

SPUR REPORT
TRANSPORTATION



More for Less

How to plan and deliver the Bay Area's major transit projects in less time, for less money and with better public value

SEPTEMBER 2020

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This report is a component of the SPUR Regional Strategy, a vision for the future of the San Francisco Bay Area

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Executive Summary



Photo by Sergio Ruiz

The San Francisco Bay Area's transit network is at a critical juncture. In the last decade, the region experienced unprecedented economic and population growth. Yet it has failed to maintain its aging transit systems or add new infrastructure to support this growth. Getting around has become slow, inconvenient and painful, and most of the region remains inaccessible by transit. Today, in the midst of a pandemic that has drastically reduced ridership and revenue, many transit agencies are also experiencing a severe fiscal crisis, threatening to stop some from running altogether before year's end.

A major reason why we do not have the transit network we need is because projects cost too much and take too long. And when each project is so expensive, it's no wonder that there's little money left to deliver the frequency and quality of service we need. There is too much at stake if we fail to bring down the time and costs of delivering projects. With each negative headline about project delays or cost overruns, people will lose faith in government to address our major challenges and may be less inclined to invest in infrastructure for the common good. The transit network will plummet into a state of decay that will make it impossible to bring riders back, let alone attract new riders. We will fail to meet our climate goals in the last decade that we have before time runs out.

SPUR believes that the region's success depends on getting ahead of these challenges and building the infrastructure we need. Yet the Bay Area has a poor track record of delivering major transit projects quickly and cost-effectively. Our projects regularly take decades from start to finish, and our project costs rank among the highest in the world.



This paper characterizes some of the chief reasons why major transportation projects take too long and cost too much in the Bay Area. The recommendations in it answer three key questions:

1. How can regional agencies and transit operators ensure that the Bay Area is planning for and selecting the best major transit projects to build?
2. How can regional agencies and transit operators deliver the most significant, high-cost and high-risk projects more quickly and cost-effectively?
3. How can California remove legislative and regulatory barriers to ensure successful project delivery?

This paper focuses on major transit projects, characterized as complex, large-scale projects that are significant to the region's transit network and that transform the way people get around by providing significant new access, frequency and connectivity and reducing greenhouse gas emissions. We focus on these projects because they have high initial costs and are at high risk of cost overruns and delay. With approximately \$100 billion worth of major projects in the pipeline in the Bay Area, the savings from these recommendations could number in the tens of billions of dollars.

Some of these major transit projects cost over \$1 billion and could be classified as “megaprojects” according

Major transit projects such as the remaking of San Jose's Diridon Station often take too long and cost too much. This report makes 10

recommendations for how the Bay Area can get better at delivering significant projects.



to academic literature.¹ These include integrated station projects such as the rebuilding of Diridon Station or the new Salesforce Transit Center, the electrification of diesel railroads, and rail extensions such as the Silicon Valley BART extension or additional transbay crossings, among others. However, the Bay Area has many projects that do not meet the \$1 billion cost threshold but can be equally transformative and can suffer from similar risks and challenges. These include the region's many stalled bus rapid transit projects.

To see the Bay Area's next generation of major transit infrastructure projects built more quickly and cost-effectively, we need to change the governance of project delivery. SPUR proposes three big ideas and makes 10 recommendations for delivering transit projects in the Bay Area in ways that save time and money. Though most beneficial as a package, each of these ideas can be pursued independently.

Big Idea 1:

Improve regional transportation planning, project selection and project oversight.

Improve regional transportation planning and project oversight so that only the projects that offer the best value to the Bay Area are advanced. The Bay Area has a history of selecting projects based on political clout rather than through a rigorous selection process based on a regional vision or objective cost-benefit metrics. Further, there are currently few incentives to control project costs. Project delivery problems start well before a project ever breaks ground.

1. Expand the Metropolitan Transportation Commission's authority to act as the region's transit network planner.
2. Develop a long-term strategic plan for a seamless network of regional transit and managed highway lanes to guide capital investments.
3. Establish a "stage gate" process with phases and periodic decision points to determine a project's readiness to advance to the next stage in the project life cycle.
4. Rigorously evaluate the business case and deliverability options for a project, especially before making financial and political commitments to it.
5. Establish integrated project management teams throughout the project life cycle.

Big Idea 2:

Create a new organization to deliver the region's most significant and high-risk projects.

A chief reason why the Bay Area has struggled with project delivery is because we build so few projects. Every project falls victim to "first timer" mistakes. Procurement and construction management are specialized skills that need to be nurtured through experience, especially because each project is unique. We further explore the concept described in Recommendation 6 in our companion paper, *Infrastructure Bay Area: A proposal for successful delivery of transformative transit projects* (spur.org/IBA).

¹ Bent Flyvbjerg, "What You Should Know About Megaprojects and Why: An Overview," *Project Management Journal*, v. 45 (2), April-May 2014, pp. 6-19. <https://journals.sagepub.com/doi/10.1002/pmj.21409>

6. Establish Infrastructure Bay Area, a project delivery entity responsible for the successful delivery of the region's most significant megaprojects.
7. Give Infrastructure Bay Area the ability to use nontraditional project delivery approaches.
8. Allow Infrastructure Bay Area to select a bidder on the basis of the best value rather than cost alone.

Big Idea 3:

Streamline environmental laws for projects that deliver significant environmental benefits.

California's foremost environmental protection law, the California Environmental Quality Act (CEQA), is often used inappropriately to delay or stop projects that would have significant benefit to the environment. Adapting CEQA for the most environmentally beneficial projects could reduce project costs and timelines, accelerating the transition to a more sustainable, affordable and healthy transportation system.

9. Establish a statewide certification process for major transit projects over \$1 billion that would reduce uncertainty and undue delay and cost in exchange for adopting best practices in project delivery.
10. Give statutory exemptions to bus rapid transit, bicycle enhancement projects and pedestrian improvements.

Reforming project delivery is a problem that cannot wait. If we continue on as we always have, the few projects that the region manages to deliver will cost too much, take too long and fail to make the region accessible and sustainable. This is a future we simply cannot accept or afford.

Introduction

Project Delivery Problems Are Costing the Bay Area

In 2019, the Bay Area's transportation network seemed as if it were about to break. The peak travel "hour" seemed to stretch into the entire day. Trains and buses were uncomfortably crowded. Many people were leaving their homes before their children woke up just to avoid traffic. In the middle of the day, transit was slow and largely nonexistent. The region's transit network sorely needed more capacity, more reliability and more access — and it was finally readying itself to make those investments.

Today, we face another kind of breaking point. The world has been thrust into a pandemic that has taken the lives of hundreds of thousands of people and left millions unemployed in just a few months in the United States alone. In the face of COVID-19, the Bay Area has gone quiet. There is no peak hour. Crowd management is about keeping people 6 feet apart and is a matter of life and death, not comfort or convenience. Large employers who had amassed sizeable real estate portfolios and operated their own bus networks to foster in-person collaboration are now letting people work at home indefinitely.

With these changes, transit agencies are facing an existential crisis. As people shelter in place and practice social distancing, transit systems are experiencing plummeting ridership and revenue. Transit fares, parking fees, bridge tolls and other transportation funds are drying up.

SPUR believes that the Bay Area's future is an urban one. Cities have survived pandemics before — and become better for it.² And though COVID-19 has made all aspects of society seem unanchored, one thing remains unchanged: Cities need transit to survive. Even today, transit is a lifeline connecting essential workers to hospitals, pharmacies, testing centers and jobs at all points along the food supply chain. And after we emerge from the pandemic, we will need a significant percentage of people to shift to transit for more of their trips: A future with more driving is a future filled with more congestion, more pollution and greater threats from climate change.

Transit can thrive if it functions well for everyone, particularly for people of color, people with low incomes, people with disabilities, older adults and children. But our transit network already serves too few people. Service is designed primarily for commuters with nine-to-five jobs. Despite crowding on a number of trains and buses, less than 3% of all trips are taken by transit, and average per capita boarding rates have fallen below their levels in 1990.³

To make transit better for everyone, we need to make it more reliable, integrated and frequent, and in some cases, we need to expand it to make more of the Bay Area accessible to more people. Doing so requires investments in policies that make the transit system function better for all,⁴ as well as new capital projects that add reliability, speed, capacity and access.

² Benjamin Grant and Sarah Karlinsky, "Physically Distant But Still Together: How Cities in the Bay Area and Beyond Will Survive the Coronavirus," SPUR, March 18, 2020, <https://www.spur.org/news/2020-03-18/physically-distant-still-together-how-cities-bay-area-and-beyond-will-survive>

³ Metropolitan Transportation Commission (MTC), "Historical Trend for Daily Transit Ridership," Vital Signs, <https://www.vitalsigns.mtc.ca.gov/transit-ridership#chart-0>

⁴ Arielle Fleisher, "Transit Fare Integration Wins Transformative Projects Competition," SPUR, February 18, 2020, <https://www.spur.org/news/2020-02-18/transit-fare-integration-wins-transformative-projects-competition>

How Poor Project Delivery Perpetuates Inequity

People with low incomes make up over half of transit riders in the Bay Area,⁵ which is more than twice their share of the regional population, and people of color account for 62% of transit trips.⁶ That means that the high cost and decades-long process to deliver transit improvements has the greatest impact on low-income communities and communities of color. Solving the problem of project delivery will greatly benefit these groups.

Long timelines leave historically marginalized communities without basic access, sometimes for decades.

For example, it has taken 17 years to deliver the East Bay Bus Rapid Transit project, leaving people who live in neighborhoods like East Oakland and downtown Oakland without a high-quality, efficient way to get where they need to go. By the time it's completed, the project may not even benefit the same people who voted for it. It understandably diminishes public trust and accountability when government can't keep its promises, particularly for communities that have repeatedly suffered from being overlooked or overpromised.

Often, project delays are caused by individuals whose narrow interests play an outsized role in project decisions.

California's foremost environmental law, the California Environmental Quality Act (CEQA), allows anyone to sue to effectively block a project, even on non-environmental grounds such as impacts on parking, traffic or aesthetics. For example, an individual sued the San Francisco bicycle plan over parking losses and traffic impacts, holding up 34 miles of bike lanes for four years. The East Bay Bus Rapid Transit project was likewise compromised when a single business owner in Berkeley threatened to file a lawsuit under CEQA over parking losses. This forced the project sponsor to significantly scale the project back to run only between Oakland and San Leandro, reducing accessibility for low-income communities.⁷ Similar challenges unfolded with the Geary Bus Rapid Transit project in San Francisco. That the lawsuits can be filed anonymously further protects the rights of an individual over the rights of the public.

Wealthier, whiter and more car-oriented communities have a lot of power over transit funding and capital investments.

For decades, the federal government has been divesting from transportation; today, federal funding makes up only 11% of all transportation dollars in the Bay Area.⁸ To their credit, voters in most Bay Area counties have repeatedly taxed themselves to try and make up the difference. Yet in order to win at the ballot, the tax measures dedicate a significant amount of locally generated funds to car-oriented projects or rail expansions, which tend to benefit wealthier and whiter populations than capital projects that improve capacity on existing systems.⁹ Similar dynamics play out at the regional level. In 2001, the Metropolitan Transportation Commission (MTC) adopted Resolution 3434, a political compromise that promised MTC's support for \$10.5 billion (in 2001 dollars) for rail expansion projects nominated by Bay Area political leaders competing for funds in their districts.

5 MTC, Plan Bay Area 2040 Equity Analysis Report, July 2017, p. 5-5. http://2040.planbayarea.org/sites/default/files/2017-07/Equity_Report_PBA%202040%20_7-2017.pdf

6 MTC, Regional Means-Based Transit Fare Pricing Study Project Overview Report, Draft Final, March 2017, p. 4, <https://mtc.ca.gov/our-work/plans-projects/other-plans/means-based-fare-discount-program>

7 Judy Silber, "Oakland City Council Gives Final Approval to East Bay BRT," Streetsblog SF, July 8, 2012, <https://sf.streetsblog.org/2012/07/18/oakland-city-council-gives-final-approval-to-east-bay-brt/>

8 MTC, Plan Bay Area 2040, Chapter 4, "Investments," p. 64, <https://mtc.ca.gov/sites/default/files/4-Investments.pdf>

9 "Faster Bay Area" in 2019/2020 was a regional ballot measure for transportation and the first ballot measure proposed exclusively for public transit.

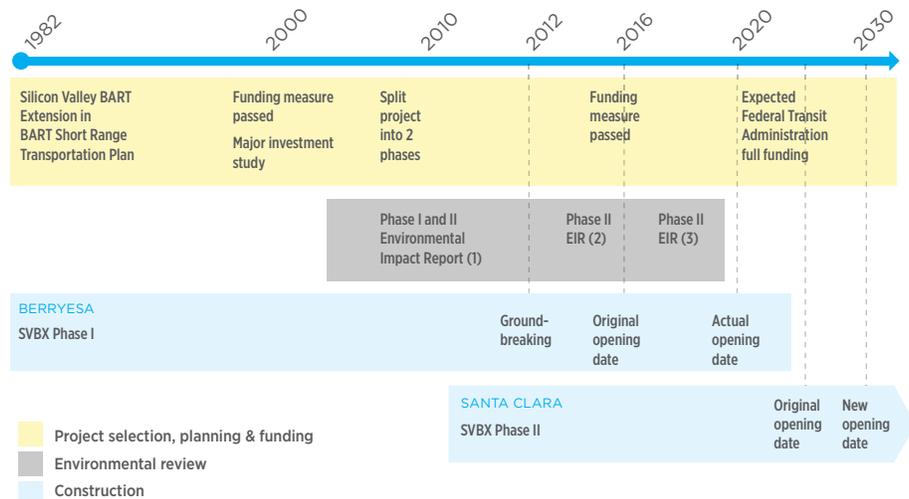
Projects Regularly Take Too Long and Cost Too Much

The Bay Area cannot afford to wait another decade without investment in the transit network. Yet capital projects were too expensive even before the current crisis.¹⁰ Out of more than 90 capital projects submitted to MTC in 2019 for Plan Bay Area 2050, fewer than a dozen were considered to be cost-effective. And for the foreseeable future, transit agencies and cities will be faced with shrunken budgets. We will need to do more with less.

The Bay Area has a poor track record in delivering major transportation projects on time, on budget and without major defect. And we are not alone. Across the globe, delivering megaprojects is notoriously challenging,^{11, 12} and schedule and cost overruns are common.¹³ In a survey of megaprojects around the world, researcher Bent Flyvbjerg found that rail projects encountered an average cost overrun of more than 44%.¹⁴ With over \$100 billion worth of megaprojects on the horizon, cost overruns could run into the tens of billions. We simply can't afford that.

In the Bay Area, projects consistently cost more and take longer than in other urbanized regions.¹⁵ Several systemic factors that drive up time and cost are unique to the Bay Area and California: extreme institutional fragmentation that makes it difficult to put forward a regional vision and gain alignment between decision-makers, an environmental review process that is often misused and adds years to a project's schedule, and a lack of flexibility and experience in capital project procurement, among others. This paper characterizes these problems and is a call to action to fix them.

FIGURE 1
The Silicon Valley BART Extension Has Taken Nearly Half a Century
 The Silicon Valley BART Extension was first identified in 1982, but the project will not be completed until 2029, nearly half a century later.



10 Laura Tolkoff and Arielle Fleisher, "To Achieve Seamless Transit, We Must Change What and How We Build," SPUR, December 18, 2019, <https://www.spur.org/news/2019-12-18/achieve-seamless-transit-we-must-change-what-and-how-we-build>

11 See note 1.

12 Karen Trapenberg Frick, *Remaking the San Francisco-Oakland Bay Bridge: A Case of Shadowboxing with Nature*, Routledge, 2016.

13 In a survey of 258 transportation infrastructure projects in 20 countries (both transit and auto), 90% experienced cost escalation. Bent Flyvbjerg, Mette K. Skamris Holm and Soren L. Buhl, "What Causes Cost Overrun in Transport Infrastructure Projects?" *Transport Reviews*, v. 24 (1), 2004, pp. 3-18.

14 See note 1.

15 Andy Bosselman, "Bay Area Subway and Rail Costs: Why Are They Among the Highest in the World?," *Curbed*, June 18, 2018, <https://sf.curbed.com/2018/6/18/17464616/bay-area-subway-train-rail-costs-price-bart-muni>

FIGURE 2
Van Ness Bus Rapid Transit Has Taken Nearly 26 Years

A conceptual study in 1995 identified four new high-priority corridors for frequent, fast transit, including Van Ness–Mission. The study initially looked at light rail and bus rapid transit options. Van Ness Bus Rapid Transit ran into several delays, including issues with Caltrans over lane width during the planning phase as well as challenges with the construction contractor and unmarked utilities that impeded construction.

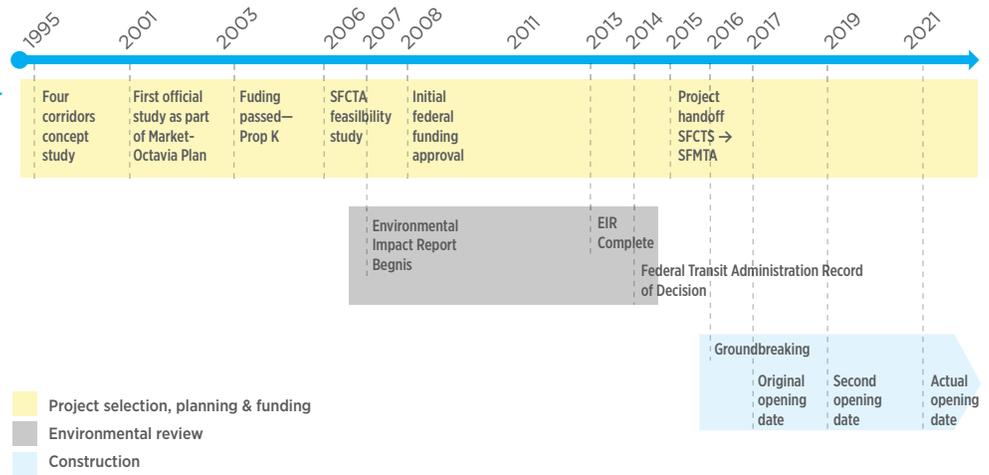
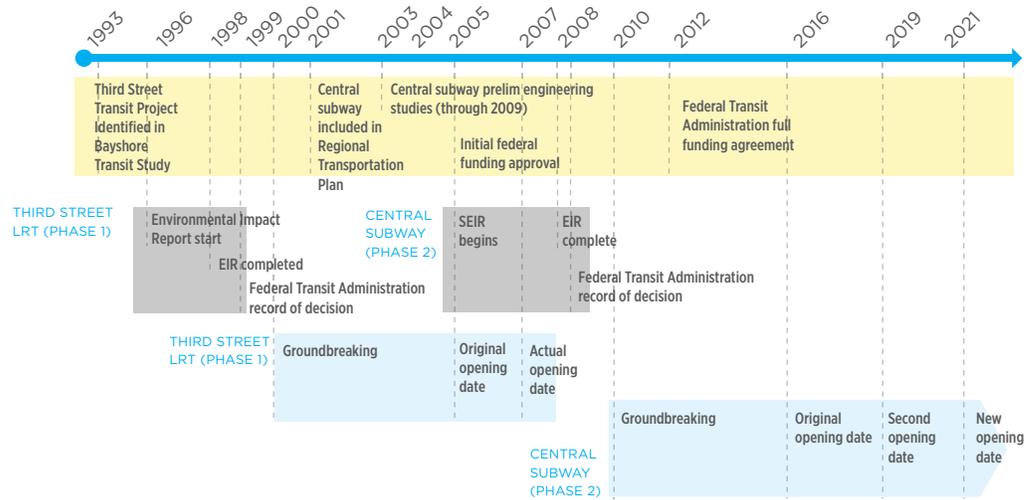


FIGURE 3
The Central Subway Has Experienced Cost Increases of 40% and Will Open Three Years Late

The Central Subway, which will bring Muni service to some of San Francisco’s most job-rich districts, was first identified as a goal in the 1980s. Initial project planning and environmental work for the project only began in 2005, after the passage of a local ballot

measure that helped to fund it.¹⁶ This project is the second phase (of three) of the Third Street Light Rail Project. The first phase, the T-Third Line, opened in 2007. The Central Subway was initially estimated to cost \$647 million (in 2001) and to take eight years to build, yet the cost and schedule ballooned during the construction phase. The project is now anticipated to cost \$1.6 billion and to open in 2021, three years late and 11 years after it started construction.¹⁷



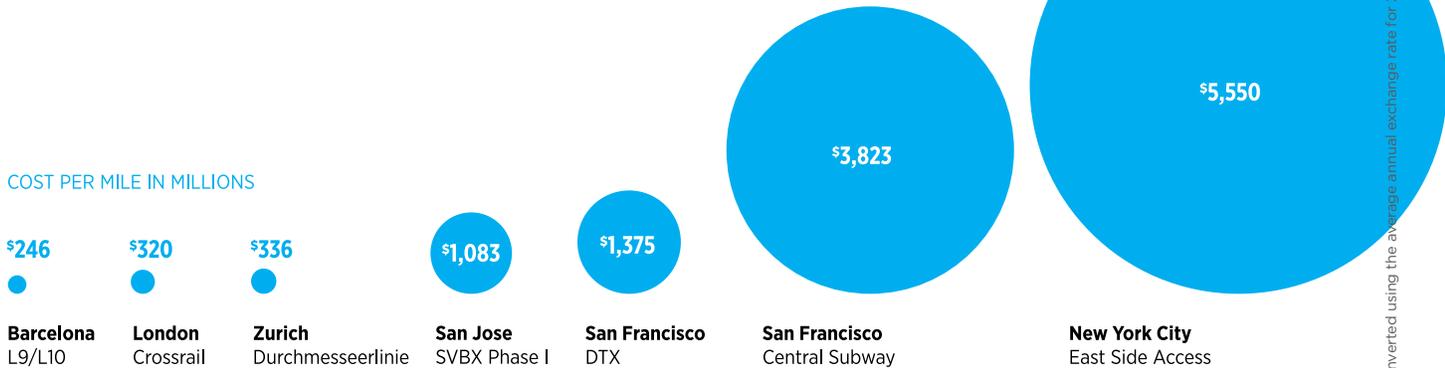
16 San Francisco Municipal Transportation Authority (SFMTA), “Central Subway Project History,” www.sfmta.com/central-subway-project-history

17 Rachel Swan, “San Francisco’s Central Subway Hits Huge Delay—Won’t Open Until 2021,” *San Francisco Chronicle*, September 18, 2019, <https://www.sfchronicle.com/bayarea/article/San-Francisco-s-Central-Subway-hits-huge-delay-14432776.php>

FIGURE 4
International Comparison of Construction Costs for Urban Rail Projects

American urban rail projects regularly cost more on a per-mile basis than comparable projects in Europe.¹⁸ This figure compares the costs per mile (in US dollars) of a sample of urban rail projects with a significant amount of underground tunneling. The Silicon Valley BART extension costs almost four times as much per mile as

the Barcelona L9/L10 metro, even though they use the same tunneling technology and the L9/L10 extension is the longest and deepest in Europe and traverses highly developed neighborhoods. New York City’s East Side Access is included because New York is regularly cited as having the highest urban rail construction costs in the world.



Our project costs start high. Many projects have come to cost so much that it is easy to cast doubt on whether we should be building them at all. Out of more than 90 capital projects submitted to MTC for consideration in Plan Bay Area 2050 in 2019, fewer than a dozen had benefits that exceeded costs.¹⁹ Despite high initial costs, large projects face a number of challenges that make them particularly vulnerable to cost overruns, as detailed on page 16.

Project delivery reform is not just a money issue—it is an issue of equity and the environment. When capital projects go over budget, transit agencies look for ways to bridge the shortfall. First they look to find cost savings in the project’s design (“value engineering”), then they take from their operating budgets, across both rail and local transit services. This can disproportionately impact people with low incomes, who make up over half of the Bay Area’s transit riders.²⁰ One prominent example is BART’s Oakland Airport Connector. As costs escalated, BART cut promised stations in East Oakland and sought to reallocate funding for buses that would connect to the project.²¹ Low-income households are doubly vulnerable to project delivery problems — first because of the delay in improved transit, and second because escalating costs can threaten to diminish the quality of existing service.

Project delivery is also a determining factor in the region’s ability to reduce greenhouse gas emissions and avoid a global climate catastrophe. The Bay Area is expected to fail to meet its 2035 climate targets,²² in part

18 Alon Levy, “Why It’s So Expensive to Build Urban Rail in the U.S.,” *CityLab*, January 16, 2018, <https://www.citylab.com/transportation/2018/01/why-its-so-expensive-to-build-urban-rail-in-the-us/551408/>

19 MTC, “Project Performance Assessment,” February 2020, <https://mtc.ca.gov/our-work/plans-projects/horizon/project-performance-assessment>

20 See note 6.

21 Joel Ramos and Clarissa Cabansagan, *Crossing Together: Equity Considerations for a Second Transbay Crossing*, TransForm, 2017, <https://www.transformca.org/transform-report/crossing-together>

22 Under SB 375, Plan Bay Area, the region’s sustainable communities strategy, must meet or exceed a greenhouse gas reduction target of 19% by 2035. Bold strategies that result in less driving will be required to meet this target. See: “Plan Bay Area 2050 Draft Blueprint: Setting the Stage,” presented by Dave Vautin to the MTC and Association of Bay Area Governments (ABAG) Executive Board on January 31, 2020. <https://mtc.legistar.com/MeetingDetail.aspx?ID=752053&GUID=B43014E3-E6FA-4EAA-B3FE-0260C3EB778D&Options=info&Search=>

because it has not delivered efficient and reliable transit that makes transit more attractive than driving. At present, the transportation sector is responsible for 40% of all of the greenhouse gas emissions in California, largely because of our overreliance on passenger vehicles.²³ The percentage of people in the Bay Area who drive alone to work has hovered at about 66% on average (and closer to 80% in some counties) since the 1980s.²⁴ All realistic paths toward achieving dramatic reductions in greenhouse gas emissions involve transit capacity and transit connections that simply do not exist today. There is no time to wait.

²³ Legislative Analyst's Office, *Assessing California's Climate Policies — Transportation*, December 21, 2018, https://lao.ca.gov/Publications/Report/3912#Key_Takeaways_From_Review_of_Major_Policies

²⁴ MTC, "Historical Commute Mode Choice," *Vital Signs*, updated May 2018, <http://www.vitalsigns.mtc.ca.gov/commute-mode-choice>

The Project Life Cycle

This paper addresses challenges throughout a project’s life cycle, starting with regional planning and project selection and continuing through project planning and ultimately project delivery. Each of these prototypical project phases is described below.²⁵ These phases will be referenced throughout this report.

FIGURE 5
TRANSPORTATION PROJECT LIFE CYCLE

Regional Planning

Establish the vision for the transit network and service performance standards for each part of the network. Standards include operational and user-focused elements and aim to achieve environmental, social and economic outcomes. Project selection is based on these regional goals and outcomes.

Project Initiation

Establish an integrated project management team; engage the public in the project vision and design; determine the project’s planning vision, objectives and strategic outcomes in relationship to the regional network plan; assess the project feasibility; and compare initial investment options.

Project Development

Confirm the need for the project, continue public engagement, evaluate investment options, complete environmental review, select a preferred investment option, conduct initial design and engineering, establish a funding and financing program, secure funding and financing, complete a project-delivery-options analysis with a value-for-money analysis and risk assessment, complete final design and engineering, and secure permits and approvals from all resource and regulatory agencies.

Procurement

Implement the selected project delivery approach, prepare project for market, bid the contracts for construction and determine workforce requirements.

Project Construction

Finalize execution strategy, build the project and ensure that the project is ready for operations/service.

Operations

Bring project into service.

Closeout

Monitor, evaluate the lessons learned and measure project performance against expectations.

Project Definition and Design

Project Delivery

25 There is some simplification in this description, which tends to reflect a process that uses a more traditional deliverability approach such as design-build.

Big Idea 1

Improve regional transportation planning, project selection and project oversight.

Good projects start with good planning. The recommendations in this section emphasize a stronger role for regional planning, project evaluation and project selection. Additionally, large transportation projects are uniquely complex and require a higher level of oversight and project controls, particularly in the early phases, to spot warning signs and correct future problems.

Challenge:

The Bay Area's fragmented transportation governance system makes it extremely difficult to align around a shared vision for the transit network and the projects that will deliver it.

There are more than two dozen transit agencies and nine countywide congestion management agencies in the San Francisco Bay Area, each with its own unique geographies, funding structures, services and priorities. Having so many different agencies with a hand in planning and funding transit makes it harder to create a shared vision for the region's infrastructure needs and to make rational funding decisions that are good for the region as a whole. Exacerbating the challenge, each agency wants its projects to be included in the regional transportation plan so that it can be eligible for scarce regional, federal and state discretionary funding, which leads to a deeply competitive project selection process. Currently, the process for developing the regional transportation plan is that each agency nominates projects to MTC for inclusion in Plan Bay Area and MTC evaluates them according to cost-benefit metrics and qualitative criteria. As a result, the region's long-range transportation plan is a piecemeal set of projects collected from local nominations and political negotiations rather than a shared vision developed from a regional set of environmental, social and economic goals.

At the project level, each agency has different priorities driven by its business and operational requirements. It can be hard to find common ground, let alone a shared vision. Further, there are few incentives or standard processes to encourage making shared decisions or prioritizing regional outcomes. State and federal transit funding programs have generally not emphasized integration.²⁶

Fragmented institutions, timelines and funding sources often stand in the way of planning collaboratively or selecting investments rationally. Adjacent or connecting projects are often planned independently instead of as one project — on different timelines, with different budgets and without sufficient consideration for phasing of decisions and construction. These differences tend to be “solved” by increasing the scope and size of the

²⁶ CalSTA's Transit and Intercity Rail Program (TIRCP) is a rare exception that emphasizes integration between systems, particularly integration with high-speed rail. See: <https://dot.ca.gov/programs/rail-and-mass-transportation/transit-and-intercity-rail-capital-program>

infrastructure or by sacrificing operational efficiency.²⁷ For example:

- Caltrain and the California High-Speed Rail Authority have agreed to share the rail corridor between San Francisco and San José, but each has different operating requirements. Consequently, initial plans were based on an assumption that high-speed rail would not be able to fit within the footprint of the station and would need to operate in a physically separate aerial structure above the existing station. This new structure would have further bisected downtown San Jose, which already faces struggles where Highway 87 cuts through it. In 2018, after a study tour hosted by SPUR showed new ways of operating and designing high-speed rail stations, the plans for an aerial structure were abandoned in favor of an at-ground configuration.
- The City of San José sold public land immediately adjacent to Diridon Station and the railyard to a developer. A portion of the parcel had been identified as necessary to create a better rail alignment that would allow faster train speeds and more trains per hour. Though the decision to sell the land will bring long-awaited economic development to the area, it compromises both rail operations at one of the region's most significant transit hubs and the long-term capacity of the rail network.
- BART's Antioch line travels through the Berkeley hills tunnels and is bisected by the Hayward Fault, an active earthquake fault. In 2015, the BART board of directors weighed several options for how it would upgrade the tunnels as part of its earthquake safety program. One of the considerations was whether or not to take a tunnel out of service to do the seismic upgrades. Of the two final options considered, one would have taken a track out of service during construction and provided express bus service to passengers on Highway 24. It would have cost \$284 million and delivered better safety in just over four years. The second option would require a new tunnel but would not significantly disrupt service on the existing tunnels. It would cost \$918 million and require almost 10 years to build.²⁸ Preferring not to disrupt service, the board ultimately chose the latter option, requiring an extra \$700 million and six years of construction to drill a third tunnel. The selected option had a poor economic and financial case and deviated from the most important policy goal of improving safety as quickly as possible.

Challenge:

Projects often suffer from poor cost-benefit estimates at the outset, which distorts project selection and has cascading impacts through the life of a project.

Newly nominated transit ideas and projects are most likely to suffer from poor initial estimates of costs and benefits.²⁹ In reviewing a sample of recently completed or ongoing transit projects in the Bay Area, SPUR found large differences between initial cost estimates and cost estimates done during the environmental review phase,

27 Alon Levy, "Why American Costs Are So High (Work-in-Progress)," *Pedestrian Observations*, March 3, 2019, <https://pedestrianobservations.com/2019/03/03/why-american-costs-are-so-high-work-in-progress/>

28 "BART Earthquake Safety Program," presented by Robert Mitroff to the BART Board of Directors, May 28, 2015, <https://www.bart.gov/about/bod/meetings/2015>

29 Karen Trapenberg Frick, "Megaplaning for Mega and Mini Projects: Common Challenges and Ways Forward," Appendix C in Ratna Amin, *Caltrain Corridor Vision Plan*, 2017, <https://www.spur.org/publications/spur-report/2017-02-23/caltrain-corridor-vision-plan>

when the scope of the project is clearer and the design is more advanced. Further, actual costs are almost always much higher than initial estimates. For example, the actual costs for the Transbay Transit Center were 40% higher than the initial estimates.

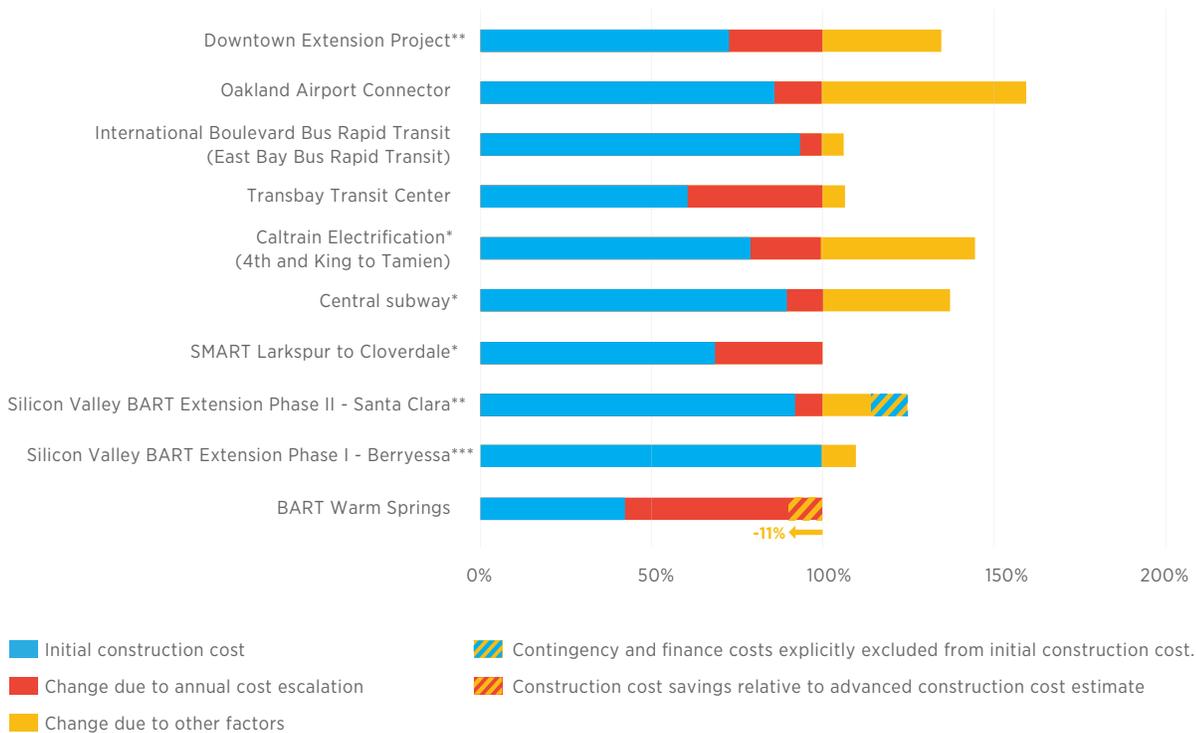
In the Bay Area, financial and political commitments are made to projects before the costs are well defined. Project selection occurs early and is based on initial cost estimates, skewing decisions toward projects that may not be cost-effective upon further design and analysis. By the time a project is finished, the costs may have increased so much that it is unlikely the project would have been selected had realistic cost-benefit metrics been available at the outset. See Figure 6 for greater detail.

FIGURE 6
Differences Between Estimated and Actual Capital Costs

This chart shows the proportion of a project's costs that were accounted for early on in a project's life cycle and the proportion of a project's costs that only became known as

the project progressed through design and construction. Comparing the early estimates with advanced estimates gives an indication of how much project cost estimates can change between the time that an initial public commitment is made and the point when a project's design comes into focus. This chart is

not intended to pinpoint the precise causes of cost escalation for each project. The differences often reflect the evolution and refinement as a project moves beyond the most conceptual stage and should not be interpreted as malfeasance.



* Project under construction or incomplete.
 ** Project not yet begun and not yet bid.
 *** Phase I is complete by not closed out. VTA reports an anticipated \$45 million in savings.

There are many reasons why initial cost estimates can meaningfully differ from actual project costs, including:

- **Shifting timelines:** Projects often face a vicious cycle: The higher the initial cost, the longer it takes to fund them. The longer it takes to fund them, the more the project costs. Project costs tend to increase on an annual basis based on changes in construction costs (e.g., labor and materials), which can grow by 3% to 5% per year on average. When a project is delayed, the costs inevitably go up. This is particularly true in a place like the Bay Area, where state and regional governments play only a very small role in prioritizing capital investments and consequently there is significant pressure to spread limited funds thin across many projects.
- **Scope changes:** The project may evolve steadily in scope, scale, construction method or technology from the time it is conceived to the time it completes its environmental review.
- **Limited resources for cost estimation early on:** There are often few up-front resources to do rigorous cost estimating in the early, conceptual stage of a project. Many projects are nominated to the region's transportation plan without a comprehensive feasibility assessment or a business case. Typically, these early cost estimates do not include comparisons to the costs and timelines for similar projects and do not account for financing costs, which can be sizable.³⁰
- **Optimism bias:** Globally, projects are almost always subject to optimism bias, meaning that people tend to estimate that a project can be delivered for less money and less time and with greater benefits than actually occur.³¹
- **Funding pressures:** The federal government requires regional transportation plans to be fiscally constrained, which means that the transportation investments included must be possible to fund using reasonably anticipated sources of revenue as well as funding from local ballot measures.³² There is significant pressure to make a project appear cost-effective for it to be included in the regional transportation plan and therefore be eligible for federal and state funding.

³⁰ Ibid.

³¹ Ibid.

³² Federal Transit Administration, "Financial Planning & Fiscal Constraint," March 11, 2019, <https://www.transit.dot.gov/regulations-and-guidance/transportation-planning/financial-planning-fiscal-constraint>

Cost Estimation for London's Elizabeth Line

Crossrail Ltd. is a publicly owned project delivery organization that is developing a new 73-mile railway line, the Elizabeth Line, under the busiest part of London. A subsidiary of Transport for London, it is jointly owned by Transport for London and the U.K. Department for Transport. In determining a cost estimate for the project, Crossrail Ltd. built a comprehensive cost model that quantified risks and uncertainties and settled on a “cost envelope,” or range, rather than a single number. This approach allowed Crossrail Ltd. to have a more honest conversation with project sponsors about the uncertainties, encouraging their full engagement in key decisions that were needed to deliver the project successfully and securing the ability to successfully defend the program when political leadership changed. The early emphasis on risk assessment translated into a focus on risk management in all parts of the project.³³ Though the Elizabeth Line, like other transit megaprojects around the world, has experienced delays and cost escalation, its most recent cost estimate, at £18.25 billion, is still within reach of the initial cost envelope.

Together, these challenges mean that when a project makes it into the regional transportation plan or a ballot measure, the cost estimate is probably too low. Low front-end cost estimates can lead project sponsors, MTC and other policymakers to support projects that they might not have backed if they'd had more accurate cost estimates. As time goes on, this can have cascading effects: Costs and timelines almost always increase when a project goes through more thorough design and engineering; projects have to go back to the ballot and public trust deteriorates; and project sponsors are often required to compromise on project design and quality to make ends meet. Yet it takes great political bravery and personal risk to revisit a project that the public has committed to in a ballot measure, even when it becomes riddled with red flags. Therefore, it is critical that the Bay Area improve the up-front work of project evaluation and selection.

Recommendation 1:

Expand MTC's authority to act as the region's transit network planner.

Who's responsible: *California legislature, transit agencies, congestion management agencies*

There are many places around the world with high-functioning, seamless transit networks that rely on multiple operators to deliver services. These places all have one entity that's accountable for designing the network. This transit coordinator, sometimes referred to as a “network planner” or “transport alliance,” plans and integrates projects, services, fares and customer information so that they add up to a more integrated and functional network. The Bay Area is missing this critical institutional role.

Though MTC's mandate is to be the transportation planning, financing and coordinating agency for the Bay Area, it has not exercised its authorities to fulfill its planning and coordination functions. It focuses primarily on its financing role, selecting which projects will receive state and federal funding. In part, MTC is limited by the

³³ Simon Wright, Richard Palczynski, and Patrick ten Have, “Crossrail Programme Organization and Management for Delivering London's Elizabeth Line,” *Proceedings of the Institution of Civil Engineers*, 2017, <https://learninglegacy.crossrail.co.uk/wp-content/uploads/2017/09/1R-001-Programme-organisation-and-management.pdf>



constraints of its own governance structure, which is made up primarily of officials who are locally elected and therefore face competing commitments between making regional decisions and maximizing the investment in their local communities. In part, MTC is also hampered by its lack of transit operating expertise, which at times engenders pushback from operators. Ultimately, transportation planning is largely done by transit agencies and county congestion management agencies. Thus, MTC ends up acting as a regional transportation project selector rather than a regional transportation planner.³⁴ As a result, the region's transportation plan is useful for financial planning but is fundamentally not a planning tool for long-range infrastructure buildout.

In other countries around the world, regional network planners play a critical role in guiding, evaluating and selecting the capital projects that get built. They do this by establishing a long-range, service-based vision to guide capital investment programs and by instituting a process through which projects are periodically and objectively evaluated for their benefits, costs, deliverability and risks.

Recommendation 2

Develop a long-term strategic plan for a seamless network of regional transit and managed highway lanes to guide capital investments.

Who's responsible: MTC, transit agencies, cities, California State Transportation Agency (CalSTA), Caltrans, California Highway Patrol (CHP)

A long-range plan for the region's transit network would provide the vision and strategic direction for the Bay Area's infrastructure needs, making project selection more transparent and public dollars more purposeful. SPUR recommends that MTC develop and implement a long-term strategic plan for service performance and capital investments of the regional, trunk-line "backbone" network and for high-frequency routes that connect people to the regional system. This should also include regional express bus service that runs on a network of highway lanes that are managed and priced.³⁵ (For more information, see SPUR's forthcoming paper *A Transit Coordinator for the Bay Area*.)

The strategic plan should:

- Identify key regional transit and managed-lane corridors for high-frequency, rapid transit services and key corridors for feeder services into the rapid network.
- Define a service vision that provides regional transit services at regular, repeating intervals with minimized wait times between transfers.
- Establish regional goals and standards for the quality of service on each corridor identified. The standards should focus on access and cover two categories of service quality. The first is operational elements such as frequency of service, hours of service, safety, reliability, timed connections, speed, productivity

34 For instance, for Plan Bay Area 2050, local governments, transportation agencies and congestion management agencies nominated 93 projects for evaluation. With a \$423 billion backlog for operations, maintenance and repair, MTC is only considering a handful of low-cost projects sprinkled throughout the region, along with funding to study a second transbay crossing, as of this writing. See: MTC, "Plan Bay Area 2050: Draft Blueprint Strategies," presented February 20, 2020, to the Joint MTC Planning Committee with the ABAG Administrative Committee.

35 For the purpose of this paper, express lanes (also referred to as high-occupancy toll lanes or HOT lanes) are a form of managed highway lanes that can be used by high-occupancy vehicles for free while permitting access to other vehicles for a variable fee that is adjusted so that these vehicles will not exceed available capacity in the lane. Regional express bus service refers to bus service that primarily operates at a multi-county or regional scale, traveling on managed highway lanes and making limited stops. Such services often extend outside the boundaries of a single transit district.

and interoperability (the ability for different services to use the same tracks, vehicles, maintenance yards and signal systems). The second is user experience elements such as information display, schedule coordination, ease of transferring between services, ticketing and fare policy, amenities and comfort.

Importantly, the service vision and standards must drive capital investment decisions. The plan provides a strategic framework for the wider public policy objectives that capital investments should achieve. SPUR believes that MTC should only allocate funding from regional ballot measures and state discretionary funds to projects that align with the long-range strategic plan. The strategic plan should be coupled with a list of priority projects that are significant to the region and a funding plan for implementation in five-year and 10-year increments. Absent an implementation plan that is consistent from year to year and makes clear the standing of each project, the intense competition between transit agencies for every new funding opportunity will continue.

The Bay Area can draw on international best practices for models of network planners. For example, the network planner in Zurich, ZVV, establishes a service-based vision for the region. ZVV determines public transit service frequencies based on population and employment density with no bias for either bus or rail. The standards are organized into “supply zones,” areas with a combination of at least 300 people, jobs and training places. These are served at least hourly by at least one stop.³⁶ The service levels increase based on the size and density of the place on a regular, repeating schedule, increasing to minimum service frequencies of an hour, half hour or every 15 minutes.³⁷ Capital investments are made only as necessary to achieve the service vision and reliable travel times. In this way, the service-based plan is used to prioritize future capital investments: Improvements are made only if they work to achieve that schedule regardless of whether they meet the transit agency’s own performance goals or political commitments.

There’s already a model for success closer to home. In 2018, California developed a service-based state rail vision, with hourly and half-hourly service minimums on key state corridors. Since then, rail agencies across the state have been working together to implement this plan by doing more detailed business planning and rail planning in each corridor. Caltrain is currently in the process of completing its business plan, which includes a program of capital investments for increased service. Capitol Corridor, Caltrain, Altamont Corridor Express (ACE), the California High-Speed Rail Authority, the San Joaquin Regional Rail Authority and Alameda County Transportation Commission are working together on a Northern California Network Integration plan to map out the infrastructure needs and trade-offs to achieve the state’s vision. The state rail plan’s strategic vision provided a foundation for transit agencies and operators to do more detailed capital and operational planning to meet that vision, which can in turn inform the Bay Area’s priority investment strategy and federally mandated regional transportation plan.

Recommendation 3

Establish a “stage gate” process with phases and periodic decision points to determine a project’s readiness to advance into the next stage in the project life cycle.

Who’s responsible: MTC

³⁶ Tim Petersen, “Network Planning, Swiss Style: Making Public Transport Work in Semi-Rural Areas,” *Proceedings of the 32nd Australasian Transport Research Forum (ATRF)*. https://www.researchgate.net/publication/254609967_Netw_ork_planning_Swiss_style_Making_public_transport_work_in_semi-rural_areas

³⁷ Paul Mees, *Transport for Suburbia: Beyond the Automobile Age*, Earthscan Publishing, 2010.



Several countries have developed very robust institutional frameworks to ensure accountability and transparency in project delivery and excellence in planning and construction, with many agencies playing a discrete role. For example, the United Kingdom has an agency that evaluates and selects capital projects using standardized criteria, Network Rail, as well as a public-sector cabinet-level (national) Infrastructure and Projects Authority, which supports project delivery across many infrastructure sectors for projects receiving public funds, and a National Audit Office, which provides oversight on major capital projects and agencies like Crossrail Ltd.

The Bay Area lacks a strong framework for accountability and transparency in project delivery. SPUR recommends a bigger role for MTC in providing oversight and accountability over major transit projects. MTC is well positioned to take on a greater oversight role both because it assumes some of the financial risk as a project investor and because it has a broad mandate to serve the public.

One way to address this is for MTC to establish a stage gate process. A stage gate process is a project management technique that divides a project or process into phases or stages, separated by decision points, known as “gates.” During a transit project’s selection and funding, stage gates occur at major project phase transitions and govern whether a project can move to the next stage toward delivery and operation. At each stage gate, project sponsors are required to submit a set of deliverables for evaluation. Stage gates are intended to prevent agencies from making commitments to projects before it is determined that the project is sound, that project sponsors and delivery agents are positioned to succeed, that the goals and objectives remain clear and understood and that the project can be expected to deliver on those goals and objectives within current funding and time constraints.

MTC should define periodic reviews that take place between stages in the transit selection and funding process, using the results of the review to allocate funding and make sure that all actors are fully coordinated and aligned. The review process should be designed to accomplish the following:

- Assess project progress.
- Ensure transparency among stakeholder agencies.
- Identify and reduce project uncertainties.
- Coordinate and gain alignment among project sponsors, funders and other decision-making entities.
- Determine the project sponsor’s organizational readiness.
- Ensure that funding is distributed only to the projects that are ready to advance.
- Support learning by evaluating project performance.

This use of stage gates is a broadly applied best practice. Internationally, it has been deployed with success by a number of delivery organizations for major transit projects. For example, Network Rail, the manager for most of the railway network in the United Kingdom, applied a stage gate process to the Elizabeth Line project; initially intended as guidance, it evolved to inform the governance framework for the project as it revealed the need for stronger decision-making. (See sidebar “Network Rail’s Governance for Rail Investment Process” on page 23.) In the Australian state of New South Wales, infrastructure investment follows a gateway review process with detailed guidance to assist lead agencies in managing structured and transparent reviews between each stage. Similarly, the U.S. Federal Transit Administration (FTA) uses a form of stage gates, defining deliverables that project sponsors must submit in each phase of a project’s life cycle in order to receive funding from the New Starts program.³⁸ This provides sponsor agencies with a clear road map for what must be done to deliver project funding. However, this prominent U.S. model is focused more on funding qualification than on project delivery.

38 Federal Transit Administration (FTA), “Final Interim Policy Guidance Federal Transit Administration Capital Investment Grant Program,” June 2016, https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/FAST_Updated_Interim_Policy_Guidance_June%20_2016.pdf

Network Rail’s Governance for Rail Investment Process

Network Rail is the public owner and operator of the U.K.’s railway network and largest railway stations. Britain’s train-operating companies provide rail service to passengers, leasing and managing stations from Network Rail. This arrangement allows Network Rail to focus on infrastructure management and delivery.

Network Rail developed the Governance for Rail Investment Projects (GRIP) process, a formal governance framework for rail infrastructure projects. GRIP defines products and standards that are required before a project can move to the next phase of project development or construction. Because Network Rail manages such a wide array of projects, the specific GRIP deliverables vary significantly and are customized by staff with approval from a professional board.

FIGURE 7
Network Rail’s Stage Gate Process: GRIP
 The U.K.’s Network Rail³⁹ uses a process called Governance for Railway Investment Projects (GRIP) to manage and control its projects. It breaks down each project into discrete stages and prescribes products to be produced at each stage. A stage gate review is held before a project can move into its next stage.

Initiate		Choose Option	Design		Build	Close	
1	2	3	4	5	6	7	8
Output Definition	Project Feasibility	Option Selection	Single Option Development	Detailed Design	Construction Test & Commission	Scheme Handback	Project Closeout

Recommendation 4

Rigorously evaluate the business case and delivery options for a project, especially before making financial and political commitments to it.

Who’s responsible: MTC, transit agencies, congestion management agencies

As described above, project sponsors are compelled to get their project in the regional transportation plan or in a ballot measure in order to qualify for funding, often without having completed rigorous planning studies. Projects are commonly selected for funding based on initial cost estimates, which can change significantly as discussed above. Spending more time on planning by developing a business case can help the Bay Area improve its investment priorities, reduce the time and cost associated with the environmental review process, lower construction costs, shorten timelines,⁴⁰ change the public discourse around a project’s impacts and help make

39 Network Rail, “Investing in the Network,” 2018, p. 11, <https://www.networkrail.co.uk/wp-content/uploads/2018/02/Investing-in-the-Network.pdf>

40 In a review of “megaprojects” around the world, McKinsey found that spending 3% to 5% of the capital cost of the project on early-stage engineering and design produces far better results in on-time and on-budget delivery. See: Nicklas Garemo, Stefan Matzinger and Robert Palter, “Megaprojects: The Good, the Bad, and the Better,” July 1, 2015, <https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/megaprojects-the-good-the-bad-and-the-better#>

sure that the public agency's governance and management structure for the project are well equipped to deliver a large project.

A business case is a comprehensive approach for assessing the benefits and costs of a project and evaluating the impacts of potential transit investments. Around the world, businesses, governments and other institutions use business case analyses for evidence-based and transparent decision-making. In the public sector, this kind of evaluation allows policymakers and taxpayers to have confidence that the billions of dollars invested in infrastructure will yield worthwhile results. A business case is a key deliverable in a stage gate process. Importantly, completing a business case once is not sufficient. The business case is made and updated several times over the project life cycle, as the project gets clearer and more information becomes available. Additionally, it's important to update the business case when making critical decisions that may significantly alter project costs, such as changing construction methods or using a different technology than originally planned. In sum, a business case analysis helps justify a transit project, makes sure it aligns with the regional vision, serves as a planning tool to determine initial project alternatives and to engage the public and provides an accountability tool for decisions made during project development and construction.

Some Bay Area transit agencies are starting to use business cases to develop their long-range capital plans, including Caltrain for its 2040 vision and BART and Capitol Corridor for a second transbay crossing. SPUR recommends requiring and institutionalizing the practice of using business case analyses. The business case should rigorously evaluate costs and benefits, accounting for major risks and comparing project costs to similar completed projects (known as "reference class forecasting"), and weigh multiple initial project alternatives to reduce the number that must be considered in the environmental process, saving time and money.

Additionally, SPUR recommends requiring and institutionalizing deliverability assessments. A deliverability assessment analyzes all delivery options (see sidebar "Project Delivery Models" on page 34 for more about delivery methods). It evaluates traditional and nontraditional delivery models using a quantitative value for money analysis, identifies stakeholder deliverability requirements, lays the foundation of a project governance structure and evaluates and assigns risks. The first deliverability assessment is typically done prior to design and environmental clearance, because the preferred delivery option may require that the contractor be more heavily involved in design and engineering for the project.

MTC, as a primary funding partner and the entity accountable for establishing the regional transit network, should:

- Create guidance documents so that project sponsors can develop business cases and deliverability assessments that are consistent and comparable for a range of potential capital investments.⁴¹
- Allocate funding for the completion of a business case in the planning and development phase of a project's life cycle.
- For all projects over \$250 million, require project sponsors to submit a business case prior to inclusion in the region's transportation plan for environmental, construction or right-of-way funding and again prior to entering the procurement phase.

41 One such example is the U.K.'s "Green Book," a guidance document developed by the treasury for estimating the social, environmental and economic costs and benefits of projects. (See: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf.) Infrastructure New South Wales also provides detailed guidance materials for various types of capital projects.



- For all projects over \$250 million, require a deliverability assessment at three points: before choosing a final design option, before entering the environmental phase and before entering the procurement phase. Ideally, the deliverability assessment would be produced by a new entity that has specialized procurement and delivery expertise and a regional portfolio, as described in Recommendation 6.

Recommendation 5

Establish integrated project management teams throughout the project life cycle.

Who's responsible: MTC, cities, transit agencies, Infrastructure Bay Area (see Recommendation 6)

A key finding from SPUR's research is that bringing together different skills and expertise is critical for planning and delivering transformational transit projects. An integrated project management team acts as a single point of responsibility for a project's outcomes. The team provides a critical connection between executive leaders, the integrated project team and contractors and enables alignment between all parties and quick decision-making. The entity responsible for building the project must be able to trust the planning process and should not revisit major planning decisions; however, some hard choices inevitably emerge when the project is confronted with difficult or unanticipated challenges. An integrated project management team aligns planning, operating and delivery considerations when these difficult decisions must be made.⁴²

An integrated project management team is especially important if the agency in charge of operating the transit service is not the same agency that is taking the lead on funding, planning or designing the project. The extension of BART into Berryessa offers the region a cautionary case study for other projects, such as the Downtown Extension (San Francisco), high-speed rail or the BART extension from Berryessa to Santa Clara. The BART extension into Berryessa was funded by the taxpayers of Santa Clara County, and VTA planned, designed and delivered the project. But BART operates the trains that serve the extension. Once construction was done, there were over a thousand discrepancies⁴³ that needed to be resolved before BART could begin service, which delayed the project opening by an extra nine months.

Integrated project management teams can lead to better outcomes. For instance:

- Including transit operators in integrated project management teams can improve the project's life-cycle costs and foster system integration and interoperability, especially if the operational decisions are aligned with a project's business case. Their perspective is especially valuable on issues of system interoperability and design decisions such as space planning for stations and passing tracks, as well as maintenance needs and emergency management. Involving operators during the project development and construction phases is critical to ensuring that the project is ready for operations and service, as well as for providing continuous service or alternative modes and customer information during construction.
- Including construction and project delivery experts in integrated project management teams can ensure that funds are used efficiently. For instance, project delivery experts will be able to determine how to best phase projects that are physically co-located, in order to avoid having to demolish or rebuild structures

⁴² PWC, 2014, Successful Capital Delivery: The art and science of effective governance," <https://www.pwc.com/gx/en/industries/assets/pwc-successful-capital-projects.pdf>

⁴³ VTA Board of Directors Meeting, March 5, 2020, <http://santaclaravta.iqm2.com/Citizens/FileOpen.aspx?Type=1&ID=2970&Inline=True>



unnecessarily. Project delivery experts can also weigh the trade-offs of operational considerations against other elements of a project's business case.

- Involving planners in the construction phase helps to retain a project's vision when difficult decisions are required to match the project scope to the budget or when unanticipated conditions arise during construction. Though construction is a late phase in the process, it's still a time when planners may suggest co-benefits that could be worth integrating, such as adding a fiber optic cable network or making surface-level street improvements for biking and walking.

Summary

These recommendations represent an expanded role for MTC, making it accountable for the region's transit network and for implementing checks and balances to make sure that only projects that build out a seamless network are advanced. With better planning and oversight, the Bay Area will get better projects.



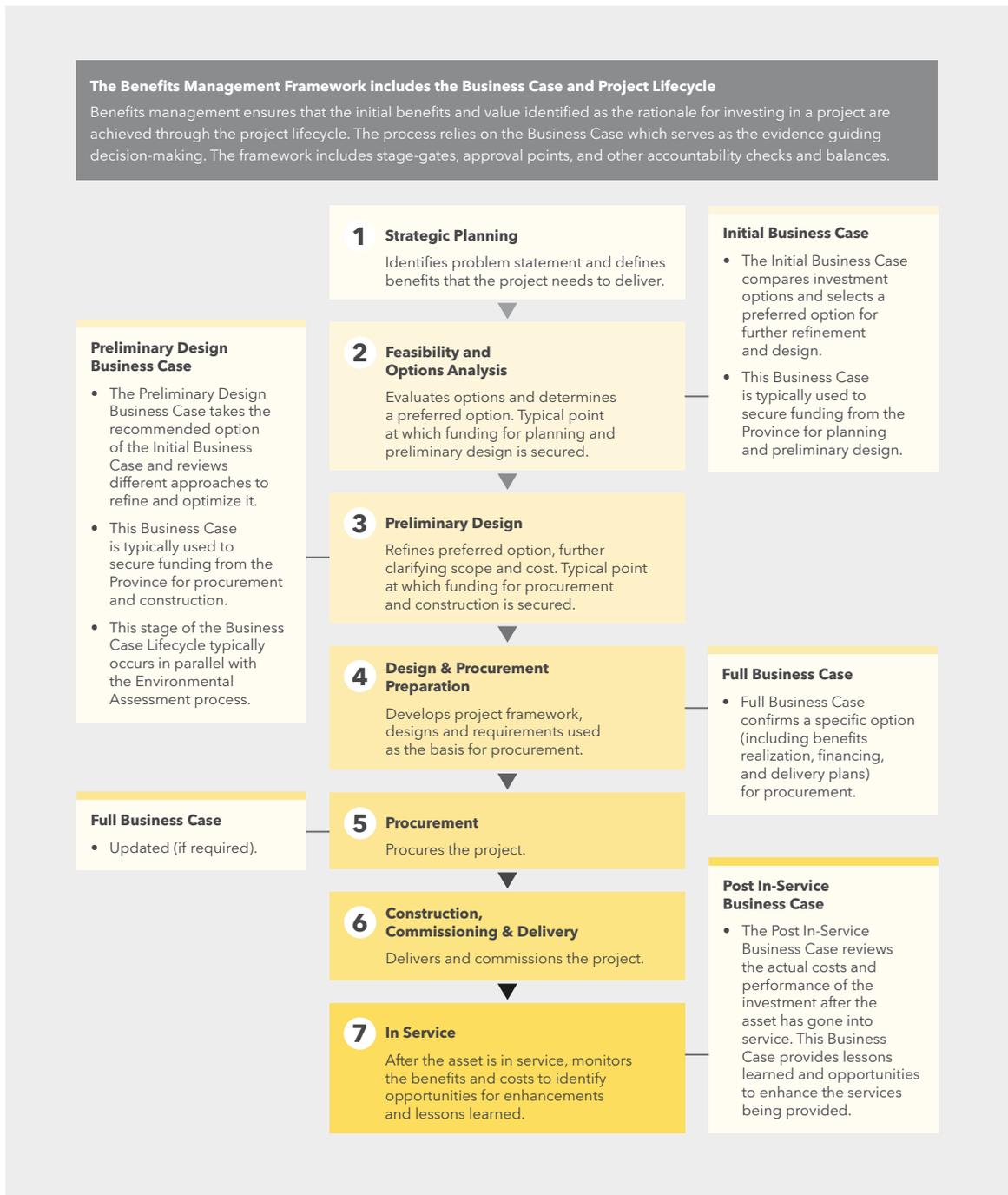


FIGURE 8
Metrolinx Business Case Process
Metrolinx⁴⁴, the regional transportation network planning agency for the Toronto-Hamilton region in Canada, has developed business case

guidance for transit agencies to use for all projects over \$250 million (Canadian dollars). Establishing the business case is an ongoing process. Multiple business cases are completed over the course of a project's life cycle: early

conception and options analysis (initial business case), the identification of a preferred option (preliminary design business case), preferred option development (full business case) and project closeout (post in-service business case).

44 Metrolinx, Business Case Manual Volume 2: Guidance, p. 17, <http://www.metrolinx.com/en/regionalplanning/projectevaluation/benefitscases/Metrolinx-Business-Case-Guidance-Volume-2.pdf>

Big Idea 2

Create a new organization to deliver the region's most significant and high-risk projects.

Challenge

Transit agencies deliver major capital programs and projects just once in a generation, making it difficult to transfer lessons learned from one project to another and to accrue expertise.

A chief problem underlying the Bay Area's repeated failures of project delivery is the fact that so many public transit agencies will deliver just a single major project over the course of several decades of operation. San Francisco Muni is building its first subway in 40 years. Caltrain is embarking on its first major capital investment program since taking over the corridor from the state in 1987. And many new organizations are set up precisely to deliver just one piece of infrastructure and then dissolve. For example, the Transbay Joint Powers Authority was set up to deliver the Salesforce Transit Center, and Valley Link was established to deliver a rail link between Dublin/Pleasanton and Stockton, connecting BART and ACE. When each agency delivers only one project in a generation, every project is at risk of making "first time" mistakes.

Challenge

Transit agencies often lack flexibility in procurement and have a hard time attracting project delivery expertise in-house.

Many transit agencies also have very little flexibility in the procurement and selection of construction contractors. California's procurement laws require public agencies to choose the lowest responsible bidder, meaning the lowest bidder with adequate insurance and licensing.⁴⁵ This is problematic because the lowest bidder may have a poor track record or may lack some of the necessary skills or experience. This law incentivizes contractors to submit a low bid to win the contract but does not ensure quality or prevent cost overruns. Costs can still escalate with last-minute change orders and delays, as has been the case with San Francisco's Central Subway.⁴⁶ Though

⁴⁵ In addition to state laws, federal laws also limit flexibility in procurement. They not only compel project sponsors to select contractors based on a low bid but also require "steel, iron, and manufactured goods used in the project" to be made in the United States. Though this benefits American manufacturing industry and jobs, project sponsors report that it can sometimes lead to higher costs and longer wait times. See: FTA, "Buy America," <https://www.transit.dot.gov/buyamerica>

⁴⁶ Paul Berger, "Port Authority Fights Lawsuit Over Renovation Delays," *Wall Street Journal*, July 14, 2019, <https://www.wsj.com/articles/port-authority-fights-lawsuit-over-renovation-delays-11563120044>; and Joe Fitzgerald Rodriguez, "Central Subway Contractor Dispute Threatens to Bust Budget," *San Francisco Examiner*, July 20, 2019, <https://www.sfexaminer.com/the-city/central-subway-contractor-dispute-threatens-to-bust-budget/>



California's procurement laws are intended to eliminate corruption and enhance fairness, the requirement to choose the lowest responsible bidder can sometimes generate unnecessary time and cost and may not always lead to a high-quality product.

Transit agencies also face difficulties recruiting seasoned procurement and project management experts who can implement nontraditional delivery strategies (for examples of these methods, see sidebar, "Project Delivery Models" on page 34). Several experts SPUR interviewed argued that one reason transit agencies have a difficult time attracting these specialized skills is that civil service compensation packages are not competitive with those in the private sector. Additionally, similar roles in the private sector allow for opportunities to work on iconic projects around the world with less complex regulatory and stakeholder environments. Aside from the new span of the Bay Bridge, the Bay Area has not built an iconic project for some time, in part because it is a notoriously difficult context to navigate.

Challenge

Transit agencies have few choices in selecting project delivery models and little experience with nontraditional models.

Transit agencies tend to have few choices in how they hire contractors to design and build projects, often relying on traditional design-build or design-bid-build models. These models typically only involve contractors in the latter stages of the projects, yet many project delivery experts agree that projects benefit from involving contractors earlier in the process, particularly on complex projects. As a result, projects lack the benefit of bringing delivery expertise and a full understanding of life-cycle costs into the project decisions.

Even when the State of California grants transit agencies the authority to enter into different types of project delivery models, the agencies often lack the expertise or staff capacity to comprehensively evaluate different models or to understand the market conditions in order to effectively bid, award and manage the contract. Transit agencies in California were granted the authority to implement design-build contracts in 2001⁴⁷, yet because so few projects have been built, few are experienced with this tool. Similarly, transit agencies could issue smaller, phased contracts instead of a lump-sum contract, but many do not. A lack of expertise often translates into a public agency having less control over performance, work quality and cost.

⁴⁷ California League of Cities, "Design-Build for Public Works Projects," May 6, 2015. <https://www.cacities.org/Resources-Documents/Member-Engagement/Professional-Departments/City-Attorneys/Library/2015/2015-Spring-Conference/5-2015-Spring-David-Gehrig-Design-Build-For-Public.aspx>



Project Delivery Organizations Around the World

The recommendations in this report are informed by a literature review on megaproject delivery, lessons learned from Bay Area project delivery practitioners through interviews and a task force, and interviews with organizations in other countries that are responsible for project delivery and procurement, either directly or in an oversight capacity. SPUR cast a wide net to capture all the possible solutions to the problem of project delivery, then narrowed down the list to those that would have the greatest chance of success in the Bay Area context.

The following types of organizations have been established in other countries to support excellence in project delivery. We evaluated each one for its potential to address the Bay Area's project delivery challenges, which led to the development of Recommendation 6. For case studies from our research, see our companion paper, *Infrastructure Bay Area: A proposal for successful delivery of transformative transit projects* (spur.org/IBA).

→ **Skill academies:** Skill academies focus on building the highly skilled labor force needed to undertake major infrastructure programs. One such example includes the U.K.'s Tunneling and Underground Construction Academy, which trains people in this unique skill set.

Upshot: Skill academies play an important part in building the workforce needed for successful project delivery, and SPUR would support bringing this idea to the Bay Area and, more broadly, California. However, workforce development is outside the scope of this report.

→ **Centers of excellence:** Centers of excellence operate as specialized advisors and consultants to public agencies on some or all parts of project delivery. These are intended to supplement the expertise of project sponsors and add greater objectivity to the project delivery process. Some project delivery agencies also function as centers of excellence. For instance, for large transit projects, Infrastructure Ontario both directly manages the procurement and delivery of major infrastructure projects and also provides advisory services to other public agencies on commercial transactions.

Upshot: Though centers of excellence are one way to bring specialized expertise in procurement and project delivery and can supplement the capacity of existing agencies, a new agency that advises but does not directly manage procurement and project delivery runs the risk of becoming too detached from the actual project and its financial risks. Additionally, setting up such a center may not add much more value than if a project sponsor were to hire a private-sector consultant with the relevant expertise.

→ **Single-project planning and delivery entities:** Some entities are established to plan, procure and deliver single projects. These typically sunset once the project wraps up and control of the facility transfers to the operator or owner. Such an entity is often a subsidiary organization or public-private partnership composed of project sponsors and local, regional or state governments. The singularity of both purpose and project means that everyone can focus on one goal: planning and delivering the project.

Upshot: This model is already in use in the Bay Area. The Transbay Joint Powers Authority and Valley Link are two such examples. Though this model brings clarity of focus and more direct accountability to communities impacted by the project, it runs the risk of perpetuating two central challenges that we are working to overcome: the need to apply lessons learned from one project to another and the need to build a more integrated transit network.



→ **Specialized procurement and delivery entities that deliver multiple projects or a related program of projects:** Some organizations have narrow mandates to provide procurement and construction expertise for many projects. Typically, these organizations are set up as a way to ensure that public funds are used responsibly and deliver good value for the money. Infrastructure Ontario is one such example, as it delivers projects across many infrastructure sectors. The agency accrues expertise from project to project and becomes an attractive place to work because it delivers many (often iconic) projects, since it does not sunset after the completion of a single project. Importantly, these kinds of entities are typically used for large capital programs that could best be understood as multiple, related megaprojects.

A variant on this model is an organization that manages procurement and construction but also manages planning and design. This type of horizontally integrated organization is a common model used to deliver stations, new rail lines and station area redevelopment in Germany and France. Some examples include Euralille, the Société du Grand Paris and Crossrail Ltd. We explore these models in greater depth in our companion paper *Infrastructure Bay Area: A proposal for successful delivery of transformative transit projects* (spur.org/IBA).

Upshot: This white paper recommends that the Bay Area establish a sophisticated project delivery entity that procures and constructs the region's most significant transit projects. This new entity would have a high level of project delivery expertise on staff and on the board, and this expertise would grow over time by delivering project after project. While Infrastructure Bay Area should be involved in the planning process in an integrated project management team, it is unlikely that transit agencies will be fully willing to cede decision-making authority and planning decisions to another entity.

Recommendation 6

Establish Infrastructure Bay Area, a project delivery entity responsible for the successful delivery of the region's most significant megaprojects.

Who's responsible: California legislature, governor of California, transit agencies

Based on our research into project delivery methods used around the world (see sidebar “Project Delivery Organizations Around the World” on page 30), SPUR recommends establishing Infrastructure Bay Area (IBA), a highly specialized regional government entity that would centralize and lead the procurement and delivery of major transit projects that are also high-value and high-risk. Specifically, IBA would be the default project delivery entity for projects that are estimated to cost over \$1 billion and are considered to be “regionally significant.” Regionally significant projects include those that provide a backbone connection between major areas of economic activity in the region and the state, that shape urban form and create significant new opportunities for growth, or are a critical piece of infrastructure whose design affects the functioning of the regional transit network. This would include, but not be limited to, multimodal stations where many services integrate and major capacity improvements to regional services that carry a large proportion of the Bay Area's riders. Like similar organizations around the world, IBA would be driven by a goal of delivering long-term value for the money to the public.

The creation of a major new governmental entity is a significant undertaking, and we do not suggest it lightly. Below we describe the benefits of establishing IBA. We delve much further into this idea in our companion paper *Infrastructure Bay Area: A proposal for successful delivery of transformative transit projects* (spur.org/IBA). There we share a proposal for IBA's mandate, define roles and responsibilities, provide case studies of similar organizations around the world and outline key factors to consider for successful organizational structure and design.

Benefits of Infrastructure Bay Area

A single entity that delivers a portfolio of projects across the region would be uniquely able to:

- Learn and accrue expertise from one project to another.
- Create greater interoperability across projects and accelerate progress toward a seamless transit network.
- Sequence construction projects to achieve cost efficiencies and synergies with other projects or goals.
- Create an organizational structure and operational governance model that is optimized for project delivery.
- Align the accountability for cost, schedule and risk with a public-sector entity that has a mandate to deliver good value for the money to the public.
- Bring a comprehensive and consistent approach to project management and project controls.
- Nurture and monitor market conditions for the interaction of different procurements at any given time and

note how they affect the delivery of each project.

→ Advise on regional and statewide workforce development and mobilization needs.

If we continue to plan and deliver projects the way we always have, each transit agency will continue to make “first timer” mistakes with every project, with minimal oversight and accountability to the public. Each agency will persist in solving similar problems independently, invent new practices for estimating costs and controlling project risks separately, purchase project management platforms and technologies independently, compete against each other for talent, confront rules about procurement one by one, and seek special exemptions and authorities individually. Centralizing project delivery in one entity can help the Bay Area overcome many of these challenges.

See our companion paper *Infrastructure Bay Area: A proposal for successful delivery of transformative transit projects* (spur.org/IBA) for our complete recommendations for establishing this new entity.

Recommendation 7

Give Infrastructure Bay Area the ability to use nontraditional project delivery approaches.

Who’s responsible: California legislature

SPUR recommends that IBA be given broad authority to enter into contracts for a variety of project delivery methods and to consider qualifications that offer the best value to the public, not only the lowest cost. Large projects resist a template approach. Therefore, IBA must have the ability to choose the right delivery approach for the project (and for different components of the project). IBA should not be limited to traditional design-build or design-bid-build models (see “Project Delivery Models” sidebar on page 34).

California has been slow to allow nontraditional delivery models for public infrastructure.⁴⁸ When agencies are permitted to use nontraditional models, they receive that authority on a case-by-case basis through discrete legislation. This would be impractical for an agency charged with delivering a large number of projects. Instead, IBA should be able to use a wide range of nontraditional project delivery approaches, and its authorities could mirror the broad procurement authorities of other public agencies such as VTA, the California High-Speed Rail Authority or the University of California.

⁴⁸ Bay Area Council Economic Institute, *Public-Private Partnership in California: How Governments Can Innovate, Attract Investment, and Improve Infrastructure Performance*, August 2018, <http://www.bayareaeconomy.org/files/pdf/P3inCaliforniaWeb.pdf>



Project Delivery Models

Infrastructure Bay Area should be authorized to use a variety of project delivery options, including but not limited to:

- Design-Bid-Build: The project sponsor hires two separate entities, one for design and one for construction, with separate contracts and responsibilities. This is the most traditional project delivery approach.
- Design-Build: The project sponsor hires one entity for both the design and construction of the project. The design-build contractor assumes responsibility for the majority of the design work and all construction activities, together with the risks associated with providing these services, for a fixed fee. The project sponsor retains responsibility for financing, operating and maintaining the project.
- Construction Manager/General Contractor (also known as “construction manager at risk”): The project sponsor hires a contractor to act as a consultant and provide feedback on the design and constructability during the design phase. This approach brings the project sponsor, the designer and the contractor together early on and enables the project sponsor to more readily control construction costs and final plans. Cost savings from risk mitigation accrue to the project sponsor. Consulting the contractor at the beginning can be especially beneficial in urban areas or on projects with highly sensitive schedules.
- Design-Build-Finance: The project sponsor awards a single contract for the design, construction and full or partial financing of a project. The design-builder assumes responsibility for the majority of the design work, all construction activities and the short-term financing for all or a portion of the project, together with the risk of providing these services, for a fixed fee. Responsibility for the long-term maintenance and operation of the facility remains with the project sponsor.
- Design-Build-Finance-Operate-Maintain: The responsibilities for designing, building, financing and operating are bundled together and transferred to private-sector partners. This is beneficial when the project sponsor does not have the capacity to operate and maintain the infrastructure or prefers to transfer most of the life-cycle costs of the project to the private sector.

Recommendation 8

Allow Infrastructure Bay Area to select a bidder on the basis of the best value rather than cost.

Who's responsible: California legislature, governor of California

Transit agencies in California must choose the lowest responsible bidder that responds to the request for proposals, but as discussed in the Big Idea 2 “Challenges” section above, this does not always lead to the best outcomes. Greater flexibility in choosing third-party contractors, combined with rigorous oversight to ensure fairness, can help reduce uncertainty and improve quality in project delivery. Infrastructure Bay Area could have more freedom to choose the right team for the job if it were able to select a bidder on the basis of the best value. “Best value” refers to a contracting strategy that allows project sponsors to consider the additional value a contractor can offer in addition to the bid price, such as the contractor’s track record of on-time delivery, safety record, labor compliance and experience.

There are examples of projects and public agencies in California that have been permitted to use best-value procurement for specific projects, such as the University of California⁴⁹ (until the law sunsetted in 2015), VTA and Caltrans (until the law sunsetted in 2014). This level of flexibility should be extended to Infrastructure Bay Area to benefit multiple projects. This recommendation is best suited to projects that are funded entirely with state, regional and local dollars, as federal laws also limit agencies’ ability to consider best-value criteria in procurement.

Summary

SPUR does not recommend new institutions lightly. However, the Bay Area needs an organization that can bring specialized project delivery experience and a portfolio-scale approach to building the region’s most important transit projects more quickly and cost-effectively. This is an idea that can’t wait: Infrastructure Bay Area can begin to deliver value immediately by bringing expertise to the projects that are being designed today.

⁴⁹ University of California Office of the President, “Best Value Construction Contracting Program,” <https://www.ucop.edu/construction-services/programs-and-processes/best-value/best-value-pilot-program.html>

Big Idea 3

Streamline environmental laws for projects that deliver significant environmental benefits.

Even with greater procurement and delivery expertise, projects will still be subject to California's uniquely complex regulatory environment, which contributes to cost and delay. The recommendations in this section largely focus on creating targeted exemptions and streamlining under the California Environmental Quality Act (CEQA) to accelerate the delivery of the Bay Area's most sustainable transit and transportation projects, enabling greater access, affordability and health while making progress toward our climate goals.

Challenge

CEQA can add significant uncertainty, cost and delay to projects.

CEQA is a state law that requires state and local agencies to identify the significant environmental impacts of projects they approve and to avoid or mitigate those impacts, if feasible.⁵⁰ Under CEQA, the public agency responsible for carrying out and approving the project (which is typically, but not always, the project sponsor) must evaluate the environmental impacts of a project and prepare findings about whether or not the project will have significant impacts on the environment. This evaluation is the basis for many state and local approvals needed to deliver the project.

The most in-depth environmental document required is an environmental impact report (EIR), which discloses the significant environmental effects of a project and identifies project alternatives and possible mitigations for the impacts the project will cause. For projects that must complete an EIR — and most transit projects do — this can be a lengthy and costly process. Anecdotally, relatively simple analyses, such as those that find a project will not need to declare any environmental impacts, can cost tens of thousands of dollars, and depending on the type of project, a complete EIR can cost millions of dollars.

Additionally, each step of the process is subject to appeals and lawsuits that can increase project costs and create delays. Appeals can regularly take six months to resolve, and lawsuits can take years. Lawsuits can also impact the eligibility of a project for federal grants, putting the project's funding at risk.

50 California Department of Fish and Wildlife, "A Summary of the California Environmental Quality Act", <https://wildlife.ca.gov/Conservation/CEQA/Purpose>

Challenge

Misuse of the environmental review and permitting worsens the region's racial and economic inequities.

Public reaction to streamlining or exempting projects from CEQA often includes concern that doing so would be inequitable or would perpetuate harms against marginalized people, especially people of color. This objection assumes that CEQA is equitable. Yet CEQA has often been used as a tool to oppose and delay critically needed projects — even those that would improve air quality, improve safety and reduce greenhouse gas emissions in the communities that need it most.⁵¹ An analysis of CEQA lawsuits filed between 2010 and 2012 found that the most commonly targeted type of public infrastructure project was transit systems.⁵²

Though many communities do use CEQA lawsuits to raise valid environmental concerns, CEQA is frequently invoked to obstruct projects for reasons that have nothing to do with the environment, consequently eroding environmental quality and community health.^{53, 54} As explained in the sidebar “How Poor Project Delivery Perpetuates Inequity” on page 9, an individual used CEQA to hold up the construction of bike lanes in San Francisco for four years. During that same time period, nine people were killed and more than 2,000 people were injured while riding their bikes in the city.⁵⁵ At the time of this writing, the same person is appealing the city's Slow and Safe Streets program,⁵⁶ a cornerstone of the city's COVID-19 recovery plan that enables people to travel at safe social distances during the pandemic. These appeals and lawsuits are not being brought on the basis of air quality or water quality or other valid environmental impacts, but rather over the loss of parking spaces and impacts on traffic congestion.

Even appeals and lawsuits that do not hold up in court still add time and cost to projects. As mentioned earlier, the East Bay Bus Rapid Transit project, which was intended to span from Berkeley to San Leandro, was significantly reduced after a business owner in Berkeley threatened to sue over parking losses. Cutting the project back significantly reduced transit access for some of the most racially and economically diverse neighborhoods in the East Bay.

Though some argue that exempting projects from CEQA perpetuates inequities, underinvestment in sustainable transportation projects that improve access and affordability and community health is also inequitable. For example, a lack of high-quality transit makes communities across California more reliant on cars, which increases congestion and pollution. But it is people of color and low-income populations who shoulder a disproportionate burden of air pollution from vehicles and who consequently experience higher rates of

51 Jennifer Hernandez, David Friedman and Stephanie DeHerrera, “In the Name of the Environment: How Litigation Abuse Under the California Environmental Quality Act Undermines California's Environmental, Social Equity and Economic Priorities — and Proposed Reforms to Protect the Environment from CEQA Litigation Abuse,” Holland & Knight LLC, 2015, https://issuu.com/hollandknight/docs/ceqa_litigation_abuseissuu/102

52 Ibid.

53 Erin Baldassari, “BART to San Jose: Sharks Sue Over Downtown Extension,” *San Jose Mercury News*, May 3, 2018, <https://www.mercurynews.com/2018/05/03/bart-to-san-jose-sharks-sue-over-downtown-extension/>

54 Bob Staedler, “What to Do When Neighboring Cities Become Enemies,” *Silicon Valley Business Journal*, June 29, 2018, <https://www.bizjournals.com/sanjose/news/2018/06/29/bob-staedler-silicon-valley-synergy-land-use-ceqa.html>

55 Based on a query of bicycle collisions within the city of San Francisco between January 1, 2006, and December 31, 2010, which are the years that the bicycle plan was in litigation. See: <https://transbase.sfgov.org/dashboard/dashboard.php>

56 <https://sfplanning.org/resource/ceqa-exemptions> (Record 2020-005472ENV)

asthma^{57, 58, 59} and other health conditions, traffic injuries and death.⁶⁰

Though CEQA is intended as a disclosure tool to protect the environment, it is often counterproductive to today's pressing environmental issues in ways that are disproportionately harmful to communities of color and low-income communities.

As described above, CEQA appeals and lawsuits frequently have inequitable results. Despite sometimes yielding inequitable *outcomes*, CEQA is sometimes perceived as enabling an equitable *process*. For decades, marginalized communities have not been adequately engaged in project planning, and many transportation projects have left deep scars through neighborhoods. Because CEQA is a legally mandated process, and because litigation is a powerful tool to hold bad actors accountable (which other planning processes do not do), efforts to reform CEQA also need to address this legacy of process disempowerment. Our recommendations for addressing this legacy can be found in Recommendation 10.

Environmental Review for Transit and Sustainable Transportation in Other Countries

In other countries, transit and sustainable transit projects are commonly presumed to have a net positive environmental impact by reducing driving and greenhouse gas emissions. In Canada, most public transit projects do not have to complete a full environmental assessment and instead can use an abridged environmental review, which takes approximately six months to complete.⁶¹ In Germany, the regional transit coordinator and transit operators can self-certify the environmental review for most transit projects.⁶² These are special processes that expedite projects because the government recognizes the critical importance of transit infrastructure to the environment and the economy.

In contrast, projects in California must perform two layers of environmental review. Project sponsors are required to comply with CEQA and to complete a related but somewhat different environmental impact statement (EIS) under the National Environmental Policy Act (NEPA) if the project receives federal funding or requires a federal permit.

57 Union of Concerned Scientists, *Inequitable Exposure to Air Pollution from Vehicles in California*, January 28, 2019, <https://www.ucsusa.org/resources/inequitable-exposure-air-pollution-vehicles-california-2019>

58 Environmental Defense Fund, "Air Pollution and Health in East Oakland," <https://www.edf.org/airqualitymaps/oakland/air-pollution-and-health-east-oakland>

59 Bay Area Regional Health Inequities Initiative (BARHII), *Health Inequities in the Bay Area*, <https://www.barhii.org/health-inequities-in-the-bay>

60 Smart Growth America, "Dangerous by Design," 2019, <https://smartgrowthamerica.org/dangerous-by-design/>

61 Ontario Ministry of the Environment, Conservation and Parks, "Guide to Environmental Assessment Requirements for Transit Projects," January 2014, <https://www.ontario.ca/page/guide-environmental-assessment-requirements-transit-projects#section-3>

62 Interview with Gisela Graf von Shlieffen, August 8, 2019.

Challenge

The environmental review process is improperly used as a planning process.

The California Code of Regulations encourages an EIR to be combined with planning, review and project approvals processes.⁶³ But in many cases, the CEQA process is used to suffice for a planning process. Though the environmental review process should be used to disclose and inform the public of potentially significant environmental impacts, it is problematic when it is used as the primary way to set goals and analyze alternative project scopes and designs. In many places with more robust accountability and oversight structures for project delivery, such as the U.K., Canada and Australia, alternatives are analyzed through business cases.

An environmental impact review is also a poor substitute for meaningful and proactive public participation. When members of the public use the public comment period to propose a new alternative or clarify their priorities, it is often late in the environmental review process, after a public agency has already invested millions of dollars and several years. At this point, the agency may be reluctant to study new options, as pursuing further study creates additional delays and increases costs. A more effective way for a project sponsor to engage people is to initiate a public process when it prepares its business case. This early engagement provides opportunities for communities to shape the project goals and the concepts for further development at the project outset.

Recommendation 9

Establish a statewide certification process for major transit projects over \$1 billion that would reduce uncertainty and undue delay and cost in exchange for adopting best practices in project delivery.

Who's responsible: California legislature, governor of California, cities

SPUR recommends that the state establish a certification process for major transit projects over \$1 billion (“megaprojects”) — particularly those that have critical significance to the regional and statewide transportation network and that offer significant environmental benefits, such as intermodal stations, the electrification of rail lines or new dedicated fixed-route rail and bus corridors.

A certification process would recognize the important role that these projects play within the transportation network and in reaching the region’s policy goals, as well as the unique characteristics of megaprojects that make them extremely difficult to deliver on time and on budget. In other words, the certification would be designed as an incentive to control costs and scope.

⁶³ California Code of Regulations, 14 CA ADC § 15080, [https://govt.westlaw.com/calregs/Document/IA5BFBA20D48811DEBC02831C6D6C108E?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=\(sc.Default\)](https://govt.westlaw.com/calregs/Document/IA5BFBA20D48811DEBC02831C6D6C108E?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default))



Common Challenges for Megaprojects: The 7 Cs

Megaprojects “tend to be *colossal, costly, captivating, controversial* and *complex*. They are laden with issues of *control* over financing, design and project development because multiple layers of key actors must interact across many sectors, public and private. As a result, they also are in need of much *communication* between key actors, the media and the public as there often is lack of transparency and accountability built into processes. These characteristics in combination complicate project timelines, cost estimates and other outcomes in the public’s interest.”

— KAREN TRAPENBERG FRICK

*Remaking the San Francisco–Oakland Bay Bridge: A Case of Shadowboxing with Nature*⁶⁴

A certification process could also be a lever for implementing additional project delivery or sustainable development best practices. The governor could require a project sponsor to complete an independent peer review, develop a transit-oriented station area plan that maximizes sustainable growth and create a station access strategy that promotes walking, biking and transit use.

The certification is an incentive to control costs while also providing critical regulatory streamlining and access to capital. Some of the benefits of certification could include:

- *Shortening the judicial review period for appeals related to CEQA or the granting of project approvals to 270 days.* SPUR recommends shortening the judicial review period for CEQA-related appeals. Appeals should be resolved within 270 days of filing the certified record of proceedings with the court. Reducing the judicial review period to nine months represents a significant time savings for the project while preserving the integrity of CEQA. There is already precedent for truncated judicial review in 2011’s Jobs and Economic Improvement Through Environmental Leadership Act (AB 900).
- *Reducing some of the impacts that must be analyzed under CEQA.* There is precedent for this in 2018’s Transportation Impacts Bill (SB 743), which lowers the number of impacts that must be analyzed under CEQA for infill housing projects.
- *Providing priority access to low-cost or no-cost capital.* There is often a large discrepancy between initial cost estimates and actual costs because projects take so long to fund and to get underway, and the costs increase year over year. Instead of spreading out state funding so that it does not meaningfully advance any project, investments should be prioritized.
- *The use of, and funding for, advanced mitigation credit agreements.* In 2017, MTC created a Regional Advance Mitigation Program (RAMP) for transportation projects to mitigate their potential environmental impacts. This is a valuable tool for project delivery and for conserving and adapting the Bay shoreline.

64 See note 12.

Agencies that participate in RAMP can receive a mitigation credit with the California Department of Fish and Wildlife. However, RAMP is unfunded and therefore does not have land to bank, so agencies cannot purchase credits. One benefit could include additional state funding for mitigation through RAMP.



Photo by Sergio Ruiz

Bus rapid transit projects, bicycle facilities and pedestrian safety projects are often the target of appeals and lawsuits under CEQA, despite delivering significant environmental and community health benefits, such as better air quality.

Recommendation 10

Give statutory exemptions to bus rapid transit, bicycle enhancement projects and pedestrian improvements.

Who's responsible: California legislature, Governor's Office of Planning and Research

A statutory exemption wholly excludes a project from CEQA, meaning that the project does not need to complete an EIR and is not subject to litigation risk. SPUR believes that some projects have such significant environmental, health, safety and equity benefits and are so critical to local and regional mobility needs that they should be expedited. These projects — including bus rapid transit, bike infrastructure, complete streets and other pedestrian improvements — are excellent candidates for statutory exemptions.



Though the construction of these projects may have near-term environmental impacts in their communities, their long-term environmental, health and equity benefits to the community are often much greater than the short-term impacts. Additionally, many are located in urban areas where there are fewer impacts to biodiversity and/or fewer mitigation opportunities.

We believe the following types of projects should receive statutory exemptions from CEQA:

- Any project in an urbanized area that implements or increases high-occupancy bus service or bus rapid transit on dedicated lanes, as well as new transit prioritization projects and facilities that increase speed and reliability on an existing right-of-way, whether or not the right-of-way is currently used for transit.
- Any classification of bicycle ways on existing public rights-of-way, including but not limited to bicycle routes, bicycle lanes, bicycle boulevards and cycle tracks.
- The creation of new facilities that support walking and street safety, including but not limited to sidewalks, trails, intersection treatments, signage and marking.

In keeping with CEQA's intent both to safeguard the environment and to give people the ability to voice their concerns about projects on the record, we propose a set of guardrails that projects must adhere to if they are to receive a statutory exemption:

- The project sponsor must be a public agency.
- The project sponsor must have undertaken a public process during early planning stages prior to seeking a statutory exemption as described below.
- The project must be located in an urbanized area, where there tend to be fewer environmental impacts to biodiversity.
- Projects over \$100 million must be included in a regional sustainable communities strategy or other plan that has complied with CEQA at a programmatic level.
- The project must not add any automobile capacity, to avoid increasing auto use and greenhouse gas emissions.
- The project must not demolish affordable housing.
- The project must not have an impact on endangered species.

Because CEQA is a way to give communities a voice in projects, policies for streamlining and exempting transportation projects should explicitly be designed to overcome process disempowerment and ensure community-led decision-making. As described above, we believe that community participation often comes too late in CEQA, or is too narrowly confined to environmental issues in the early scoping phase — rather than on



critical concerns around racial impacts and displacement. Some ways to ensure community-led decision-making include:

- Requiring that the lead agency or project sponsor complete a public planning process to shape the project goals and alternatives prior to filing a notice of exemption or an application for streamlining
- Requiring that the lead agency or project sponsor complete a racial equity analysis to understand disproportionate benefits and burdens and recommend mitigations
- Requiring that the lead agency or project sponsor create a construction mitigation program and hold public meetings with impacted communities throughout construction.
- Requiring that the lead agency or project sponsor provide documentation that the project has offered opportunities for impacted communities to be heard and that these opportunities were accessible, culturally competent and linguistically appropriate.

Summary

Though CEQA is not the only source of project delivery challenges, it is one that nearly every transit and sustainable transportation project encounters. Creating targeted new exemptions and streamlining will allow projects that significantly benefit the environment, equity and health to be delivered more quickly and cost-effectively.

Appendix A

Project Costs

Figure 6 shows the magnitude with which project cost estimates can change from the time that an initial or early public commitment is made. The figure is based on project cost estimate data taken at three different points in a project's life cycle for a handful of recently completed and ongoing rail and transit projects in the Bay Area. This appendix discusses how to interpret these data points, explains our methodology and provides sources for each data point.

Importation Cautions

1. This chart should not be used to compare projects to each other or to compare agency performance relative to other agencies. Each project is unique.
2. This chart can be used to get a high-level sense of the magnitude with which project cost estimates can change from the time that an initial or early public commitment is made.
3. Changes in cost should not be interpreted as malfeasance. Cost differences often reflect the evolution and refinement of a project as it moves beyond its most conceptual stage through the design and engineering process.
4. The lack of consistent cost estimation practices makes it difficult to derive precise conclusions about any given project or to make sweeping conclusions about the set of projects.

Key Takeaways

Takeaway 1:

Project sponsors in the Bay Area consistently underestimate how much projects will cost. Comparing the early estimates with advanced estimates gives an indication of how much project cost estimates can change between the time that an initial or early public commitment is made and when a project's design comes into focus. Though it is not possible to pinpoint the specific reasons why project costs escalate using these data points, this graphic shows how Bay Area transit agencies are consistently too optimistic in their early estimates of project costs. The danger in overly optimistic early estimates is that transit leaders, and the public, make commitments to projects based on incomplete and generally inaccurate information. By the time a project is finished, the costs may have increased so much that it is unlikely the project would have been selected had realistic cost-benefit metrics been available at the outset.

Takeaway 2:

A significant amount of cost escalation happens simply because projects take so long. Projects often face a vicious cycle: The higher the initial cost, the longer it takes to fund them. The longer it takes to fund them, the more the project costs grow. Project costs tend to increase on an annual basis based on changes in construction



costs (e.g., labor and materials), which can range from 3% to 5% per year on average. When a project is delayed, the costs inevitably go up. Shifting timelines have accounted for up to 30% of a project's total cost.

In some cases, the cost escalation — including both annual construction increases and changes due to other factors — is almost double the project's initial cost. Market conditions may also change along with shifting timelines. When the market is slow, competition for public projects may be much higher and bids may be lower, and vice versa.

Together, these takeaways suggest how vulnerable transit agencies are to the optimism bias and underscores the importance of having a business case with comprehensive cost estimates that use reference class forecasting prior to making political or financial commitments to a project.

Comparing the advanced estimates with the latest estimates or actual expenditures gives an indication of how much project cost estimates can change from the environmental review phase to procurement and construction. The findings show large cost escalations as projects move into final design and engineering, procurement and construction — underscoring the importance of project delivery improvements, in addition to having more robust planning and oversight processes. It is not possible to pinpoint a single cause for the cost escalation. The cost escalations can represent a number of factors, including but not limited to refinements to the design (most projects have only 20% of their design completed at the environmental review stage), the incorporation of transaction and finance costs, changes in labor costs and materials, hurdles in the construction phase, mismanagement or other issues.

Point-in-Time Cost Estimate Data

“Early estimates” describe cost estimates that occur early in a project's life cycle and before a project is designed. These early cost estimates are typically used to garner initial financial commitments and political or public support, either through a ballot measure, a county transportation plan or a regional transportation plan.

“Advanced estimates” describe cost estimates that occur when a project has completed some portion of design but has not entered into procurement. Typically, advanced estimates come from environmental impact statements (EIS) and environmental impact reports (EIR).

“Latest estimates” or “actual expenditures estimates” describe the most recent available information. Actual final costs are used if the project is complete. If the project is not complete, the latest estimate represents a recent and publicly available cost estimate. Some of these come from a supplemental EIS and EIR, construction updates or the project sponsor's board meetings.

All sources are cited below.

How to Interpret This Chart

All projects listed in Figure 6 are measured against a total: 100%, which refers to the initial project cost plus annual construction cost increases.

One reason project costs increase is because the project timeline changes. We sought to answer the question: How much of the advanced or latest/final cost estimates might be attributable to annual construction cost increases? Understanding this annual cost escalation helps us isolate some of the changes that might be due to scope changes or problems during design and construction, which are partially preventable with the



appropriate planning, procurement flexibility, oversight and management types, as described in this paper. In other words, 100% is the cost of the project without any other possibly preventable “changes due to other factors.”

Example: The initial cost estimates for SMART were approximately 70% of the latest estimates. Another 30% of the project cost can be attributed to annual construction cost escalations.

Changes due to other factors are displayed as a project cost exceeding 100%. Changes due to other factors could include problems during construction, such as a large number of change orders or problems with utility relocation. Changes due to other factors could also be scope changes such as changes in technology or tunneling method or the addition or reduction of a station. For example, the Central Subway’s early cost estimates had the project following an entirely different route than it currently follows (Third Street instead of Fourth Street).

Example: For the Oakland Airport Connector, there was a 59% increase in project costs above initial cost estimates and annual construction cost escalation.

Methods

Step 1: SPUR relied on public documents generated by the project sponsors or their partners to identify project costs. SPUR verified that the estimates corresponded with the appropriate point in a project’s life cycle (early, advanced, latest/actual). Costs represent capital costs. Fleet costs were excluded.

Step 2: We standardized costs to the extent practical. Project costs are not estimated and reported across agencies in a consistent manner. For example, some agencies report cost estimates as base-year expenditures, and others report them in the year of expenditure. For those that report in the year of expenditure, there are many different cost escalation rates used. Some “advanced” estimates are at less than 10% design, whereas some are closer to 30% design. The lack of consistent cost estimation practices makes it difficult to derive precise conclusions about any given project or sweeping conclusions about the projects as a whole. (This should be a consideration for MTC in developing project business case guidelines and its project oversight role.)

If costs were given as base year but the base year was not stated, the base year was assumed to be the year of completion for the public document that contained the published cost. For instance, if the document was published in 2006, we assumed the base year to be 2006. We adjusted cost estimates to the midpoint of construction based on annual construction cost escalation factors, for the reasons described above. We applied a standard annual escalation rate of 3.5% to initial cost estimates, unless the agency specified a different escalation rate for a project (e.g., the Downtown Extension project used a 5% escalation rate).

For estimates that were provided in the year of expenditure, construction costs were already internalized in the cost estimate and therefore were not accounted for separately. However, adjustments were made if a public data source confirmed a shift in the project timeline and provided a new year of expenditure and/or construction schedule.

Costs were further standardized by estimating the amount of increase due to construction costs, as described above.

Sources

SMART (Larkspur to Cloverdale)

Early Estimate	\$541,000,000	Sonoma-Marín Area Rail Transit District Measure Q Ballot, 2008, Table 1, p. 14, https://www.marincounty.org/-/media/files/departments/rv/elections/past/2008/nov/measureq.pdf
Advanced Estimate	\$650,000,000	<i>Sonoma-Marín Area Rail Transit District 2014 Strategic Plan</i> , pp. 9-10, https://mtc.ca.gov/sites/default/files/SMART-2014-StrategicPlan-Final.pdf
Latest Estimate/Actual Expenditure	\$791,000,000	<i>Sonoma-Marín Area Rail Transit District 2019 Strategic Plan</i> , p. 20, https://www.sonomamarintrain.org/sites/default/files/Financial%20Documents/2019%20Strategic%20Plan%20Final-Nov%202019.pdf

Note: Cost estimates for SMART include both capital expenditures for the rail line and for the multi-use pathway.

BART Extension – Warm Springs

Early Estimate	\$546,000,000	Alameda County Transportation Commission (ACTC), <i>Alameda County's 20-Year Transportation Expenditure Plan</i> , July 2000, https://www.alamedactc.org/funding/fund-sources/measure-b/
Advanced Estimate	\$890,000,000	BART, "BART Breaks Ground on Warm Springs Extension," September 30, 2009, https://www.bart.gov/news/articles/2009/news20090930a
Latest Estimate/Actual Expenditure	\$750,000,000	BART, "Warm Springs Extension Project Overview," updated September 2019, https://www.bart.gov/about/projects/wsx

Note: Latest estimate/actual expenditure excludes Irvington Station.

Silicon Valley BART Extension Phase I – Berryessa

Early Estimate	\$2,108,000,000	Santa Clara Valley Transportation Authority (VTA), <i>Final EIS Volume 1</i> , Chapter 9, "Financial Considerations," 2010, https://www.vta.org/sites/default/files/documents/09.0_Financial%2520Considerations.pdf
Advanced Estimate	\$2,330,000,000	VTA, Board of Directors Meeting, December 8, 2011, Item 29, http://santaclaravta.iqm2.com/Citizens/FileOpen.aspx?Type=1&ID=1549&Inline=True
Latest Estimate/Actual Expenditure	\$2,330,000,000	VTA, Board of Directors Meeting, March 5, 2020, http://santaclaravta.iqm2.com/Citizens/FileOpen.aspx?Type=1&ID=2970&Inline=True As noted in figure 6, VTA has estimated that this estimate will be officially reduced by \$45 million upon project close-out.

Note: Earliest cost estimate is in the 2010 EIR because the Silicon Valley BART extension was split into two phases in 2009.

Silicon Valley BART Extension Phase II — Santa Clara

Early Estimate	\$4,780,000,000	VTA, Chapter 9, "Financial Considerations," 2018, https://www.vta.org/sites/default/files/documents/Chapter%25209_Financial%2520Consideration_feb20_2018.pdf This figure explicitly excludes unallocated contingency and financing costs. The source document notes that they will be added to project costs at a later date. VTA, in coordination with funding partners, subsequently established an unallocated contingency of \$262 million and financing costs of \$246 million. This represents 42% of the "change due to other factors" category, as indicated by the blue and yellow hatched area in Figure 6.
Advanced Estimate	\$5,600,000,000	VTA, "VTA's BART Silicon Valley Phase II Extension Project," September 20, 2019, https://www.vta.org/sites/default/files/2019-10/2019-09-20%20VTA%20Board%20Workshop%20Presentation_2SlidesPerPage_Reduced.pdf . This is based on 2% design and excluded financing and unallocated contingencies.
Latest Estimate/ Actual Expenditure	\$6, 500,000	VTA, "VTA First Agency to Submit Expedited Federal Funding Request for BART Phase II", https://www.vta.org/blog/vta-first-agency-submit-expedited-federal-funding-request-bart-phase-ii VTA cited a number of technical reasons for cost increases, including the following: <ul style="list-style-type: none"> • Slightly larger tunnel diameter to accommodate optimized track arrangement and seismic requirements • New infrastructure at two mid tunnel facilities which now include emergency egress platforms to help mitigate BART's concerns on stacked configuration • 28th Street/Little Portugal Station now configured as a side platform cut-and-cover station box • Further data on utilities in Yard, portals and mid-tunnel facilities some requiring relocations • Additional information on CBTC which was not available during the environmental planning phase

Caltrain Electrification (San Francisco to Tamien)

Early Estimate	\$456,000,000	Peninsula Corridor Joint Powers Board, <i>Caltrain Electrification Program Draft Environmental Assessment/Environmental Impact Report</i> , Chapter 2, "Project Description," 2004, http://www.caltrain.com/Assets/Peninsula+Rail+Program/Electrification+2025/EA-DEIR-04-2004/Chapter_2_WEB.pdf
Advanced Estimate	\$785,000,000	Peninsula Corridor Joint Powers Board, <i>Caltrain Electrification Program Environmental Assessment/Final Environmental Impact Report Volume 1</i> , Chapter 2, 2009, p. 48. https://www.caltrain.com/Assets/Peninsula+Rail+Program/Electrification+2025/Caltrain_Electrification_EA-FEIR_Vol-I_July_2009-WEB.pdf
Latest Estimate/Actual Expenditure	\$1,316,000,000	Peninsula Corridor Electrification Program, <i>January 2019 Monthly Progress Report</i> , January 31, 2019, http://www.caltrain.com/Assets/Caltrain+Modernization+Program/Documents/MPR/2019-01+January+2019+Monthly+Progress+Report.pdf

Central Subway

Early Estimate	\$994,000,000	<i>Annual Report on New Starts: Proposed Allocation of Funds for Fiscal Year 2007.</i> https://www.transit.dot.gov/funding/grant-programs/capital-investments/annual-report-new-starts-proposed-allocations-funds
Advanced Estimate	\$1,235,000,000	SFMTA, <i>Central Subway Project Final SEIS/SEIR Volume 1</i> , 2009, Table 8-1, https://www.sfmta.com/sites/default/files/reports/2017/Central_Subway_Final_SEISSEIR_Volume_1_Part2.pdf
Latest Estimate/Actual Expenditure	\$1,578,000,000	SFMTA, <i>Central Subway Monthly Progress Report, May 2019.</i> https://www.sfmta.com/sites/default/files/reports-and-documents/2019/06/2019_05_mpr.pdf

Note: Year of expenditure for latest estimate/ actual expenditure is assumed to be 2016, roughly the midpoint of construction.

Transbay Transit Center

Early Estimate	\$1,185,000,000	Transbay Joint Powers Authority, <i>Draft Environmental Impact Statement/ Environmental Impact Report</i> , Chapter 2, 2002, https://tjpa.org/uploads/2009/10/Chapter_2.pdf
Advanced Estimate	\$1,754,000,000	Transbay Joint Powers Authority, <i>Final Environmental Impact Statement/ Environmental Impact Report</i> , Chapter 6, 2004, p. 6-9, https://www.tjpa.org/uploads/2009/11/FEIS_Ch6.pdf
Latest Estimate/Actual Expenditure	\$2,200,000,000	San Francisco County Transportation Authority (SFCTA), "Salesforce Transit Center," https://www.sfcta.org/projects/salesforce-transit-center

International Boulevard Bus Rapid Transit/ East Bay Bus Rapid Transit

Early Estimate	190,000,000	ACTC, <i>Measure B Capital Program FY12/13 Strategic Plan</i> , p. A-14, https://www.alamedactc.org/news-publications/expenditure-plans/
Advanced Estimate	181,000,000	ACTC, "East Bay Bus Rapid Transit," Measure B Capital Program FY13/14 Strategic Plan Fact Sheet, June 2018.
Latest Estimate/Actual Expenditure	217,000,000	ACTC, "East Bay Bus Rapid Transit," June 2018, http://alamedactc.org/wp-content/uploads/2018/12/PN1193000_East_Bay_Bus_Rapid_Transit_BRT_20180604-1.pdf

Oakland Airport Connector

Early Estimate	\$130,000,000	ACTC, <i>20-Year Transportation Expenditure Plan</i> , July 2000, https://www.alamedactc.org/wp-content/uploads/2018/11/2000_MeasureB_Expenditure_Plan_v14-2.pdf
Advanced Estimate	\$220,000,000	BART, <i>Final Environmental Impact Statement</i> , March 2002, p. S-5, Table S-1, https://www.bart.gov/sites/default/files/docs/OAC_FEIR-FEIS_Volume_1_Part_1.pdf
Latest Estimate/Actual Expenditure	\$484,000,000	ACTC, <i>Measure B Capital Program FY12/13 Strategic Plan</i> , p. A-6, www.alamedactc.org

Downtown Extension Project (DTX)

Early Estimate	\$2,303,000,000	MTC, Resolution 3434, 2001, https://mtc.ca.gov/sites/default/files/RES-3434.pdf
Advanced Estimate	\$3,930,000,000	SFCTA, <i>Report of Expert Panel: Downtown Rail Extension (DTX) Program Review</i> , October 2019, https://www.sfcta.org/sites/default/files/2019-10/Final%20Report%20of%20Expert%20Panel_DTX%202019-10-07v1.pdf
Latest Estimate/Actual Expenditure	\$6,000,000,000	City of San Francisco Planning Department, <i>Rail Alignment and Benefits (RAB) Study</i> , May 29, 2018, https://default.sfplanning.org/Citywide/rail-yard_blvd/RAB_PublicMeeting_Presentation_052918.pdf

Note: Advanced and latest cost estimates reflect the Pennsylvania Avenue alignment

Appendix B Project Timelines

Figures 1 through 3 show the timelines for several major transit projects in the Bay Area. This appendix lists the sources for each of the milestones denoted in the timelines.

Van Ness BRT

MILE STONE	DATE/YEAR	DETAIL	SOURCE	COST	SOURCE	NOTES
Concept Study	1995		https://archive.sfcta.org/geary-corridor-bus-rapid-transit-faq			
Study as Part of Market Octavia Plan	2001	Initial studies as part of Market-Octavia project	https://www.sfchronicle.com/bayarea/place/article/S-F-has-startling-plan-for-Van-Ness-Middle-2-2846877.php			
Funding Measure Passed- Prop K	2003	Part of Prop K - November 2003 (investment plan approved for ballot by BOS July 2003)	https://www.sfcta.com/projects/van-ness-improvement-project, "Van Ness Avenue History" section			
SFCTA Feasibility Study	Dec-06		https://www.sfcta.org/sites/default/files/2019-02/Van%20Ness%20BRTFeasibilityStudy_Dec_2006.pdf	\$62.5m	https://www.sfcta.org/sites/default/files/2019-02/Van%20Ness%20BRTFeasibilityStudy_Dec_2006.pdf, p4-32	2005 dollars
Initial Federal Funding Approval	Jan-08		https://www.sfchronicle.com/bayarea/article/S-F-rapid-bus-project-to-vie-for-U-S-funds-3230467.php			
Projected Opening Date	Nov-11		https://sf.streetsblog.org/2013/07/11/van-ness-brt-delayed-2-more-years-after-caltrans-pushes-wider-car-lanes/			
EIR Start	Sep-07		https://archive.sfcta.org/sites/default/files/content/Planning/VanNess_BRT_EIR/VN%20BRT%20NOP%209-12-07.pdf			
EIR Complete	Jul-13		https://archive.sfcta.org/sites/default/files/content/Planning/VanNessAvenueBusRapidTransit_email/VanNessBRT_NOA_FINAL_July2.pdf	\$126m	https://www.sfcta.org/sites/default/files/2019-02/Van_Ness_BRT_Final_EIS_EIR_Volume_1.pdf, p 5-9	
FTA ROD	20-Dec-13		https://www.sfcta.com/projects/van-ness-improvement-project			
Final Legislative Approval	18-Nov-14		https://www.sfcta.com/projects/van-ness-improvement-project			
Groundbreaking	24-Oct-16		https://www.sfcta.com/project-updates/construction-van-ness-glance			
Projected Opening Date	Dec-17	Estimate at close of EIR process	https://www.sfchronicle.com/bayarea/article/Why-do-SF-transit-projects-take-so-long-4551887.php			
Adjusted opening date	Early 2019		https://www.sfchronicle.com/bayarea/article/Bay-Area-transit-projects-shift-What-it-means-6597101.php			
Actual/New Opening Date	Mid-2021		https://www.sfcta.com/sites/default/files/reports-and-documents/2020/07/vn_newsltr_2020-04_webversion.pdf, p3	\$169.6m for bus project alone, \$309.3m total including associated public works relocation and restoration	https://www.sfcta.org/projects/van-ness-improvement-project, "Cost and Funding"	\$309.3m total including associated public works relocation and restoration

Central Subway

MILESTONE	Phase 1		Phase 2		COST	SOURCE	NOTES
	DATE/YEAR	SOURCE	DATE/YEAR	SOURCE			
Concept Study	1993	https://archive.org/details/bayshoretransits1993sanf/page/n183/mode/2up	1993				
Funding Measure Passed			2001	https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/Central_Subway_ROD_and_MOA.pdf			
Initial cost estimate			2004	https://books.google.com/books?id=j_85QAAMAAJ&pg=SL1-PA156&lpg=SL1-PA156&dq=central+subway+preliminary+engineering&source=bl&ots=1_r7oCTmDj&sig=ACfU3U1pB5-Khsoa0XpJOn--yGLbOCHGXg&hl=en&sa=X&ved=2ahUKEwiIstHSpc3qAhVUJTQIHdHHAt04ChDoATADegQlChAB#v=onepage&q=central%20subway%20preliminary%20engineering&f=false; page A-156	994.4m		From annual report on New Starts from DOT
Concept Study			2003-2009	https://archive.sfcta.org/sites/default/files/content/CapitalProjects/images/Central_Subway/CentralSubway_factsheet_042017.pdf	\$1.4125b	https://books.google.com/books?id=j_85QAAMAAJ&pg=SL1-PA156&lpg=SL1-PA156&dq=central+subway+preliminary+engineering&source=bl&ots=1_r7oCTmDj&sig=ACfU3U1pB5-Khsoa0XpJOn--yGLbOCHGXg&hl=en&sa=X&ved=2ahUKEwiIstHSpc3qAhVUJTQIHdHHAt04ChDoATADegQlChAB#v=onepage&q=central%20subway%20preliminary%20engineering&f=false; page A-155	From annual report on New Starts from DOT
Initial Application for Fed Funds			2002	https://www.sfmta.com/central-subway-project-history			
EIR Start	Oct-96		2005	https://www.sfmta.com/central-subway-project-history			
EIR Complete	1998	https://www.sfmta.com/sites/default/files/reports/2017/Central_Subway_Final_SEISSEIR_Volume_1_Part1.pdf , p3	Sep-08	https://www.sfmta.com/central-subway-project-milestones	\$1.235m	https://www.sfmta.com/sites/default/files/reports/2017/Central_Subway_Final_SEISSEIR_Volume_1_Part1.pdf , p S-13	YOE dollars, includes vehicles; see table S-3 for full break-out of costs
FTA ROD	Mar-99		1-Nov-08	https://www.sfmta.com/central-subway-project-milestones			
Full funding Grant Agreement			1-Oct-12	https://archive.sfcta.org/sites/default/files/content/CapitalProjects/images/Central_Subway/CentralSubway_factsheet_042017.pdf			
Groundbreaking	Sep-00	https://www.sfgate.com/news/article/Groundbreaking-for-Muni-s-Third-Street-Light-Rail-2736746.php	1-Feb-10	https://www.sfmta.com/central-subway-project-milestones			
Original Opening Date			2016	https://www.sfmta.com/sites/default/files/reports/2017/Central_Subway_Final_SEISSEIR_Volume_1_Part1.pdf , p S-34			
Second Opening Date			Late 2018	https://archive.sfcta.org/sites/default/files/content/CapitalProjects/images/Central_Subway/CentralSubway_factsheet_042017.pdf	\$1.578b	https://www.sfmta.com/projects/central-subway-project	
Actual/ New Opening Date	Apr-07	https://www.sfmta.com/central-subway-project-history	2021	https://www.sfmta.com/projects/central-subway-project			

Silicon Valley BART Extension

Combined Phases

MILESTONE	DATE/ YEAR	DETAIL	SOURCE	COST	SOURCE	NOTES
Concept Study	1982	SVBX In BART Short Range Transportation Plan			https://archive.org/details/bayarearapidtran1982sanf/page/56/mode/2up	
Major Investment Study	2001				https://www.vta.org/projects/bart-sv	South Fremont to Santa Clara
Funding Measure Passed	2000	Measure A				
FTA New Starts Rejection	2005				https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/FY05_Annual_Report_on_Funding_Recommendations.pdf	Rejected Phase I and Phase II together
Phase I and II EIR	2004-2011				https://www.vta.org/projects/bart-sv/phase-i	Project separated into two phases in 2009, and therefore VTA completed a 2nd supplemental environmental EIR
Split Project into 2 Phases	2009				https://www.vta.org/projects/bart-sv	

Phase 1

Phase 2

MILESTONE	DATE/ YEAR	DETAIL	SOURCE	COST	SOURCE	DATE/ YEAR	DETAIL	SOURCE	COST	SOURCE	NOTES
FTA Record of Decision						2018	ROD for Phase II			https://www.vta.org/blog/vta-receives-federal-record-decision-bart-silicon-valley-phase-ii-extension-project	
Funding Measure Passed						2016	Measure B				
Groundbreaking	2012				https://www.vta.org/projects/bart-sv						
Projected Opening Date	2017				https://web.archive.org/web/20160924151758/http://www.mercurynews.com/2012/03/12/next-target-extending-bart-under-downtown-san-jose/	2028	Completion of substantial construction	https://www.vta.org/blog/vta-first-agency-submit-expedited-federal-funding-request-bart-phase-ii	\$6.5 billion	https://www.vta.org/blog/vta-first-agency-submit-expedited-federal-funding-request-bart-phase-ii	Cost estimate updated as of June 2020.
Adjusted Opening Date	2019				https://www.vta.org/blog/vtas-bart-berryessa-extension-update						
Actual/New Opening Date	2020				https://www.vta.org/projects/bart-sv						



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