

$$\text{Passengers per Vehicle Revenue Hour (PVRH)} = \frac{\text{Trips}}{\text{Revenue Hours}}$$

$$\text{Passengers per Vehicle Revenue Mile (PVRM)} = \frac{\text{Trips}}{\text{Revenue Miles}}$$

$$\text{Cost Per Autonomous Mile (CPAM)} = \frac{\text{Total AV Operating Cost}}{\text{Autonomous Vehicle Miles Traveled (AVMT)}}$$

$$\text{Cost per Safety Driver Hour} = \frac{\text{Total Safety Driver Compensation Cost}}{\text{Total Safety Driver Hours}}$$

$$\text{Insurance Cost Per Trip} = \frac{\text{(Total Insurance Premium + Claims Costs)}}{\text{Total Completed Trips}}$$

$$\text{Insurance Cost Per Trip} = \frac{\left(\frac{C_H}{T_H}\right) - \left(\frac{C_{AV}}{T_{AV}}\right)}{\left(\frac{C_H}{T_H}\right)} \times 100$$

$$\text{Labor Cost Reduction Relative to Human-Driven Service} = \frac{\text{(Human Driver Labor Cost} - \text{AV Labor Cost)}}{\text{Human Driver Labor Cost}}$$

Where

C_H = Total operating cost under the human-driver model
T_H = Total trips under the human-driver model
C_{AV} = Total operating cost under the autonomous model
T_{AV} = Total trips under the autonomous model

Due to the potential for high costs associated with innovative technologies and new or expanded mobility partnerships, public transit agencies should proceed with fiscal prudence. Deploying services that are not cost-effective or financially sustainable over the long term can jeopardize public resources and even harm the very riders these services are intended to serve (e.g., launching a new or expanded service and then taking it away) [107] [108]. Transit agencies should carefully evaluate both the operational and fiscal value of these services to ensure they do not introduce unsustainable financial risks.

A study by the National Academies of Sciences, Engineering, and Medicine examining microtransit and demand-responsive transit services found substantial variability in both productivity and cost performance across systems. Reported ridership ranged from 2.5 to 4.7 passengers per vehicle service hour. Operating costs per vehicle service hour varied widely, from $34.69 to $214.00, while costs per passenger trip ranged from $7.34 to $71.00. These findings underscore the extent to which service design, local context, and operating models influence financial efficiency and ridership outcomes.

With respect to automated vehicle deployments, several additional metrics could be important. Cost per autonomous mile, cost per safety driver hour, insurance cost per trip, and cost reduction compared to equivalent human-driven service are also important metrics. Public transit agencies may also track labor savings associated with the deployment of AVs and evaluate these metrics in the context of overall system reliability and convenience. Reliability (how consistently a service adheres to its schedule) and convenience (service frequency, wait times, ease of transfers, and overall trip duration) directly influence ridership and the perceived value of new services [109] [110]. Strategies that reduce travel time, improve dependability, and enhance convenience can attract more riders, making these operational considerations critical for both financial and ridership outcomes.

Together, these traditional, AV-specific, and service-quality metrics provide a framework for transit agencies to evaluate the fiscal performance, operational effectiveness, and long-term sustainability of innovative transit deployments. While operational performance influences fiscal sustainability, land use and real estate strategy can influence the long-term financial resilience of a transit system.

Land Use, TOD, and Real Estate Strategies

Land Use, Transit Oriented Development, and Station Parking:

Decades of research on TOD consistently show that development intensity, land-use mix, and proximity to transit are key urban development drivers of ridership [8]. A 2004 study by the National Academies emphasized the “4 Ds” of the built environment—density, land-use diversity, design, and distance to transit—as critical factors influencing transit use [72]. The study found that:

- **Density**: Doubling residential or employment density near transit is associated with roughly a 60% increase in transit boardings and supports all-day ridership beyond peak commuting periods.

- **Diversity**: Increasing land-use diversity—through mixed-use development—can increase ridership by 5 to 10% by attracting a mix of residential, commercial, and recreational trips.

- **Design**: Walkable, connected, grid-like street networks can increase transit use by up to 20% while enhancing first- and last- mile accessibility and reducing reliance on private vehicles.

- **Distance to Transit**: People who live close to transit are between five to eight times more likely to use it, citing literature from Washington, D.C., Toronto, and the San Francisco Bay Area. This highlights the importance of proximity and its influence on transit travel patterns.

While these relationships likely still remain, the magnitude of their impacts may have shifted in recent years. Most TOD literature was published prior to the COVID-19 pandemic, before widespread remote and hybrid work reshaped commuting patterns [72] [111] [112] [113]. Additionally, competition from emerging mobility services—such as TNCs and AV ridehailing—may temper the effects traditionally associated with density, land-use mix, walkability, and proximity to transit. As a result, the elasticity of ridership with respect to the "4 Ds" may be lower today than earlier studies suggest, underscoring the need for updated research that reflects post-pandemic travel behavior [114] [115]. Land use policy levers—such as upzoning near transit, streamlined developer approvals, and value-capture mechanisms—can further enhance ridership and revenue. These strategies concentrate development where transit access is highest and capture land-value increases to support station area and corridor investments.

Several studies have also compared adding TOD density versus adding park-and-ride capacity near rail stations [116] [117] [118]. These studies have found that on a per-square-foot basis, residential and office developments typically produce fewer transit riders than an equivalent area devoted to park-and-ride; however, high-rise residential or office projects could surpass park-and-ride in ridership generation, provided there is sufficient demand to support such high-density development [116] [117]. This suggests that the Bay Area may not be building intensely enough around its stations to fully capture transit ridership benefits, especially given changing work and travel patterns.

Residential TOD may be underperforming in terms of transit ridership due to the increase in remote and flexible work since the COVID-19 pandemic, highlighting the importance of integrating equitable and inclusive development strategies—such as workforce and affordable housing, diverse land uses, and social equity considerations—to ensure TOD benefits are broadly shared and continue to support ridership recovery [119]. Well-planned TOD not only has the potential to support ridership but can also generate long-term economic benefits (e.g., rising land values, developer fees, and other revenue opportunities) for transit agencies, reinforcing the importance of integrating land-use planning with a transit real estate strategy. More broadly, public transit investment can generate wider economic benefits through job creation, increased business productivity, and enhanced regional competitiveness, further strengthening the case for aligning transportation and land-use decisions [120].

Real Estate Strategies:

Public transit in the San Francisco Bay Area is at a critical crossroads. Rising operating costs and reduced post-pandemic revenue have left farebox revenue and traditional public subsidies insufficient to sustain today's service levels—let alone expand them. To address mounting fiscal pressures while supporting TOD goals, the Bay Area's transit agencies may need to pursue proactive strategies that combine land-use planning with revenue generation. One potential strategy is to build, leverage, and actively manage a diversified real estate portfolio that generates ongoing, reliable income while reinforcing transit-enabling development [121].

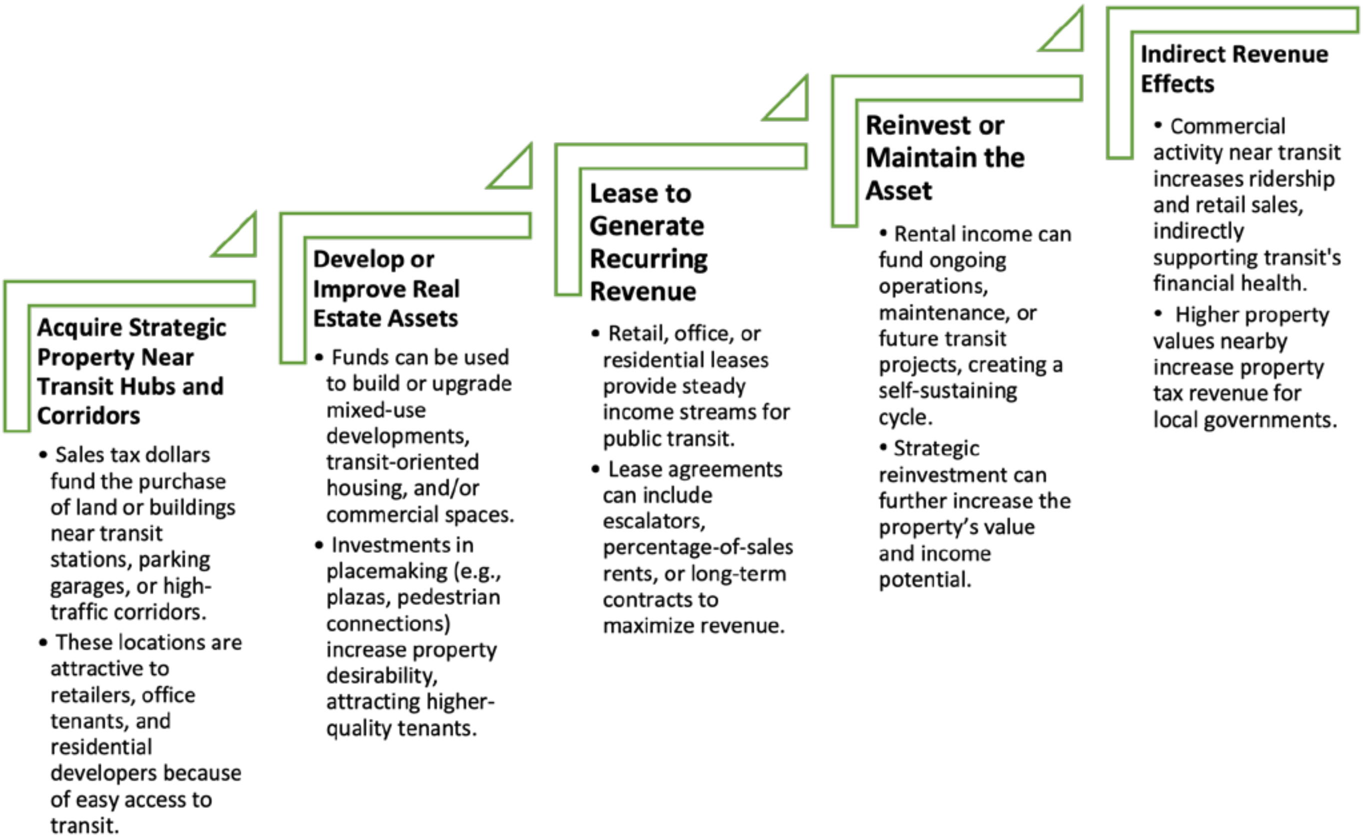
Internationally, transit operators have shown that property along public transportation corridors can serve as a stable and diversified revenue source capable of sustaining transit over the long term. Today, in Hong Kong, MTR Corporation uses a “Rail plus Property” model in which high-density residential and commercial projects are developed atop or adjacent to stations [122]. By capturing the increased land value, MTR funds, builds, and operates new rail lines without direct government subsidy [122]. MTR’s strategy focuses on securing development rights before rail construction, then partnering with private developers to build residential, retail, and office projects [122]. In turn, MTR receives a share of the developers’ profits. In 2024, MTR reported a net profit of about $2B (HK$15.8 billion) [123]. This model demonstrates how transit agencies can align land-use planning with financial sustainability while promoting dense, walkable station areas.

The concept has deep roots in U.S. transit history. Early streetcar operators frequently developed land surrounding new lines, using real estate sales to subsidize system expansion while increasing property values along the routes—one of the earliest examples of transit-oriented development in the United States [124] [125] [126] [127] [128]. Where the model fell short was in short-term speculation: developers typically sold properties rather than holding them for long-term revenue. Federal Transit Administration Joint Development rules (Circular 7050.1C) are generally supportive of revenue generation for public transportation, such as income derived from rental or lease payments [129]. A transit operator that engages in large-scale, professional property management—with the goal of generating long-term income—could achieve far greater fiscal stability, allowing revenue to be reinvested into future system expansion. (Figure 1) [130].

Examples of Public Transit Real Estate Revenue Opportunities

- TOD Ground Leases
- Retail Leasing in Stations and Mobility Hubs
- Parking Redevelopment
- Telecom, Fiber, and Utility Leases
- Energy Leases (e.g., rooftop solar, battery storage, and microgrid leases)
- Advertising
- Value Capture

Figure 1. How Public Transit Investments in Real Estate Generates Ongoing Revenue



Using financing and leverage, a relatively small public investment can attract much larger private capital. For example, a $10 million investment could help fund $40 million or more in development. With capitalization rates (cap rates) typically ranging from 5–7% for commercial properties [131]:

Net Operating Income=Cap Rate x Property Value

A $40 million project with a 5–7% cap rate could yield $2.0–2.8 million annually. Over 20–30 years, this single investment could far exceed the original $10 million outlay, all while enhancing the transit corridor. As noted earlier, the proposed sales tax measure is projected to generate $264 million annually for VTA, or an estimated $3.7 billion over 14 years [1]. Scaling this across the full $3.7 billion investment (assuming a 75% debt-to-capital ratio) could produce a $14.8 billion real estate portfolio generating $740 million to $1.04 billion annually—exceeding VTA's projected 2026–27 operating budget of $610 million [132]. This demonstrates the potential for intergenerational institutional wealth and long-term financial independence from taxpayer subsidies.

Beyond financial sustainability, this approach offers additional benefits, such as: funding new multifamily housing, supporting workforce housing for transit employees, and promoting densification and mixed-use development to increase ridership. In summary, transit agencies can leverage real estate strategically—not only to secure fiscal independence, but also to shape land use, catalyze station-area and transit corridor development, and enhance the resiliency of the transit system.

Given the scale of potential sales tax revenues and the breadth of strategic options available, assessing the fiscal performance of investments and expenditures are essential.

Measuring Performance and Sales Tax Return on Investment

Transportation sales tax measures are most successful when public agencies can demonstrate that revenue translates into measurable outcomes and taxpayer ROI. All Bay Area transportation agencies anticipating revenue from a proposed sales tax measure should consider adopting performance governance that connects operating metrics, capital investments, and taxpayer ROI into a single accountability framework or scorecard.

This framework or scorecard could answer the most pressing transit policy questions:

1. Is VTA operating with fiscal discipline and long-term sustainability?

2. Are the sales tax expenditures making transit faster and more reliable?

3. Are innovations and land use strategies funded by the sales tax measure generating measurable financial and ridership returns?

4. Are the sales tax expenditures growing ridership and expanding access to opportunity?

5. Are investments equitably distributed and improving mobility for underserved communities?

This scorecard could integrate traditional public transportation performance measures (e.g., cost per trip, on-time performance, riders per revenue hour) with sales tax–specific ROI metrics (e.g., travel-time savings per dollar invested, private capital leverage ratios, cost per new rider gained). Additionally, this scorecard could lay the foundation for evaluating technology innovations, service demonstrations, and mobility partnerships. This approach helps ensure that sales tax revenues are not only spent, but invested. Table 2 provides an example of the types of policy objectives, core transit metrics, and sales tax ROI metrics that could be included in a performance and ROI scorecard. Translating these core metrics and sales tax ROI measures into action requires deliberate policy direction and prioritization by VTA staff and the Board.

Table 2. Example Performance and ROI Scorecard

Policy Area	Policy Objective	Core Metrics	Sales Tax ROI Measures	Purpose
Financial Sustainability	Ensure fiscal prudence and cost effectiveness [133] [134]	• Operating cost per trip • Subsidy per trip • Farebox recovery ratio • Passengers per revenue hour	• Cost per trip trend vs. baseline year • Operating cost savings from speed improvements • Lifecycle cost analysis for major projects	Protects against unsustainable expansion and ties innovation to measurable fiscal discipline.
Ridership & Access	Expand access to opportunity and grow ridership [133] [134] [6] [135]	• Riders per revenue hour • Riders per revenue mile • % of residents within ½ mile of frequent service • Jobs reachable within 45 minutes on VTA service	• Ridership growth attributable to sales tax-funded service • Cost per new rider gained • Additional revenue hours per $1M invested	Prioritizes high-impact service expansion and ensures new funding produces measurable ridership growth.
Reliability & Travel Time	Make public transit faster and more dependable [136]	• On-time performance • Excess wait time • Travel time variability • Missed connection rate	• Corridor travel-time savings per $1M invested • Annual rider hours saved (e.g., monetized using USDOT value-of-time) • Reduction in excess wait time attributable to sales tax investments	Demonstrates that TSP, bus lanes, and corridor upgrades produce measurable, monetizable benefits.
Innovation & Land Use Performance	Align technologies and land use strategies with long-term resilience [137]	• Cost per trip vs. equivalent fixed-route • New housing units within ½ mile of a transit station or corridor • Ground lease revenue growth	• Private capital leveraged per public dollar • Real estate return on investment (ROI) • Value capture revenue generated • Cost reduction versus human-driven baseline (for AV deployments)	Ensures demonstrations scale only if productive and links TOD/real estate strategies to long-term fiscal independence.
Equity & Accessibility	Improve mobility in underserved communities [138]	• % of low-income households near frequent service • ADA on-time performance • Fare burden as % of income	• % of sales tax funds invested in equity priority areas • Travel-time reduction in priority corridors • Fare burden reduction attributable to sales tax investments	Reinforces accountability, fairness, transparency, and social equity.

Recommendations & Path Forward for the VTA Board

The following strategic considerations synthesize the key themes emerging from existing research and VTA's long-term policy goals. These considerations are intended to help VTA evaluate where targeted investments, partnerships, and policy direction can have the greatest impact on ridership, reliability, financial sustainability, and customer experience. As shown in Table 3: Strategic Considerations Summary, each consideration is organized into three components: 1) Consideration Area, summarizing the strategic topic; 2) Rationale, describing the underlying need or evidence supporting its relevance; and 3) Potential Agency Actions, offering non-directive examples of how the Board and staff may choose to advance or explore each area. The alignment of these considerations with established industry practice further underscores their relevance as a practical framework for guiding VTA's near- and long-term decision-making. Rather than being prescriptive, this table is designed to support informed deliberation as VTA evaluates policy options and sales tax investment priorities in the future.

These considerations provide an approach for assessing future service improvements, regional coordination efforts, technology deployments, and land-use strategies. They also help ensure that upcoming decisions—including those related to the 2026 regional transportation measure—are grounded in clear strategic intent and aligned with VTA's broader mission to deliver reliable, accessible, and financially resilient public transportation. While many of these considerations reflect established best practices already understood by VTA, their value lies in providing a structured, decision-oriented framework (see Tables 1 and 2) that can help the agency operationalize these concepts within its existing governance and organizational constraints. The framework is intended not to introduce new ideas, but to support prioritization in implementation.

Table 3. Summary of Strategic Considerations

Consideration Area	Rationale	Potential Agency Actions
Prioritize Reliability and Travel-Time Improvements	Given that reliability and speed are the strongest predictors of transit ridership, VTA may consider policies and investments that improve route/corridor performance.	• Consider investments in transit signal priority, bus lanes, queue jumps, stop optimization—on high-ridership corridors. • Improve frequencies where demand potential is highest to improve network competitiveness.
Assess Opportunities to Expand Off-Peak, Early-Morning, and Late-Night Service	Hybrid work, shift work, and other changes have diversified travel demand beyond the traditional commute peaks.	• Evaluate where early-morning, late-night, and weekend service extensions would most improve access to jobs and essential services. • Test targeted mobility partnerships (microtransit, ridehailing, guaranteed-ride-home) to address low-density or after-hours gaps.
Advance Multimodal Integration and Simplified Fare Systems	Reducing friction in transfers across modes can increase transit use.	• Work with regional partners to accelerate fare integration, fare capping, and other initiatives. • Support coordinated service planning with adjacent operators (e.g., Caltrain, BART, ACE) to reduce wait times and missed connections.
Use Traveler Segmentation and Targeted Incentives to Strengthen Ridership	Understanding rider subgroups can support more effective service planning, pricing, and outreach.	• Develop a segmentation framework (e.g., shift workers, students, older adults, occasional riders, low-income riders) to tailor incentives and communications. • Leverage data from Clipper and VTA's app to personalize service alerts, promotions, and fare products. • Expand youth, low-income, and institutional fare programs shown to encourage long-term ridership.
Address Workforce and Labor Sustainability	Ongoing operator shortages, workforce availability constraints, and labor agreements directly influence VTA's ability to deliver reliable, frequent, and cost-effective service. Without addressing these factors, planned service improvements may not be operationally or fiscally feasible.	• Advance recruitment, retention, and training programs to stabilize the workforce, while recognizing opportunities for new service models and technological innovation. • Explore workforce modernization strategies, including career pathways, job quality improvements, and integration of new technologies that support—not replace—the existing workforce.
Advance Transit-Supportive Development and Real Estate Investments	Land use and real estate offer long-term benefits for ridership, fiscal stability, and community development.	• Strengthen TOD policies and encourage walkable, mixed-use density near stations and high-frequency corridors. • Update VTA's real estate and joint development strategy to generate recurring revenue and support station-area revitalization. • Prioritize station access improvements (e.g., ADA pathways, lighting, shelters, bike and pedestrian connections) in partnership with local jurisdictions.

Use Innovation and Automation Strategically to Enhance Core Service	Emerging technologies can improve safety, efficiency, and customer experience when deployed with clear guardrails.	• Invest in predictive operations management tools (connection protection, dynamic dispatching, real-time crowding). • Consider the introduction of automated shuttles and AV ridehailing partnerships in well-defined use cases where they complement fixed-route service.
Align Sales Tax Measure Investments with High-Impact Priorities	The sales tax measure provides a unique opportunity to stabilize finances and modernize the network.	• Focus the expenditure plan on evidence-based strategies with strong ridership and reliability impacts. • Prioritize expenditures that will yield high fiscal ROI, cost reductions, and revenue growth. • Balance funding between capital improvements and operating resources needed to sustain higher frequencies and expanded hours.

References

[1] Metropolitan Transportation Commission, "MTC Summary of Senate Bill 63: Public Transit Revenue Measure," 12 September 2025. [Online]. Available: https://mtc.ca.gov/sites/default/files/meetings/attachments/6408/6aiv_Handout_SB_63_Overview_0.pdf?cb=1090875c. [Accessed 1 February 2026].

[2] S. Wiener, "San Francisco Bay Area: local revenue measure: public transit funding.," Legislative Counsel's Digest, 13 October 2025. [Online]. Available: https://legiscan.com/CA/text/SB63/2025. [Accessed 26 February 2026].

[3] Metropolitan Transportation Commission, "Draft Transit 2050+: A New Vision for the Bay Area's Transit Network," Metropolitan Transportation Commission, San Francisco, 2025.

[4] S. Pulugurtha, R. Mishra and S. Jayanthi, "Does Transit Service Reliability Influence Ridership?," Mineta Transportation Institute, San Jose, 2022.

[5] S. Berrebi, S. Joshi and K. Watkins, "On bus ridership and frequency," Transportation Research Part A: Policy and Practice, vol. 148, pp. 140-154, 2021.

[6] B. Taylor and C. Fink, "Explaining transit ridership: What has the evidence shown?," Transportation Letters: The International Journal of Transportation Research, vol. 5, no. 1, pp. 15-26, 2013.

[7] TransitCenter, "Who's On Board 2016: What Today's Riders Teach Us About Transit That Works," TransitCenter, Washington DC, 2016.

[8] Santa Clara County Valley Transportation Authority, "Transit Service Guidelines," Santa Clara County Valley Transportation Authority, San Jose, 2023.

[9] E. Guerra, H. Qiao, X. Zhao, and Q. Si, "Transit dependents, choice riders, and service criticality: an analysis of the determinants of bus ridership in the Philadelphia Region," Carnegie Mellon University, Pittsburgh, 2023.

[10] Santa Clara County Valley Transportation Authority, "Valley Transportation Authority Board Memorandum - Visionary Transit Network," Santa Clara County Valley Transportation Authority, San Jose, 2023.

[11] O. Stewart, A. Vernez Moudon and B. Saelens, "The Causal Effect of Bus Rapid Transit on Changes in Transit Ridership," Journal of Public Transportation, vol. 20, no. 1, pp. 91-103, 2017.

[12] National Academies of Sciences, Engineering, and Medicine, "Bus Rapid Transit Practitioner's Guide," National Academies of Sciences, Engineering, and Medicine, Washington DC, 2007.

[13] N. Rennalls, “Investing in transit signal priority can boost bus ridership in the U.S.,” Mass Transit, 22 September 2021.

[14] M. Tsai, “Targeted rights-of-way could boost transit reliability,” University of Minnesota Center for Transportation Studies, 18 June 2025. [Online]. Available: https://www.cts.umn.edu/news-pubs/news/2025/june/transit. [Accessed 1 February 2026].

[15] E. Al-Hyasat and T. Alhadidi, “Evaluating the performance of implementing regionally coordinating bus priority signals under different control schemes,” Computational Urban Science, vol. 4, no. 22, 2024.

[16] Federal Transit Administration, “Bus Rapid Transit: Elements, Performance, Benefits,” U.S. Department of Transportation, Washington DC.

[17] Y. Fan, A. Guthrie and D. Levinson, “Waiting time perceptions at transit stops and stations: Effects of basic amenities, gender, and security,” Transportation Research Part A: Policy and Practice, vol. 88, pp. 251-264, 2016.

[18] X. Shi , A. Vernez Moudon, P. Hurvitz, S. Mooney , C. Zhou and B. Saelens, “Does improving stop amenities help increase Bus Rapid Transit ridership? Findings based on a quasi-experiment,” Transportation Research Interdisciplinary Perspectives, vol. 10, 2021.

[19] V. Ceccato, C. Sundling and G. Gliori , “Making Stations Inclusive and Safer,” in Transit Safety for a Sustainable City, New York City, Springer, 2025, pp. 203-218.

[20] Federal Highway Administration, “Chapter 3: Actions to Increase the Safety of Pedestrians Accessing Transit,” in Pedestrian & Bicyclist Safety, Washington DC, U.S. Department of Transportation, 2025.

[21] P. Merrick, “How using amenities when designing stops can enhance the transit experience and bring community value,” Mass Transit, 16 December 2025.

[22] L. Liu, J. Lee and H. Miller, “Evaluating accessibility benefits and ridership of bike-transit integration through a social equity lens,” Computers, Environment and Urban Systems, vol. 112, 2024.

[23] C. Cui and Y. Zhang, “Integration of Shared Micromobility into Public Transit: A Systematic Literature Review with Grey Literature,” Sustainability, vol. 16, no. 9, 2024.

[24] N. Sharaby and Y. Shiftan, “The impact of fare integration on travel behavior and transit ridership,” Transport Policy, vol. 21, pp. 63-70, 2012.

[25] A. Levin, “New regional fare integration study shows major benefits,” Seamless Bay Area, 19 September 2021. [Online]. Available: https://www.seamlessbayarea.org/blog/2021/9/19/new-regional-fare-integration-study-shows-major-benefits. [Accessed 1 February 2026].

[26] S. Owusu-Agyemang, R. Simons, M. Henning and M. Marshall, “Transit made Easy: Examining the adoption and impact of mobile fare payment technology among bus riders,” Transportation Research Interdisciplinary Perspectives, vol. 25, 2024.

[27] I. Alhassan, B. Matthews, J. Toner and Y. Susilo, “Public transport users’ willingness-to-pay for a multi-county and multi-operator integrated ticket: Valuation and policy implications,” Research in Transportation Business & Management, vol. 45, no. Part C, 2022.

[28] “Clipper® BayPass Makes Case for Fare Coordination,” Metropolitan Transportation Commission, 7 July 2023. [Online]. Available: https://mtc.ca.gov/news/clipperr-baypass-makes-case-fare-coordination. [Accessed 1 February 2026].

[29] S. Pike, M. D’Agostino and K. Flynn, “Un- and Underbanked Transit Passengers and the California Integrated Travel Project,” University of California, Davis, Davis, 2022.

[30] S. Pike, “Seamless and Integrated Transit,” California Air Resources Board, Sacramento, 2025.

[31] V. Kori, S. Srikanth and S. Dey, “Evaluating multimodal integration of metro and feeder bus services in Bengaluru using integrated analytical and perception based methods,” Multimodal Transportation, vol. 5, no. 2, 2026.

[32] M. Hadi Almasi, A. Sadollah, Y. Oh, D.-K. Kim, S. Kang and ‘, “Optimal Coordination Strategy for an Integrated Multimodal Transit Feeder Network Design Considering Multiple Objectives,” Sustainability, vol. 10, no. 3, 2018.

[33] Caltrans, “Caltrans Bay Area Transit Plan,” Caltrans, Oakland, 2025.

[34] L. Abu Ashour, Q. Shen, A. Moudon, M. Cai, Y. Wang and M. Brown, “Post-pandemic transit commute: Lessons from focus group discussions on the experience of essential workers during COVID-19,” Journal of Transport Geography, vol. 116, 2024.

[35] J. Siqveland, “Examining off-peak transit behaviors to improve transit equity,” University of Minnesota Center for Transportation Studies, 19 February 2025. [Online]. Available: https://www.cts.umn.edu/news-pubs/news/2025/february/transit-equity. [Accessed 1 February 2026].

[36] M. Palm, J. Allen and S. Farber, “Shifted out: The well-being and justice implications of evening and night commuting,” Transportation Research Part D: Transport and Environment, vol. 122, 2023.

[37] American Public Transportation Association, “Supporting Late-Shift Workers: Their Transportation Needs and the Economy,” American Public Transportation Association, Washington DC, 2019.

[38] National Academies of Sciences, Engineering, and Medicine, “Planning and Operations Initiatives to Support Nighttime Transit Ridership,” National Academies of Sciences, Engineering, and Medicine, Washington DC, 2025.

[39] L. Ecola and M. Grant, "Impacts of Transit Benefits Programs on Transit Agency Ridership, Revenues, and Costs," Journal of Public Transportation, vol. 11, no. 2, pp. 1-18, 2008.

[40] P. C. Bueno, J. Gomez, J. Peters and J. M. Vassallo, "Understanding the effects of transit benefits on employees' travel behavior: Evidence from the New York-New Jersey region," Transportation Research Part A: Policy and Practice, vol. 99, pp. 1-13, 2017.

[41] National Academies of Sciences, Engineering, and Medicine, "A Guidebook for Marketing Transit Services to Business," National Academies of Sciences, Engineering, and Medicine, Washington DC, 1999.

[42] Southern California Association of Governments, "TDM Toolbox of Strategies," Southern California Association of Governments, Los Angeles, 2024.

[43] N. Labib Georggi, P. Winters, S. Rai and L. Zhou, "Measuring the Impacts of Employer-based Transportation Demand Management Programs on an Interstate Corridor," Journal of Public Transportation, vol. 10, no. 4, pp. 51-77, 2007.

[44] J. Brown, D. B. Hess and D. Shoup, "Fare-Free Public Transit at Universities: An Evaluation," Journal of Planning Education and Research, vol. 23, no. 1, pp. 69-82, 2003.

[45] K. Clifton and S. Handy, "Qualitative Methods in Travel Behaviour Research," in International Conference on Transport Survey Quality and Innovation, Kruger National Park, 2001.

[46] A. Weinstein Agrawal, A. Loukaitou-Sideris, C. Tortora and Y. Hu, "Crime and Harassment on Public Transportation: A Survey of SJSU Students Set in International Context," Mineta Transportation Institute, San Jose, 2020.

[47] J.-D. Saphores, "A Review of Reduced and Free Transit Fare Programs in California," University of California, Irvine, Irvine, 2020.

[48] R. Vieira, R. Pereira, L. Emanuel and P. Jorge Alves, "The effects of fare-free transit on the travel behavior of older adults," Journal of Environmental Economics and Management, 2025.

[49] W. Caron, "New report: Statewide "Keiki Ride Free" transit program would improve access, equity, and opportunity for Hawai'i's youth," Hawaii Appleseed, 18 February 2026. [Online]. Available: https://hiappleseed.org/press-releases/statewide-keiki-ride-free-transit-program-improve-access-equity-opportunity-hawaii-youth. [Accessed 18 February 2026].

[50] J. Zhao, M. Arcaya, J. Steil and C. Zegras, "How Low-income Transit Riders in Boston Respond to Discounted Fares: A Randomized Controlled Evaluation," Massachusetts Institute of Technology, Cambridge, 2019.

[51] American Public Transportation Association, "Policy Brief: Transit Savings Grow as Auto Costs and Gas Prices Increase," American Public Transportation Association, Washington DC, 2023.

[52] San Mateo County Transit District, “Mobility Plan for Older Adults and People with Disabilities,” San Mateo County, San Mateo, 2018.

[53] D. van Lierop and A. El-Geneidy, “A New Market Segmentation Approach: Evidence from Two Canadian Cities,” Journal of Public Transportation, vol. 20, no. 1, pp. 20-43, 2017.

[54] Y. Shiftan, M. Outwater and Y. Zhou, “Transit market research using structural equation modeling and attitudinal market segmentation,” Transport Policy, vol. 15, no. 3, pp. 186-195, 2008.

[55] A. Hamre, J. Fisher and D. Kack, “Travel Behavior and Transportation Planning Insights from the Small Urban Area of Chittenden County, Vermont: An Application of Traveler Segmentation,” Western Transportation Institute, Bozeman, 2020.

[56] National Academies of Sciences, Engineering, and Medicine, “A Handbook: Using Market Segmentation to Increase Transit Ridership,” National Academies of Sciences, Engineering, and Medicine, Washington DC, 1998.

[57] T. Teichert, E. Shehu and I. von Wartburg, “Customer segmentation revisited: The case of the airline industry,” Transportation Research Part A: Policy and Practice, vol. 42, no. 1, pp. 227-242, 2008.

[58] Y. Long and P. Belobaba, “Airline revenue management with segmented continuous pricing: methods and competitive effects,” Journal of Revenue and Pricing Management, vol. 23, pp. 14-27, 2024.

[59] S. Ozturk Usun, S. Akin Bas, B. Meniz and B. Ahlatcioglu Ozkok, “Passenger satisfaction assessment in the aviation industry using Type-2 fuzzy TOPSIS,” Journal of Air Transport Management, vol. 119, p. 119, 2024.

[60] Southern California Association of Governments, “Transportation Demand Management Strategic Plan and Final Report,” Southern California Association of Governments, Los Angeles, 2019.

[61] J. Brey, “Fare-Capping Policies May Increase Transit Ridership,” Governing, 7 November 2023.

[62] Z. Ma and H. Koutsopoulos, “Optimal design of promotion based demand management strategies in urban rail systems,” Transportation Research Part C: Emerging Technologies, pp. 155-173, December 2019.

[63] S. Hulse, “Innovative Ways Transit Agencies Use Data to Improve the Rider Experience,” Transit Tomorrow, 5 May 2025. [Online]. Available: https://transittomorrow.com/innovative-ways-transit-agencies-use-data/. [Accessed 2 February 2026].

[64] O. Mercer, “United Airlines Launches Major Upgrade to Ease Connecting Flights,” Visa Verge, 26 June 2025. [Online]. Available: https://www.visaverge.com/news/united-airlines-launches-major-upgrade-to-ease-connecting-flights/. [Accessed 2 February 2026].

[65] National Academies of Sciences, Engineering, and Medicine, “Linking Transit Agencies and Land Use Decision Making: Guidebook for Transit Agencies,” National Academies of Sciences, Engineering, and Medicine, Washington DC, 2015.

[66] National Academies of Sciences, Engineering, and Medicine, “Effects of TOD on Housing, Parking, and Travel,” National Academies of Sciences, Engineering, and Medicine, Washington DC, 2008.

[67] R. Huang, A. Moudon, C. Zhou, O. Stewart and B. Saelens, “Light rail leads to more walking around station areas,” Journal of Transport & Health, vol. 6, pp. 201-208, 2017.

[68] K. Park, R. Ewing, B. Scheer and G. Tian, “The impacts of built environment characteristics of rail station areas on household travel behavior,” Cities, vol. 74, pp. 277-283, 2018.

[69] B. Bobbitt , “Imagine 2050 - Transit Design and Performance Guidelines,” Metropolitan Council, Saint Paul.

[70] A. Ibraeva, G. H. de Almeida Correia, C. Silva and A. Pais Antunes, “Transit-oriented development: A review of research achievements and challenges,” Transportation Research Part A Policy and Practice, vol. 132, no. 11, pp. 120-130, 2019.

[71] N. Rizzo, “Measuring the Promise of Transit-Oriented Development: A Proposed Methodology for BART,” TransForm, Oakland.

[72] National Academies of Sciences, Engineering, and Medicine, “Transit-Oriented Development in the United States: Experiences, Challenges, and Prospects,” National Academies of Sciences, Engineering, and Medicine, Washington DC, 2004.

[73] U.S. Department of Transportation, “ITS for Bus Rapid Transit (BRT) - Transit Signal Priority (TSP),” ITS Joint Programs Office, December 2025. [Online]. Available: https://www.itskrs.its.dot.gov/briefings/executive-briefing/its-bus-rapid-transit-brt-transit-signal-priority-tsp. [Accessed 1 February 2026].

[74] K. Wu and S. I. Guler, “Estimating the impacts of transit signal priority on intersection operations: A moving bottleneck approach,” Transportation Research Part C: Emerging Technologies, vol. 105, pp. 346-358, 2019.

[75] Washington State Department of Transportation, “Transit signal priority,” Washington State Department of Transportation, [Online]. Available: https://tsmowa.org/category/intelligent-transportation-systems/transit-signal-priority. [Accessed 1 February 2026].

[76] C. Liu, M. Zlatkovic, R. Porter, K. Fayyaz and S. Yu, “Augmenting bus rapid transit with GPS-based transit signal priority strategies can reduce transit time by almost 10 percent with minimal non-transit impact.,” ITS Joint Programs Office, 21 February 2019. [Online]. Available: https://www.itskrs.its.dot.gov/2019-b01347. [Accessed 1 February 2026].

[77] M. S. Ali , J. Kodi, P. Alluri and T. Sando, “Exploring the operational benefits of transit signal priority: A microsimulation-based analysis,” International Journal of Transportation Science and Technology, vol. 12, no. 4, pp. 1080-1092, 2023.

[78] J. Flynn, “Bus Rapid Transit in the United States,” TR News, pp. 16-21, June 2016.

[79] U.S. Department of Transportation, “Use Case: Transit Signal Priority Benefit-Cost Analysis,” U.S. Department of Transportation, No Date. [Online]. Available: file:///C:/Users/apcoh/Downloads/dot_65729_DS1.pdf. [Accessed 28 March 2026].

[80] National Association of City Transportation Officials, “Dedicated Curbside/Offset Bus Lanes,” National Association of City Transportation Officials, [Online]. Available: https://nacto.org/publication/urban-street-design-guide/street-design-elements/transit-streets/dedicated-curbside-offset-bus-lanes/. [Accessed 1 February 2026].

[81] SAE International, “J3016 - Levels of Driving Automation,” SAE International, Warrendale, 2021.

[82] Federal Transit Administration, “Strategic Transit Automation Research Plan,” U.S. Department of Transportation, Washington DC, 2018.

[83] Federal Transit Administration, “Determining Requirements for Automated Transit Bus Test Facilities: Considerations for Practitioners,” U.S. Department of Transportation, Washington DC, 2019.

[84] National Academies of Sciences, Engineering, and Medicine, “Current Practices in the Use of Onboard Technologies to Avoid Transit Bus Incidents and Accidents,” National Academies of Sciences, Engineering, and Medicine, Washington DC, 2020.

[85] S. Fox and N. Martelaro, “Co-Designing Safety-Enhancing ADAS with Transit,” Carnegie Mellon University, Pittsburgh, 2024.

[86] Kansas City Area Transportation Authority, “KCATA Receives $600K Innovation Grant for Precision Guidance Sensors,” Kansas City Area Transportation Authority, 31 August 2020. [Online]. Available: https://www.kcata.org/news/innovation-grant-for-precision-guidance-sensors. [Accessed 1 February 2026].

[87] Federal Transit Administration, “FTA-Managed Transit Bus Automation Demonstration Projects,” Federal Transit Administration, 7 August 2024. [Online]. Available: https://www.transit.dot.gov/research-innovation/fta-managed-transit-bus-automation-demonstration-projects. [Accessed 1 February 2026].

[88] Federal Transit Administration , “Transit Bus Automation Quarterly Update,” Federal Transit Administration , Q2 2024. [Online]. Available: https://www.transit.dot.gov/sites/fta.dot.gov/files/2024-08/Transit-Bus-Automation-Quarterly-Update-Q2-2024.pdf. [Accessed 1 February 2026].

[89] D. Begley, “Warranty issues’ slow on-street tests of Metro autonomous shuttle at TSU and University of Houston,” Houston Chronicle, 20 February 2024. [Online]. Available: https://www.houstonchronicle.com/news/houston-texas/transportation/article/houston-metro-autonomous-shuttle-delayed-18678017.php. [Accessed 1 February 2026].

[90] S. Shaheen, A. Cohen, J. Broader, R. Davis, L. Brown, R. Neelakantan and D. Gopalakrishna, “Mobility on Demand Planning and Implementation: Current Practices, Innovations, and Emerging Mobility Futures,” U.S. Department of Transportation, Washington DC, 2020.

[91] National Association of City Transportation Officials, “Blueprint for Autonomous Urbanisn, 2nd Edition,” National Association of City Transportation Officials, Washington DC, 2019.

[92] National Academies of Sciences, Engineering, and Medicine, “Partnerships Between Transit Agencies and Transportation Network Companies (TNCs),” National Academies of Sciences, Engineering, and Medicine, Washington DC, 2019.

[93] S. Shaheen, A. Cohen, B. Wolfe and E. Martin, “Communities Are Experimenting with Microtransit to Fill Critical Gaps in Public Transit Service – What Have We Learned so Far?,” University of California Institute of Transportation Studies, Berkeley, 2024.

[94] J. Niles and J. Pogodzinski, “Steps to Supplement Park-and-Ride Public Transit Access with Ride-and-Ride Shuttles,” Mineta Transportation Institute, San Jose, 2021.

[95] Z. Hilton, “Letter: Caltrain numbers don’t justify added VTA expenditures,” Gilroy Dispatch, 13 August 2025.

[96] National Academies of Sciences, Engineering, and Medicine, “Redesigning Transit Networks for the New Mobility Future,” National Academies of Sciences, Engineering, and Medicine, Washington DC, 2021.

[97] Valley Transportation Authority, “VTA’s BART Silicon Valley Phase II,” Valley Transportation Authority, [Online]. Available: https://www.vta.org/projects/bart-sv/phase-ii. [Accessed 2 February 2026].

[98] J. Schweiterman, M. Livingston and S. Van Der Slot, “Partners in Transit: A Review of Partnerships between Transportation Network Companies and Public Agencies in the United States,” DePaul University, Chicago, 2019.

[99] S. Feigon, G.-w. Torng, B. Schutzman, J. Auten and B. Graves, “Shared Mobility for People with Disabilities –Challenges & Opportunities for Paratransit,” Shared-Use Mobility Center, Chicago, 2017.

[100] S. Shaheen, A. Cohen, J. Broader and S. Hoban, “Shared Automated Vehicle Toolkit: Policies and Planning Considerations for Implementation,” National Academies of Sciences, Engineering, and Medicine, Washington DC, 2022.

[101] San Francisco County Transportation Authority, “Emerging Mobility Guiding Principles,” San Francisco County Transportation Authority, 2019. [Online]. Available: https://www.sfcta.org/policies/emerging-mobility. [Accessed 1 February 2026].

[102] S. Fatima, C. H. Lee and A. Dannenberg, “Equity issues associated with the widespread implementation of autonomous vehicles,” Oxford Open Infrastructure and Health, vol. 2, 2024.

[103] National Cooperative Highway Research Program, “Preparing for Automated Vehicles and Shared Mobility: Models for Data Sharing and Governance for Automated Vehicles and Shared Mobility,” National Academies of Sciences, Engineering, and Medicine, Washington DC, 2020.

[104] National Academies of Sciences, Engineering, and Medicine, “Sharing the Costs of Human Services Transportation,” National Academies of Sciences, Engineering, and Medicine, Washington DC, 2011.

[105] National Acadeies of Sciences, Engineering, and Medicine, “Microtransit or General Public-Response Transit Services: State of the Practice,” National Acadeies of Sciences, Engineering, and Medicine, Washington DC, 2019.

[106] National Academies of Engineering, Sciences, and Medicine, “Provision of Alternative Services by Transit Agencies: The Intersection of Regulation and Program,” National Academies of Engineering, Sciences, and Medicine, Washington DC, 2023.

[107] “Finding a route to fiscal stability for US transit agencies,” McKinsey & Company, 19 December 2024. [Online]. Available: https://www.mckinsey.com/industries/infrastructure/our-insights/finding-a-route-to-fiscal-stability-for-us-transit-agencies. [Accessed 1 February 2026].

[108] M. Joffe and A. Joshi, “The Cost of Transit in California,” California Policy Center, Tustin.

[109] S. Pulugurtha, R. Mishra and S. Jayanthi, “Does Transit Service Reliability Influence Ridership?,” Mineta Transportation Institute, San Jose, 2022.

[110] V. Perk, J. Flynn and J. Volinski, “Transit Ridership, Reliability, and Retention,” University of South Florida, Tampa, 2008.

[111] TransLink, “Transit-Oriented Communities,” TransLink, Vancouver, 2010.

[112] R. Cervero and K. Kockelman, “Travel demand and the 3Ds: Density, diversity, and design,” Transportation Research Part D: Transport and Environment, vol. 2, no. 3, pp. 199-219, 1997.

[113] S. Ryan and L. Frank, “Pedestrian Environments and Transit Ridership,” Journal of Public Transportation, vol. 12, no. 1, pp. 39-57, 2009.

[114] Z. Ding, E. Chen and J. Teng, “Discovering impacts of built environment on transit ridership in the post-COVID era: Policy intervention and nonlinear dynamics,” International Journal of Transportation Science and Technology, 2025.

[115] A. Forouhar, K. Chapple, R. Pokharel and J. Allen, “Transit-driven resilience: Unraveling post-COVID-19 urban recovery dynamics,” Journal of Transport Geography, vol. 128, 2025.

[116] J. Niles and J. Pogodzinski, “TOD and Park-and-Ride: Which is Appropriate Where?,” Mineta Transportation Institute, San Jose, 2021.

[117] National Academies of Sciences, Engineering, and Medicine, “Guidelines for Providing Access to Public Transportation Stations,” National Academies of Sciences, Engineering, and Medicine, Washington DC, 2012.

[118] National Academies of Sciences, Engineering, and Medicine, “Strategies to Attract Auto Users to Public Transportation,” National Academies of Sciences, Engineering, and Medicine, Washington DC, 1998.

[119] C. Ling, Z. Chen , J. Yang and T. Yang, “Evaluating inclusive transit-oriented development with location affordability and its influencing factors,” Transportation Research Part A: Policy and Practice, vol. 201, 2025.

[120] American Public Transportation Association, “Economic Impact Of Public Transportation Investment,” American Public Transportation Association, Washington DC, 2026.

[121] California State Auditor, “Santa Clara Valley Transportation Authority: Improvements Are Necessary to Strengthen Its Project Management and Financial Oversight,” California State Auditor, Sacramento, 2024.

[122] L. Leong, “The ‘Rail plus Property’ model: Hong Kong’s successful self-financing formula,” 2 June 2016. [Online]. Available: https://www.mckinsey.com/capabilities/operations/our-insights/the-rail-plus-property-model. [Accessed 1 February 2026].

[123] MTR Corporation, “MTR Corporation Posts 2024 Results Year-on-Year Revenue Growth Recorded as Business Continues to Recover “Think ahead and Stay ahead” to Harness Growth Opportunities,” MTR Corporation, 6 March 2025. [Online]. Available: https://www.mtr.com.hk/archive/corporate/en/press_release/PR-25-013-E.pdf. [Accessed 1 February 2026].

[124] Federal Transit Administration, “Historic Context Report for Transit Rail System Development,” Federal Transit Administration, Washington DC, 2017.

[125] S. B. Warner Jr., Streetcar Suburbs: The Process of Growth in Boston, 1870-1900, Cambridge: Harvard University Press, 1978.

[126] M. Vallianatos and M. Brozen, “Transit-oriented development in Los Angeles: Past, Present and Future,” UCLA, Los Angeles, 2019.

[127] Smithsonian, “A Streetcar City: Washington, D.C., 1900,” National Museum of American History, [Online]. Available: https://americanhistory.si.edu/explore/exhibitions/america-on-the-move/online/streetcar-city. [Accessed 1 February 2026].

[128] E. Newcombe, “The Fascinating Rise, Fall and Rebirth of Streetcar Suburbs,” Governing, 7 January 2022. [Online]. Available: https://www.governing.com/context/the-fascinating-rise-and-fall-of-streetcar-suburbs. [Accessed 1 February 2026].

[129] Federal Transit Administration, “Federal Transit Administration Guidance on Joint Development (FTA Circular 7050.1C),” U.S. Department of Transportation, Washington DC, 2024.

[130] J. Bergal, “Transit Agencies Lease Real Estate to Generate Much-Needed Cash,” Stateine, 30 September 2021. [Online]. Available: https://stateline.org/2021/09/30/transit-agencies-lease-real-estate-to-generate-much-needed-cash/. [Accessed 1 February 2026].

[131] J.P. Morgan, “The role of cap rates in real estate,” J.P. Morgan, 2 February 2026. [Online]. Available: https://www.jpmorgan.com/insights/real-estate/commercial-term-lending/cap-rates-explained. [Accessed 2 February 2026].

[132] S. Cannestra, “Silicon Valley transit agency looks for solutions to looming deficit,” San Jose Spotlight, 12 June 2025.

[133] Federal Transit Administration, “National Transit Database Reporting Policy Manual,” U.S. Department of Transportation, Washington DC, 2024.

[134] Victoria Transport Policy Institute, “Evaluating Public Transit Benefits and Costs,” Victoria Transport Policy Institute, Victoria, 2025.

[135] G. Currie and I. Wallis, “Effective ways to grow urban bus markets – a synthesis of evidence,” Journal of Transport Geography, vol. 16, no. 6, pp. 419-429, 2008.

[136] National Academies of Sciences, Engineering, and Medicine, “Transit Capacity and Quality of Service Manual,” National Academies of Sciences, Engineering, and Medicine, Washington DC, 2013.

[137] National Academies of Sciences, Engineering, and Medicine, “Shared Mobility and the Transformation of Public Transit,” National Academies of Sciences, Engineering, and Medicine, Washington DC, 2016.

[138] R. Puentes, “Missed Opportunity: Transit and Jobs in Metropolitan America,” The Brookings Institution, Washington DC, 2011.

Acknowledgements

The author thanks the Santa Clara Valley Transportation Authority (VTA) and the City of San José. The author also thanks Lisa Rose for editorial services, as well as MTI staff Project Assistant Cameron Simons and Graphic Designer Katerina Earnest.

We would like to thank the following individuals and organizations:

- San José Mayor Matt Mahan
- Alejandra Leynez Chantres, San José Mayor's Office
- David Hai Tran, San José Mayor's Office
- Sam Sargent, Santa Clara Valley Transportation Authority
- Adam Burger, Santa Clara Valley Transportation Authority
- San José Department of Transportation
- Jay Tyree, Santa Clara Valley Transportation Authority
- Michael Tree, Santa Clara Valley Transportation Authority
- Art Guzzetti, American Public Transportaion Association

About the Author

Adam Cohen is a senior researcher in innovative and emerging mobility. He has over two decades of experience as a researcher with the Mineta Transportation Institute of San Jose State University and the Transportation Sustainability Research Center at the University of California, Berkeley. Adam also chairs the Transportation Research Board's Standing Committee on Innovative Public Transportation Services and Technologies (AP020). He has a master's degree in city and regional planning and a masters degree in international affairs from Georgia Tech.

Disclaimer

This report can be accessed at
transweb.sjsu.edu/research/2608

The Mineta Transportation Institute (MTI) is a university transportation center located within the Lucas Graduate School of Business at San José State University. MTI supports the advancement of safe, efficient, and innovative surface transportation through research, education, workforce development, and technology transfer.