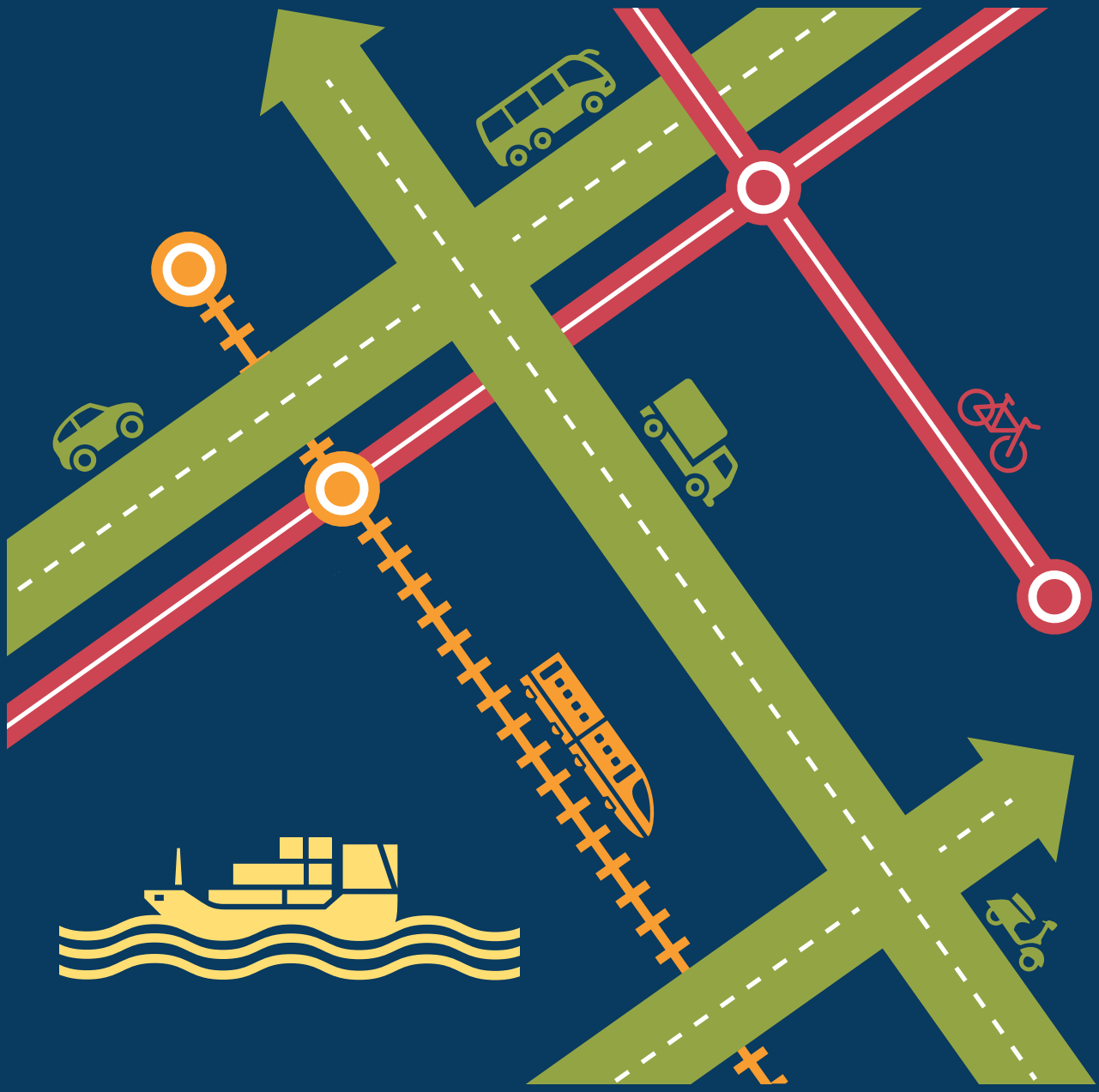
In The Fast Lane:

Improving Reliability, Stabilizing Local Funding, and Enabling the Transportation Systems of the Future in Alameda County



An exploration of Alameda County's transportation systems, how they are funded, what role they play in supporting economic growth, and what changes are needed to ensure a prosperous future.

An analysis prepared by the Bay Area Council Economic Institute

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This report was prepared by the Bay Area Council Economic Institute for the Alameda County Transportation Commission. Sean Randolph (President & CEO) oversaw the development of the study. Tracey Grose (Vice President) designed the study and directed the analysis and completion of the report. Matt Chwierut (Consulting Senior Research Associate) was the primary contributor to Sections 1, 3 and 4 and also contributed to Section 2. Jeff Bellisario (Senior Research Associate) contributed to the overall narrative of the document. Alex Foard (Research Associate) contributed to Sections 2 and 5.

ALAMEDA
County Transportation Commission

Alameda County Transportation Commission's mission is to plan, fund and deliver a broad spectrum of transportation programs and projects that expand access and improve mobility to foster a vibrant and livable Alameda County.

The Bay Area Council Economic Institute

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Bay Area Council Economic Institute is a partnership of business with labor, government, higher education, and philanthropy that works to support the economic vitality and competitiveness of the Bay Area and California.

The Association of Bay Area Governments (ABAG) is a founder and key institutional partner. The Economic Institute also supports and manages the Bay Area Science and Innovation Consortium (BASIC), a partnership of Northern California's leading scientific research universities and federal and private research laboratories.

Through its economic and policy research and its many partnerships, the Economic Institute addresses key issues impacting the competitiveness, economic development, and quality of life of the region and the state, including infrastructure, globalization, science and innovation, energy, and governance. A public-private Board of Trustees oversees the development of its products and initiatives.

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Improve Reliability, Stabilize Local Funding, and Enable the Transportation Systems of the Future in Alameda County

Alameda County, the Hub of Bay Area Commute Flows

Alameda County has the second-largest population in the region, and one of the fastest-growing populations in the state.

Alameda County's more than 600,000 jobs make it the second largest employment base in the Bay Area, behind Santa Clara County.

Alameda residents commuting outside the county increased from 46% to 52% from 2003 to 2011.

12% of Alameda County commuters use public transit, 2% more than the regional average.

20% of all public transit boardings in the Bay Area are in Alameda County

34% of all BART boardings originate in Alameda County

37% of Bay Area workers travel to, from, or through Alameda County

53% of workers in Alameda County live outside the county

Strengthening Economic Competitiveness

Efficient transportation systems are being deployed around the world, positioning regions for the future to:

- **Support** the clustering of firms
- **Expand** the regional labor pool
- **Improve** reliability
- **Conserve** natural resources
- **Improve** quality of life
- **Lower the cost** of moving people & goods

Alameda County's 2014 TEP* addresses current and future needs.

Well-functioning transportation systems are critical to economic competitiveness at the national and the regional levels, influencing commute times, freight delays, land use, quality of life, and productivity.

* Transportation Expenditure Plan that will be on Alameda County's November 2014 ballot

Alameda County represents a critical focal point in the Bay Area's regional transportation system. While the Port of Oakland accounts for a large share of movement of goods in and out of the region, the county also serves as a vital conduit across all modes of transportation for people within the Bay Area.

Transportation systems must not only be maintained but also upgraded and expanded to keep pace with population growth, connect housing and jobs, and support the economic competitiveness of the region.

Stimulating Economic Impact

Direct spending from Alameda County's 30-year, $8 billion 2014 Transportation Expenditure Plan will yield:

$20B in total economic activity in the Bay Area

150,000 jobs*

- Construction
- Transit operations and maintenance
- Professional, scientific, and technical services
- Manufacturing

* Full-time equivalent jobs

Expanding Goods Movement

Alameda County is the Bay Area's hub for international and domestic trade:

90% of Bay Area trade in agriculture, wine, and heavy machinery by weight goes through the Port of Oakland, sending California's exports around the world

99% of containerized cargo from Northern California passes through the Port of Oakland

The Bay Area's **trucking distribution system** is highly concentrated in **Alameda County**.

The direct spending of Alameda County's 2014 Transportation Expenditure Plan is estimated to yield $20 billion in total economic activity in the Bay Area economy by extending and augmenting the existing 1/2-cent transportation sales tax.

Executive Summary

Alameda County represents a critical focal point in the Bay Area's regional transportation system. While the Port of Oakland accounts for a large share of movement of goods in and out of the region, the county also serves as a vital conduit for people within the Bay Area across all modes of transportation.

As the population of the county and wider region grows, and as global trade increases, transportation systems must not only be maintained but also upgraded and expanded. But, where does the funding come from? And how does transportation funding translate into positive economic impact?

Alameda County has proposed a 2014 Transportation Expenditure Plan (TEP) that addresses the county's desire to expand transit services, keep fares affordable, provide traffic relief, improve air quality, and create jobs. This document lays out the fundamentals of public transportation spending, illustrates signals of the future of transportation systems, and highlights the role of transportation infrastructure in an advanced economy in enhancing quality of life and securing global competitiveness. This report also provides an overview of the proposed TEP and how it addresses the region's current and future needs.

Advancing transportation infrastructure is critical for growing regional economic competitiveness as it influences everything from the cost of production, the flow of innovation and ideas, and property values.

- Efficient transportation systems increase reliability and can lower the cost of commuter flows and goods movement.
- Quality transportation systems support the productive clustering of firms and expand the labor pool.
- Technological innovations are opening new possibilities in urban transportation, encouraging the growth of systems that are more digital, multi-modal, efficient, adaptable, and accommodating of petroleum alternatives.
- Cities around the world are experimenting with transportation solutions, ready to reap the economic benefits of superior mobility.
- In this uncertain environment, regions must make transportation investments to prepare for a changing future of moving goods and people.

Alameda County is at the heart of Bay Area commute flows, connecting diverse residential communities (even outside the Bay Area) with the region's job centers. As the economy and population grow, Bay Area commutes are becoming longer, and the number of commuters is rising.

- The Bay Area's highly mobile regional labor pool consists of 1.3 million residents who cross at least one county line to get to work. These workers account for 47 percent of employed residents in the Bay Area.
- Approximately 37 percent of Bay Area workers travel to, from, or through Alameda County. In 2011, approximately 180,000 commuters traveled through the county each day to work destinations to both its east and west, and over 300,000 commuters traveled into the county for work.

- Alameda County is the largest source of inter-county commuters in the Bay Area with over 300,000 residents commuting outside of the county each day.
- The percentage of Alameda County residents commuting outside the county increased from 46 percent to 52 percent from 2003 to 2011.
- Over 12 percent of commutes originating in Alameda County use public transportation, compared to 10 percent of commutes in the broader Bay Area, and 5 percent in the United States.
- Approximately one-third of all BART system boardings occur in Alameda County.
- Home to 21 percent of the Bay Area's population, Alameda County was one of the fastest growing counties in California in 2013.
- More cars and longer distances translate into greater delays. Given its pivotal position in the region, Alameda County experiences the largest number of vehicle hours spent delayed in traffic in the Bay Area.

Alameda County is the Bay Area's hub for international and domestic trade.

- By value, 41 percent of Bay Area trade passes through Alameda County.
- The Port of Oakland handles over 90 percent of total Bay Area trade by weight for many of California's key exports, including high-value agriculture, wine, and heavy machinery.
- The Port of Oakland handles 99 percent of containerized cargo that flows through Northern California.
- The Oakland International Airport handles the majority of all air cargo in the Bay Area, with a focus on domestic trade.
- Highly concentrated in Alameda County, Bay Area trade relies extensively on the trucking distribution system and, in turn, on the region's highways.

Transportation funding is complex, increasingly unreliable, and more and more dependent on local communities.

- The transportation funding system in the United States is complex. Funds come from a variety of sources and flow through multiple levels of governments until they can be directed to local uses and projects.
- Federal sources of transportation funding are becoming increasingly unreliable. Federal stimulus funding funneled more than $50 billion in general funds to transportation projects, but this recent surge in spending is unlikely to continue.

The direct spending of Alameda County's 2014 Transportation Expenditure Plan is estimated to yield $20 billion in total economic activity in the Bay Area economy.

- The federal gas tax - set at $0.184 per gallon for gasoline - has not been raised since 1993. Because it is not indexed to inflation, its value has eroded immensely over the past 20 years.
- Bonds are increasingly relied on for transportation funding across the US and in California. A $20 billion transportation bond, approved by voters statewide in 2006, is almost entirely spent.
- Local funding, including sales tax measures (like Measure B in Alameda County in 2000), supplies approximately 50 percent of transportation revenues in California and, relative to other funding sources, provides strong local transparency and control.
- Most of the projects envisioned in the voter-approved 2000 Measure B have been completed ahead of schedule. A Citizens Watchdog Committee has found expenditures to be consistently satisfactory. This has occurred even in the face of lower-than-forecast sales tax revenues.
- Measure B funds have helped secure over $3 billion in additional external funding to support transportation projects in Alameda County.

Alameda County's 2014 Transportation Expenditure Plan (TEP) invests in immediate transportation needs with an eye toward the future success of the region's economy.

- The 2014 TEP primarily focuses on maintaining existing transportation systems, particularly transit, and on relieving congestion, improving air quality, and stimulating economic development.
- Major new projects envisioned in the 2014 TEP include BART modernization and expansion, improved bicycle trails and facilities throughout the county, expanding high-occupancy vehicle/high-occupancy toll (HOV/HOT) lanes, local community developments that connect transit to jobs, and projects that improve the movement of freight on trucks and rail.

The direct spending of Alameda County's 2014 Transportation Expenditure Plan is estimated to yield $20 billion in total economic activity in the Bay Area economy.

- Planned spending across the economy for maintenance, operations, new construction, new equipment, and other new systems will translate into approximately 149,900 full-time equivalent jobs.
- This added economic activity will generate an estimated total of approximately $2.4 billion in federal, state, and local tax revenue.

Introduction

Alameda County is a critical focal point in the Bay Area's regional transportation system. While the Port of Oakland and Oakland International Airport account for a large share of the movement of goods in and out of the region, the county also serves as a vital conduit for people moving throughout the Bay Area across all modes of transportation.

As the population of the county and region grows, and as global trade increases, transportation systems must not only be maintained but also upgraded and expanded. But, from where does the funding come? And how does transportation funding translate into positive economic impact in the county?

This document illustrates signals of the future of transportation systems and highlights the role of transportation infrastructure in enhancing quality of life and securing global competitiveness in an advanced economy. The report focuses on Alameda County and the significant part it plays in the movement of goods and people in the Bay Area economy. To support this vital role, Alameda County has proposed a 2014 Transportation Expenditure Plan (TEP) that addresses the county's desire to expand transit services, keep fares affordable, provide traffic relief, improve air quality, and create jobs.

In order to better understand the importance of these investments and their potential positive economic benefits, this report provides an overview of the evolution of transportation infrastructure and the financing system that is used to pay for it. Alameda County's TEP seeks to position the region ahead of these changes, which will translate into economic advantages as the Bay Area becomes more interconnected. Additionally, TEP investments will produce significant economic benefit for the area in the form of job growth, while improving upon a transportation system that is a crucial piece of the region's competitive infrastructure.

Section 1 explores the role of advanced transportation systems in economic competitiveness today, offers examples of early-stage transportation systems of the future, and discusses places in the world that are early adopters of advanced technologies. Through a series of metrics, **Section 2** illustrates Alameda County's critical role as the region's hub for the movement of goods and people. **Section 3** examines the sources of transportation funding in Alameda County and how that funding has changed over the years. Alameda County's proposed 2014 (TEP) is laid out in **Section 4**. Reflecting on the planned expenditures of the TEP, **Section 5** estimates the broader regional economic impacts of this investment.

Advanced Transportation Systems and Economic Competitiveness

Modern transportation systems play an important role in local and global commerce, growing economic vitality and improving quality of life. Our context is changing locally and globally. External drivers as well as changing preferences are forcing us to reconsider how we do things, and technology offers new options for responding to change and shaping our future. Other places in the world are already in the fast lane, implementing advanced transportation systems to support local economic growth and future competitiveness. What are the systems of the future? How can new technology in transportation systems improve our lives and commerce in the county and region?

New practices and new technological tools are emerging that offer new options either in response to change or in advance of change. Positioning a region on the front end of change translates into a stronger competitive position.

This section explores the role of advanced transportation systems in economic competitiveness today and how improving system reliability and reducing traffic congestion can grow economic vitality and quality of life. Pushing the envelope of creative problem-solving, examples of early-stage transportation systems of the future are presented as well as examples of other metro areas in the world that are early adopters of advanced technologies. This section closes by shifting the focus to Alameda County, where numerous examples of innovative transportation systems are already in use. The 2014 Transportation Expenditure Plan (TEP) provides funding to expand these types of advanced projects and services, which will help shape and drive the county's future development.

Looming Changes in Transportation: Technological, Economic, Political, Environmental, and Social Changes

One hundred years ago, a Ford Model T – the famous first mass-produced automobile – could be produced in 93 minutes, and Henry Ford's plants produced more automobiles than all other automakers combined. The Ford Model T helped draft the agenda for 20th century transportation, and since then, the story of personal transportation in the US has largely been a series of footnotes to the Model T. Eighty years ago, Robert Moses began the transformation of New York infrastructure to accommodate the automobile – and many cities followed suit. The post World War II era saw massive investment in highway infrastructure across the US, and the automobile dominated the aspirations of middle-class life. Were Henry Ford to step forward 100 years into the US, into California or into Alameda County to view the transportation system today, much would be recognizable. The buses, bikes, rail, and cylinder-engine automobiles that today support the 1.5 million residents of Alameda County were all known in his day.

However, were he to step forward another 10 years, to 2024, much would likely surprise him. Numerous technological and socioeconomic developments are laying the foundation for improved transportation systems – using new strategies for addressing new mobility needs. Vehicles based on new fuels are accelerating into the market. Digitization of the car, the road, and the driving experience are combining the

1910 Ford Model T

Photo Credit: Wikimedia Commons

2013 Ford Focus

Photo Credit: "Ford Focus (2 of 3)" by viZZZual.com

IT industry and the transportation industry. Shifting demographic preferences and social practices are destabilizing the dominant model of automobile ownership. Evolving practices in 21st century work are changing how transportation is delivered and demanded. Preparing for – and harnessing – many of these changes demands investments in a next-generation transportation system.

Henry Ford helped revolutionize how we move people, but our transportation system also must move goods. Indeed, innovations in freight movement and broader economic changes over the past half-century set the stage for Alameda County's critical role in US freight transportation. In the mid-20th century, Malcom McLean, a trucking entrepreneur, helped standardize the use of containers for the transportation of goods; his particular genius was designing a system where containers could be transported over sea and land without being unloaded in between. This began modern container shipping, which today allows single containers to come through US ports and be loaded directly onto trucks or rail. This innovation also caused shipping costs to plummet, trade to swell, and supply chains to expand. One of containerization's many effects was the decline of the Port of San Francisco, which could not handle deep-hull ships, and the rise of the Port of Oakland, which could. In 2012, the Port of Oakland handled over 2 million TEUs (twenty-foot equivalent unit) of cargo, including machinery, apparel, wine, and produce.[1]

Air transportation also dramatically changed freight movement and trade, offering faster and more flexible shipping routes. This, in turn, has helped globalize supply chains and available markets, particularly for items with a high value-to-weight ratio, such as pharmaceuticals and advanced electronics. In 2011, electronics accounted for 37 percent of the total value of California's air exports – more than any other category by value – but only 13 percent of total tonnage, second only to agricultural products. In 2011, the Bay Area (San Jose, San Francisco, and Oakland) exported almost $8 billion in electronics products by air – though only 20 kilotons.

Freight movement is undergoing a revolution. Automation is quietly infiltrating advanced port operations. Advanced freight tracking and management help maximize the efficiency of the existing system. Changes in oil prices and regulations requiring cleaner fuels will impact transportation costs

[1] Port of Oakland Container Statistics, http://www.portofoakland.com/maritime/containerstats.aspx. A TEU (twenty-foot equivalent units) is an inexact unit measuring cargo capacity in container shipping. A 20-foot container is 1 TEU; a 40-foot container is 2 TEUs.

Cargo Plane

Photo Credit: "Airplane at the Vienna International Airport" by viZZZual.com

Container Ship, Port of Oakland

Photo Credit: "Container Ship, Port of Oakland" by Michael Layefsky

and transportation modes. The expansion of the Panama Canal, expected to conclude in 2015, is likely to change Pacific shipping routes. With major implications for West Coast ports, some shipping traffic from Asia may bypass California and pass directly to the East Coast. But some Atlantic traffic may come directly to the West Coast. The ultimate effect is uncertain. A 2008 study argues that Atlantic and Gulf ports could seize up to 25 percent of West Coast cargo,[2] but Dan Smith of the Tioga Group, a freight transportation consultancy, argues that the importance of transit time, reliability, Southern California and Bay Area consumer markets, and actual capacity on alternative routes will dampen cargo diversion.[3]

A major report analyzing the competitive position of West Coast Ports argues that further investment in rail is needed to maintain cargo share.[4] Regardless, many analysts agree that other economic forces, such as consumer demand, will be greater drivers. Economic changes are favoring more agile, often more local, supply chains – even as overall global trade is forecast to grow. Any changes in goods movement will have major implications for our transportation systems.

An Array of Possibilities

Transportation planners are challenged to design and manage systems that must perform in an uncertain future. Each decade brings a new set of disruptions, innovations, and regulations, but transportation investments must be resilient. It is critical to examine areas of change that might affect transportation, and the benefits of this scrutiny are twofold. It is possible to anticipate the consequences of major changes, particularly issues that might influence demand for transportation. It is also possible to identify potential technological tools that could enable new strategies for improving efficiency, could create economic opportunities, or could pose policy challenges.

The next ten years will see a range of possibilities for personal and freight mobility. Transportation infrastructure may change slowly in the US, but mobility practices are changing rapidly. Ten years ago, the navigation aid in state-of-the-art cars was a dedicated GPS receiver; now, voice automated smartphones can provide turn-by-turn instructions. In the US, car sharing used to mean borrowing a friend's car; now, car sharing is a widely recognized industry including organizations such as Zipcar and City CarShare.

[2] Drewry Supply Chain Advisors, "US Transpacific Intermodal Today and Tomorrow," September 2008.
[3] Bonney, Joseph, "Redrawing Trade Winds," Journal of Commerce, March 23, 2009.
[4] Cambridge Systematics, "Port Activity and Competitiveness Tracker Progress Report," prepared for Southern California Association of Governments, February 2011.

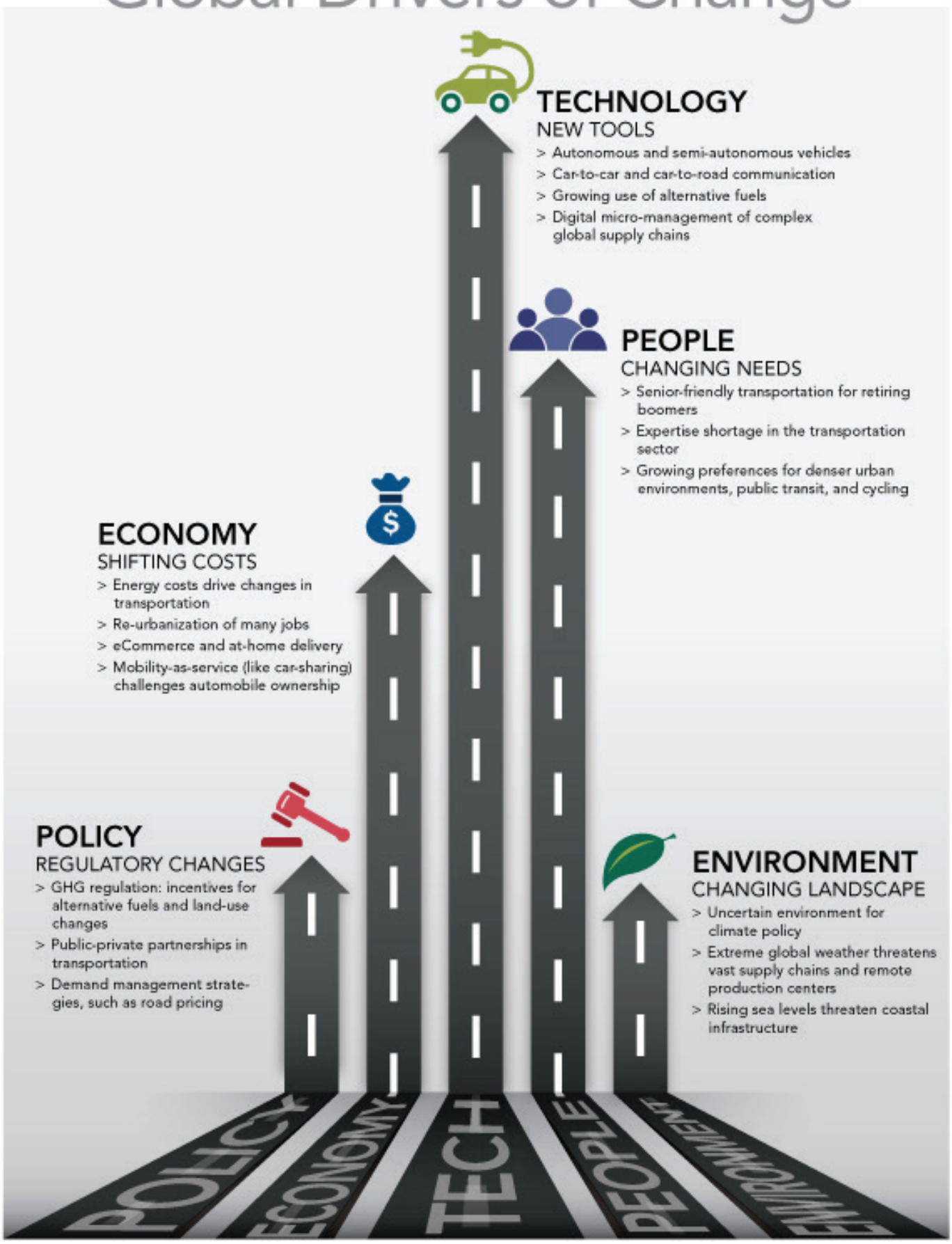
Autonomous vehicles were still science fiction; now financial analysts are predicting the economic savings that autonomous cars will be contributing to the economy in the next decade, and California is drafting regulations to allow autonomous cars on the road in 2015. Today, all of these developments are major topics for media and, to varying degrees, for transportation planners.[5] Analyzing the flow of innovations and trends helps reveal how transportation systems might change over the next decade.

Global Drivers of Change

Category	Developments in Transportation of People and Goods
People: Changing needs and preferences	• The wave of retirements in the coming decade is expected to present a shortage of workers in the transport sector – both personal and freight. • Retiring Baby Boomers and extended longevity will require more senior-friendly transportation and land use. • As Millennials (born in the 1980s and 1990s) enter adulthood, they are preferring denser urban environments, public transit, and cycling.
Technology: New tools for today and the future	• Digitization of transportation can enable autonomous and semi-autonomous vehicles. • Wireless sensors and advanced routers could enable cars connected to the Internet, infrastructure, and each other. • Alternative fuels will require new refueling infrastructure. • Sensors and data analytics enable much more granular freight tracking and complex supply chains.
Policy: Geopolitical and regulatory changes reframing the context	• Greenhouse gas (GHG) regulation will drive adoption of clean fuels, land use changes, and demand-management strategies like road pricing. • Densification of land use will encourage more urban and multimodal forms of transportation, and have implications for non-work travel. • Trade policy will impact the costs of freight, though this is difficult to forecast. • Public-private partnership models – including private transportation systems – are increasingly necessary to address transportation funding gaps.
Markets: Shifting local and global markets for labor and goods	• Energy costs will be a major driver of change in transportation. • A knowledge- and innovation-based economy in the US will concentrate in metro areas, making well-functioning urban transportation systems essential. • Mobile work and coworking are changing commute patterns. • E-commerce and home delivery could put new demands on the urban freight system, which will be required to transport goods to houses rather than just to retail outlets. • Mobility-as-a-service (such as car sharing) will challenge the automobile ownership model. • Reshoring of manufacturing may reduce imports but could also increase exports. • Digital fabrication technologies – and local manufacturing networks – could increase intra-regional trade and domestic freight.
Environment: Changing physical landscape creates disruptions	• Climate change will create an uncertain environment for climate policy. • Extreme weather events will drive the need for simple or more agile supply chains. • Rising sea levels could threaten coastal infrastructure – at any point in the supply chain. • Planning for an uncertain environmental future will require resilience measures and infrastructure adaption.

[5] An exhaustive analysis of new technologies or fully developed US transportation scenarios are beyond the scope of this paper. Examples of such work include "Long Range Strategic Issues Facing the Transportation Industry," by ICF International; the MIT "Future Freight Flows Symposium," and "The Future of Mobility: Scenarios for the United States in 2030," by RAND.

Global Drivers of Change



These drivers of change are what will shape future transportation development in Alameda County and across the globe. As a result, transportation in Alameda County will evolve over the next 30 years. The 2014 TEP will shape the county's development over this time and provide funding for the types of projects and services that will be required as a result of these drivers of change. Potential implications for next-generation transportation systems include:

Transportation systems are increasingly automated and digital. The core technologies for transporting people and goods are undergoing a revolution. The internal combustion engine has dominated transportation for over 100 years; now a host of innovations are rebuilding and rewiring the automobile. The Google fleet of autonomous Priuses has logged over 140,000 miles. General Motors predicts that autonomous vehicles will enter consumer markets by 2020. Even sooner, carmakers are releasing vehicles with automation features, such as active cruise control with stop-and-go function.[6] New regulatory challenges arise when such vehicles share the road with other vehicles, but policymakers have already been discussing these issues for several years, and California law will allow these vehicles on the road in 2015. Moreover, autonomous vehicles might see more deployment in port operations and other sites using heavy equipment. In October 2013, international research consortium InTraDE successfully demonstrated technology for intelligent autonomous vehicles (IAVs) for loading and unloading port cargo.[7] Also close to deployment is connected vehicle technology, which communicates wirelessly with other vehicles and with road infrastructure. The technology underpinning autonomous vehicles also includes numerous other features, such as automatic breaking to avoid collisions, traffic rerouting, and location-based services. Such efficiency is two-edged: allowing more cars to move seamlessly on the roads can relieve congestion and increase safety, but it also increases wear and tear on the roads, which already suffer from maintenance funding shortfalls.

Transportation strategies are multimodal. As the world urbanizes, a core challenge will be developing transportation systems that are maximally efficient and multimodal. Cities around the world are investing in pedestrian and bike facilities and in new transit systems. Global automobile usage will rise, but many cities and regions around the world are simply too dense to rely solely on single-occupancy vehicles. High density also dictates certain types of transportation, as new car infrastructure often cannot be built out in dense areas. This has led to programs such as bike sharing; in early 2013, there were over 500 bike sharing systems worldwide, with many more cities in the process of planning or launching such systems.[8] Hangzhou, home to China's first commercial car sharing scheme, also has one of the largest bicycle sharing systems in the world, with a fleet of almost 70,000. Hangzhou has also integrated the bike network with transit and subway networks.[9] Bike sharing systems, combined with bike infrastructure investment, can relieve congestion by encouraging the mode shift from cars to bicycles. Demographic trends also point to multimodal growth; Millenials in the US – roughly defined as those born in the 1980s and 90s – are driving less, ride transit more, and prefer urban walkable neighborhoods more than previous generations.[10] Another pillar of multimodal transportation systems is mobility-as-a-service (MaaS) systems, including informal car sharing. Services like Zipcar allow people to rent cars by the hour. Car2go,

[6] BMW, "BMW Active Cruise Control with Stop&Go Function," http://www.bmw.com/com/en/insights/technology/technology_guide/articles/active_cruise_control_stop_go.html.
[7] InTraDE, "Successful demo of the InTraDE IAV in Oostende!," http://www.intrade-nwe.eu/project-live.
[8] Early Policy Institute, "Bike-sharing Programs Hit the Streets in Over 500 Cities Worldwide," http://www.earth-policy.org/plan_b_updates/2013/update112.
[9] *Ibid.*
[10] See "A New Direction: Our Changing Relationship with Driving and Implications for America's Future," by US PIRG, 2013 and "Millennials and Mobility: Understanding the Millennial Mindset," by American Public Transportation Association, 2013.

a European car sharing scheme managed by Daimler, allows members to rent small vehicles by the minute and park them in areas throughout the urban service area. Peer-to-peer (P2P) programs allow users to rent out their own cars to others. Uber, a service that allows members to share rides, creates a P2P taxi service. Corporations are also entering the transportation market by providing commuter shuttle services to and from their corporate campuses. All of these innovations decrease the need for automobile ownership and help make urban mobility even easier.

Advanced transportation systems focus on efficient use. A growing body of research is challenging the dominant paradigm of highway expansion as a cure for congestion, and demand management systems are being seen as better alternatives. Research suggests that expanding highways does not reduce congestion in the long term, primarily because as highways expand, more people choose to drive or move to areas where driving is necessary.[11] Congestion pricing and related strategies that use price signals to encourage rational user behavior are put forward as a preferred strategy for managing congestion. McKinsey & Company has found that expanding highway capacity has one of the lowest benefit-cost ratios among congestion reduction strategies, often much lower than demand management systems like congestion pricing and signal optimization. Demand management is also much cheaper. For example, the UK's M42 motorway intelligent transport system (ITS) cost $150 million and required two years to implement; widening the road for the same outcome would have cost $800 million and would have taken 10 years.[12]

"When it comes to the future, there are three kinds of people: those who let it happen, those who make it happen, and those who wonder what happened."

- John M. Richardson, Jr., pioneer in the field of systems dynamics

Advanced transportation systems must be agile. Expanding world trade will impact the freight transportation system. If manufacturing increases in the US, exports may rise. Broad market shifts that privilege speed to market and niche offerings will likely also lead to complex supply networks that must respond to shifts in production and market demand. E-commerce may increase the need for transportation networks that connect to the home; the "last-mile problem" might become warehouse to neighborhood, rather than warehouse to retailer. A 2012 report by Accenture notes that more than 80 percent of companies are concerned about supply chain resilience; supply chain managers globally are worried about supply chain disruptions due to extreme weather, political unrest, and cyber security issues.[13] An MIT report on the future of freight noted that digital fabrication and small-scale manufacturing could change how consumers acquire goods.[14]

Advanced transportation systems need new petroleum-alternative infrastructure. Three major reports on the future of transportation emphasize the importance of oil prices in driving transportation

[11] Gilles Duranton and Matthew A. Turner. "The Fundamental Law of Road Congestion: Evidence from US cities." American Economic Review, October 2011.
[12] McKinsey Global Institute, "Infrastructure Productivity: How to Save $1 Trillion a Year," January 2013.
[13] Accenture, "Building Resilience in Supply Chains," January 2013, http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture-Building-Resilience-Supply-Chains.pdf.
[14] MIT Center for Transportation and Logistics, "Future Freight Flows Symposium," 2011.

futures.[15] A review of cleantech investment by the Congressional Budget Office found that R&D funding and federal tax incentives related to energy, including fossil fuels and energy efficiency, jumped after the oil crisis in the 1970s, then fell as oil prices came down, and then rose again in the past decade as oil prices rose again.[16] Nonetheless, R&D investment has already led to new products and near-to-market clean technologies, such as advanced biofuels, electric vehicles, fuel cells, and more. These will require advanced fueling infrastructure, consumer confidence, and new technologies to make them viable in the marketplace. Policy – in the form of incentives and renewables targets, such as California's AB32 – is advancing requirements that are funneling investments to alternative infrastructure and driving adoption.

These examples are major changes in transportation that will affect residents, planners, and companies. Thinking through future alternatives is critical to designing robust transportation systems. As John M. Richardson, Jr., a pioneer in the field of systems dynamics, noted, "When it comes to the future, there are three kinds of people: those who let it happen, those who make it happen, and those who wonder what happened."[17] In Alameda County, transportation planners are looking ahead to the infrastructure needs of the county. The proposed 2014 TEP puts forth solutions that address present and future gaps in furthering advanced transportation systems in Alameda County.

Responding to Change Is Critical – and Some Are Already There

Transportation is the circulatory system of our economy. A complex network of infrastructure, vehicles, and exchange points enables the flow of people and goods around the world. People can access jobs, meet to exchange ideas, and engage in leisure activities. Goods can be manufactured in one area, tested in another, and purchased in a third – taking advantage of the economic strengths of each place. Ships, planes, trains, and trucks support an extraordinarily complex global supply chain. Well-functioning transportation systems are critical to economic competitiveness at the national and the regional levels, where they influence everything from commute times, freight delays, land use, quality of life, air quality, productivity, and agglomeration.

- **Cost of Production and Competitiveness:** An efficient transportation system can lower the cost of goods movement and increase reliability. Studies have found a correlation between infrastructure investments and economic output; infrastructure supports private sector productivity gains, often with higher returns than traditional business investments.[18]
- **Agglomeration and Productivity:** When firms cluster, they can more easily share ideas, supply chains, and people, thus boosting productivity. A 2012 study by Patricia Melo and Daniel Graham found that "doubling the number of jobs accessible within 20 minutes of driving time leads to an increase in real average wages of 6.5 percent, while the impact for a similar increase within 20 to 30 minutes is as small as 0.5 percent."[19] This effect is even more pronounced in knowledge-intensive industries.[20]

[15] See previous footnote on studies on studies by MIT, RAND, and ICF International.
[16] Congressional Budget Office, "Federal Financial Support for the Development and Production of Fuels and Energy Technologies," March 2012, http://www.cbo.gov/sites/default/files/cbofiles/attachments/03-06-FuelsandEnergy_Brief.pdf.
[17] John M Richardson, Jr. was a pioneer in the field of system dynamics and global modeling with the Club of Rome. He has applied systems dynamics principles to multiple fields, including sustainability, civic conflict, and international development. Dr. Richardson is currently faculty emeritus at American University.
[18] See "A New Economic Analysis of Infrastructure Investment," Department of the Treasury with the Council of Economic Advisors, 2012
[19] Melo, Patricia and Daniel Graham, "Agglomeration, Accessibility, and Productivity: Evidence for Urbanized Areas," Transportation Research Board, Annual Meeting, 2013.
[20] American Public Transportation Association, "The Role of Transit in Support of High Growth Business Clusters in the U.S.," December 2013.

- **Imports and Exports:** A 2010 Brookings report on metropolitan exports found that exports are critical to national and regional economic competitiveness. In addition, the report notes that many US exports require intermediary inputs, implying that imports are also critical for the value-added processes that US firms employ on eventual exports.[21]
- **Expanded Labor Pool:** Well-functioning transportation systems enable firms to access more workers. This supports economic growth and facilitates efficient labor matching, allowing firms to access the most talented workers in a given geographic area.
- **Real Estate Values:** Transportation infrastructure can boost local property values. For example, a study of the Hiawatha Light Rail corridor running from Minneapolis to Bloomington, Minnesota found that "the LRT [light rail transit] had a significant positive impact on property values..." and that "residential property values increased by $47 million along the segment of the corridor studied."[22] Trails and greenways have been found to have a similar positive effect on real estate.[23]
- **Employment Benefits:** Transportation provides well-paying jobs and has ripple effects across the public and private sector. For example, a study prepared for the American Public Transportation Association found that for every billion dollars of national investment in public transportation, 36,000 jobs are supported for one year.[24]

Well-functioning transportation systems are critical to economic competitiveness at the national and the regional levels, influencing commute times, freight delays, land use, quality of life, and productivity.

Much like the human circulatory system, people most often notice transportation systems when they malfunction. Congestion, routing errors, and system failure all contribute to economic losses.

- In 2013, over one-fifth of US scheduled flights were delayed or canceled.[25]
- In 2011, US drivers lost 5.5 billion hours, 2.9 billion gallons of fuel, and $121 billion due to traffic congestion and delay.[26]
- Nineteen percent of shipping vessels do not arrive on time in ports; in the world's busiest shipping lanes, container delivery to the end customer was even less reliable.[27]

Maintaining transportation system performance is critical for economic competitiveness.

[21] Brookings Institution, "Export Nation 2012: How U.S. Metropolitan Areas are Driving National Growth," 2012.
[22] Goetz, Edward G., et al., "The Hiawatha Line: Impacts on Land Use and Residential Housing Value," Minneapolis: Center for Transportation Studies, University of Minnesota, 2010.
[23] Rails-to-Trails Conservancy, "From Trail Towns to TrOD: Trails and Economic Development," August 2007.
[24] Glen Weisbrod and Arlee Reno, "Economic Impact of Public Transportation Investment," APTA, October 2009.
[25] US Bureau of Transportation Statistics, "Research and Innovation Technology Statistics," http://www.transtats.bts.gov/HomeDrillChart.asp.
[26] Texas Transportation Institute, "2011 Urban Mobility Report," http://d2dtl5nnlpfr0r.cloudfront.net/tti.tamu.edu/documents/mobility-report-2011-wappx.pdf.
[27] DC Velocity, http://www.dcvelocity.com/articles/20120803-report-most-container-ships-arrive-on-time-but-delivery-to-customer-lags/.

Transportation systems are not easy to design, build, or manage. Some transportation technologies can fundamentally change the architecture of transportation systems (as the advent of the automobile and the airplane did). Other technologies, like cargo cranes or wireless sensors can introduce new ways to manage transportation systems.

Transportation infrastructure must be engineered for safety, reliability, *and* efficiency. Transportation investments are also about people, how they *want* to move around, and what impacts transportation systems might have on their communities. Complex global supply chains rely on efficient transportation systems that can handle multiple moving pieces. Transportation globally is increasingly becoming a challenge for urban and suburban communities. Where physical space is a premium, construction is more complex and costly, and the sheer density of people introduces critical tradeoffs between different transportation modes. Even without a changing future, transportation systems are complex, and new developments can intensify the challenges.

Cities and Regions Around the World Are Moving Into the Fast Lane

Cities and regions around the world are not idling while the future overtakes them. Many are tackling the challenges and defining the next era of transportation systems. Some transportation improvements are humble design innovations whose time has come. Others are radical experiments in mobility. Historically, US economic competitiveness has been supported by a world-class rail network and then by a road network. New York City enjoys the human capital benefits of density, which are difficult to imagine without its subway system. The Bay Area has similar pockets of density,[28] which are connected by an extensive rail network. US seaports and airports feed a complex trucking distribution system enabled by a highway network. Today, other transportation systems are now positioning their regions for social and economic success in the 21st century.

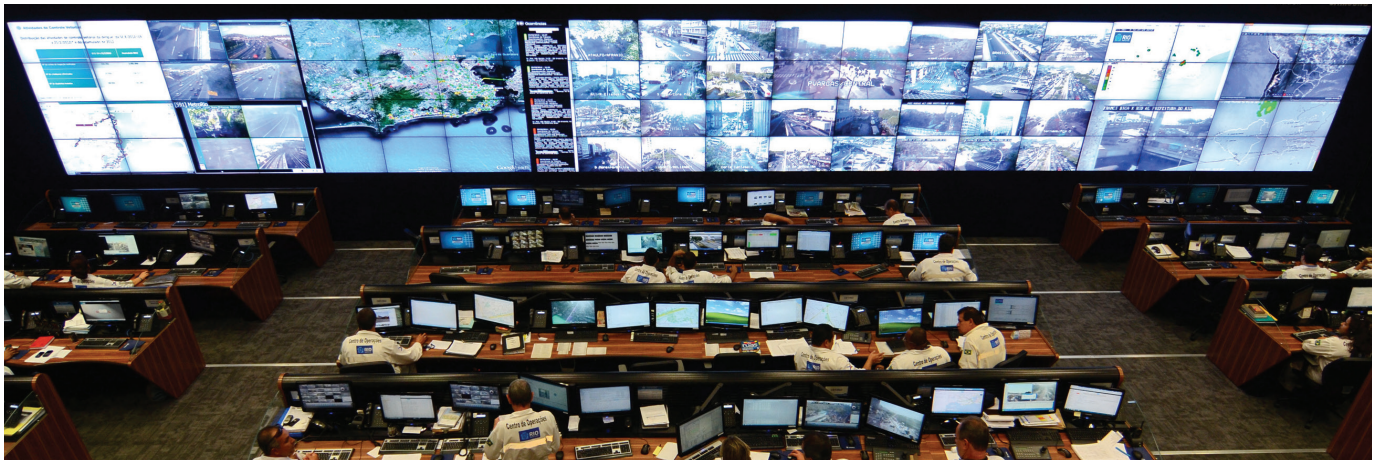
Examples of advanced transportation systems deployed or in early development around the world include the following.

Agile Transit Infrastructure: Over the past decade, bus rapid transit (BRT) has captured the imagination of transportation planners around the world. BRT offers many of the amenities of a subway, including platform boarding, enclosed stations, dedicated lanes, and the dramatically reduced costs of using roads and wheels rather than rail infrastructure and custom-designed trains. BRT systems can be maintained and expanded at a fraction of the costs for rail. TransMilenio, a BRT system introduced in 2000 in Bogotá has been viewed as a model BRT system and has convinced

Bogotá, Colombia TransMilenio Bus Rapid Transit

Photo Credit: Wikimedia Commons

[28] Smart Growth America, "Measuring Sprawl 2014," http://www.smartgrowthamerica.org/documents/measuring-sprawl-2014.pdf.



IBM Mission Control in Rio de Janeiro

Photo Credit: IBM.com

many skeptics that it can outperform alternative light rail systems. In 2012, the entire system covered 54 miles, with ambitions to eventually cover 240 miles; in comparison, the entire BART (Bay Area Rapid Transit) system in California covers 105 miles. There are now many BRT systems around the world, although there are few in the US that actually have dedicated lanes, which are critical to improving performance.

Digitally Integrated Smart City: In Rio de Janeiro, city officials and administrators can monitor various systems in the entire city from an IBM-created mission control room, which reports integrated city data in real time. In response to an emergency such as a fire or a building collapse, controllers can reroute traffic, close transit stations, and issue warnings to travelers. This lets first responders do their jobs, allows Rio residents to continue their travels, and prevents already critical situations from getting out of control. In integrating transportation as part of a larger system of city behavior, the intelligent operations center enables highly coordinated responses to urban needs, including the flow of goods and people.

Efficient Demand Management: In 2006, policymakers in Stockholm, Sweden launched a pilot congestion pricing scheme that charged vehicles entering the city center a variable fee during the weekday rush hour. After extensive outreach, planners held a six-month trial of the system, then revoked it and later held a referendum to see if Stockholm citizens wanted to keep it. They voted to reinstall it permanently. The system avoids the cost and traffic of tollbooths by using optical recognition of license plates; monthly bills are sent to the drivers. Congestion inside and outside the city center fell by 20 to 25 percent during the trial period, public transit use increased, and air quality improved. The city recouped its investment in less

Stockholm Congestion Pricing Signage

Photo Credit: Wikimedia Commons

Tesco Virtual Subway Shopping Store in Seoul

Photo Credit: Tesco Homeplus

Port of Hong Kong Automated Crane

Photo Credit: B&R Automation

than four years.[29] Similar strategies have been employed in the Bay Area by SFpark and GoBerkeley in order to better manage scarce parking spaces.

A New Transit Experience: In Seoul, South Korea, subway riders can shop for goods from Tesco Homeplus (a major retailer) using a virtual store aisle in the downtown subway station. Riders can order items via Quick Response Code from their phones and have them delivered to their homes or held for pickup.[30] This use of transportation infrastructure has enabled new financing streams and delivered a unique service to riders.

Automated Port Operations: Located in Hong Kong's Kwai Tsing Container Terminals port facility, Hong Kong International Terminals (HIT) uses a technologically wired terminal management system that is widely considered to be the most advanced in the world. A massive data tracking system enables automated rail-mounted cranes to operate 24 hours a day. This technology will likely be explored by other ports as a way to increase trade volume.

Automated Electric-Car Dispensing Vending Machine: In China, the city of Hangzhou, home to 8.7 million people, is experimenting with a new system of car sharing on a scale and density unmatched anywhere in the world. Car sharing is not a novel invention, but the complexity of cities in China requires a model different from the Zipcar model of surface-parked cars. A company called Kandi Technologies intends to use a system that works like a

Chinese Kandi Car Dispenser

Photo Credit: Mundo Auto Motor

[29] McKinsey Global Institute, "Infrastructure Productivity: How to Save $1 Trillion a Year," page 59.

[30] Lawson, Alex "Tesco Expands Korean Virtual Stores," Retail Week, February 7, 2012.

Example of a Straddle Bus

Photo Credit: Shenzhen Huashi Future Parking Equipment Co.

Protected Bike Lanes in Oakland

Photo Credit: Melanie Curry, Streetsblog San Francisco

vending machine to make 100,000 vehicles available to residents of Hangzhou through automated parking garages that each hold up to 300 vehicles.[31] By comparison, the entire Zipcar fleet in 2012 was less than 10,000 vehicles.[32] The system allows one-way rentals, and the mechanically dispensed cars can be rented by the hour and returned to any Kandi automated garage in the city.

Land Airbus: TBS China has proposed plans for a massive bus that travels over two lanes of traffic, combining the minimal-infrastructure benefits of BRT with the high-tech interior and traffic independence of a rail system. The bus would allow traffic to pass underneath even when stopped. The idea first appeared in 2010, with construction slated in Beijing's Mentougou district,[33] but an updated concept by TBS China was released in 2012, showing increased capabilities and safety features. Actual deployment is unclear, but the idea shows creative experimentation for highly dense urban areas where even rail and roads compete for right of way.

Complete Street Design: New approaches to street design break down the traditional separation between highways, transit, walking, and bicycling, and instead focus on the desired outcome of a transportation system that supports safe use and beneficial public spaces. The complete streets movement is gaining steam across the US, as cities like New York City, San Francisco, Oakland, Chicago, and Washington, D.C. experiment with new cost-effective, context appropriate street designs. While complete streets policies are different in every location, strategies that calm traffic, separate buses and bicycles from vehicle flows, and enhance crosswalks and pedestrian refuges can make streets safer, optimize traffic speeds, and produce economic vitality.

These innovations in cities and regions around the world offer more than points of inspiration; they also represent economic competition. Mobility of goods and people is critical in the 21st century, and ideas, investments, and businesses will flow where regional advantages, including transportation, are highest. However, the future is not only occurring overseas; it is also happening today in Alameda County.

[31] Rogowsky, Mark,, "Kandi Crush: An Electric-Car Vending Machine From China Could Upend The Auto Industry," Forbes, Dec. 28, 2013, http://www.forbes.com/sites/markrogowsky/2013/12/28/kandi-crush-an-electric-car-vending-machine-from-china-could-upend-the-auto-industry/.

[32] Zipcar, "Annual SEC Filing," 2012, http://quote.morningstar.com/stock-filing/Annual-Report/2012/12/31/t.aspx?t=:ZIP&ft=10K&d=046ab7e63b7d64119cb4c2.

[33] Alter, Lloyd, "Straddle bus may be coming down the road soon." September 11, 2013 http://www.treehugger.com/public-transportation/straddle-bus-may-be-coming-down-road-soon.html.

Early Signs of the Transportation Future in the Bay Area

Many of the technologies driving global infrastructure innovation are initially developed in the Bay Area. In addition, many transportation agencies, including those in Alameda County, are investing in advanced infrastructure systems. Examples exist where Alameda County is on the forefront of innovation, moving beyond traditional transportation to adjust to changing demand preferences, environmental considerations, and emerging technology.

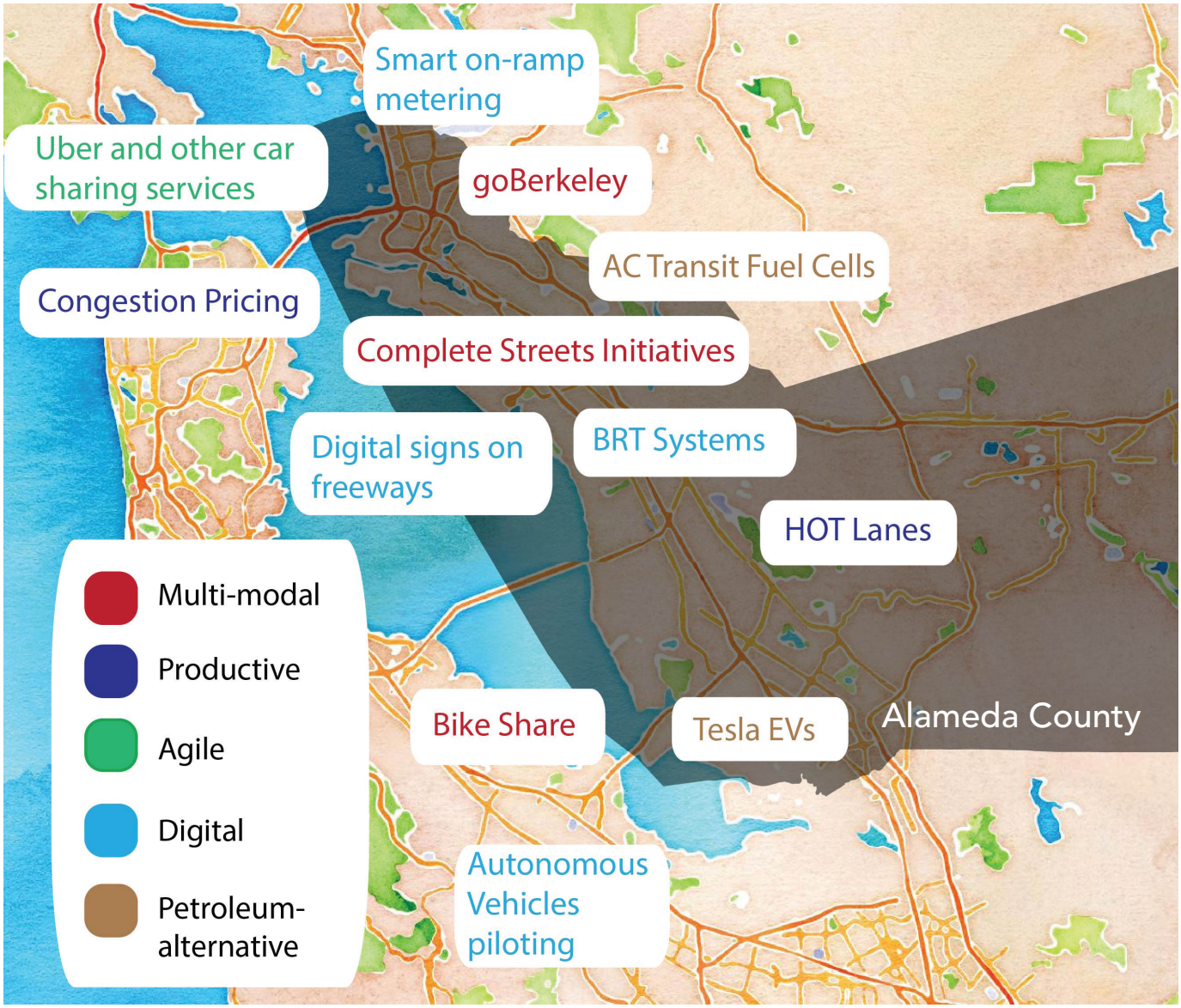
- **East Bay Bus Rapid Transit:** Planned improvements include rail-like bus stations, dedicated bus lanes, new traffic signals with priority for buses, street lighting, landscaped medians, and crosswalk improvements between the cities of Oakland and San Leandro. The project corridor stretches from 20th Street in downtown Oakland; extends along International Boulevard; and ends at the San Leandro BART station. Projections show an increase in corridor ridership from 25,000 to 36,000 patrons per day with 28 percent faster travel speeds during the afternoon rush hour as compared to current bus service.
- **I-80 Integrated Corridor Mobility:** This project will implement intelligent transportation strategies, such as adaptive ramp metering and incident management systems, along a 19.5-mile stretch of I-80 from the Bay Bridge Toll Plaza to the Carquinez Bridge in Contra Costa County. Adaptive ramp metering – which uses an algorithm that takes into account ramp and freeway volumes – will optimize the flow of traffic, while real-time traffic information displays will allow drivers to make informed route decisions during their trip.

Across the Bay Area, many other elements of advanced transportation systems are also emerging. Examples include dynamic pricing for highway use and parking, BRT, smart metering at highway on-ramps, car and bike sharing, and digital freeway signs for real-time information. Companies in the region such as Tesla and Google are also at the forefront of advancing transportation technologies.

Express Lane on I-680

Photo Credit: ACTC

Transportation systems represent a complex component of daily life. As physical infrastructure, they involve large, long-term investments, and they are governed by multiple regulatory bodies at different levels of government. They serve complex economies of goods and services, commuting workers, multiple vehicles, and countless diverse communities. However, the diverse needs of residents and commerce and the demands of public policy can shift quickly. A major challenge facing any infrastructure system – and particularly the transportation system – is how to adapt to a rapidly changing future. Alameda County's 2014 TEP proposes investments that will position the county to respond to evolving demands on its transportation infrastructure while also moving toward a future in which mobility can continue to translate into economic benefits.



Early Signs of the Transportation Future in the Bay Area

Data Source: Bay Area Council Economic Institute
Image Source: Stamen Maps

Alameda County: A Critical Hub for the Movement of Goods and People in the Bay Area

Alameda County serves as the Bay Area's hub for the movement of goods and people. Approximately 37 percent of Bay Area workers move to, from, or pass through Alameda County, an indication of the county's vital importance to the region's economy.[34] In addition, at least 41 percent of Bay Area trade (by value) passes directly through Alameda County's air and water ports, and much trade through other regional ports relies on Alameda County's extensive transportation system.[35] The following sections detail current transportation trends in Alameda County and around the Bay Area.

Alameda County, the Hub of Bay Area Commute Flows

Given its central positioning in the nine-county Bay Area, Alameda County serves as a conduit for commuters moving throughout the region. With three bridges spanning San Francisco Bay, 20 BART stations, and multiple major highways, Alameda County has connections to all corners of the region. In addition to being a hub for transportation flows, the county also boasts a large and growing population of over 1.5 million residents – making it the second largest county in the Bay Area. With 21 percent of the region's total population, it trails only Santa Clara County. Its population increase of 1.68 percent over the one-year period to July 2013 constituted the fastest county population growth rate in all of California.[36]

Approximately 37 percent of Bay Area workers move to, from, or pass through Alameda County each day on their way to work.

Regional Commute Patterns by Geography

Unlike most metropolitan regions with a central city as the hub of the regional economy, the Bay Area has multiple job centers and a diversity of residential communities. Given this situation, the region has a highly mobile regional labor pool. With a total workforce of approximately 3 million people, large numbers of commuters cross bridges and take trains in the region each day. Alameda County plays an outsized role in supporting Bay Area commutes. With its central location, Alameda County frequently handles cross-regional trips or is the home county for two-worker households living between two workplaces.

Forty-seven percent of all Bay Area workers cross at least one county line to reach their places of employment. With Alameda County's proximity to large employment centers in Silicon Valley and San Francisco, 52 percent of the county's employed residents work outside the county boundaries. In comparison to other commute patterns in the broader Bay Area, a slightly larger percentage of Alameda County residents commute to other counties for work.

[34] Calculation based on the US Census Bureau, Longitudinal Employment-Household Dynamics dataset. The calculation includes only those that work in the nine-county Bay Area as its total population.
[35] Calculation based on US Trade Online dataset.
[36] State of California, Department of Finance, "July 1, 2013 County Estimates Ranked by Size, Numeric and Percent Change," December 2013.

Bay Area Commute Patterns by County, 2011

County	Residents Working Outside the County	Residents Working within the County	Workers Living Outside the County
Alameda	52%	48%	53%
Contra Costa	61%	39%	49%
Marin	60%	40%	61%
Napa	47%	53%	49%
San Francisco	39%	61%	60%
San Mateo	61%	39%	61%
Santa Clara	30%	70%	38%
Solano	64%	36%	51%
Sonoma	39%	61%	32%
Bay Area	47%	53%	50%

Data Source: US Census Bureau, Longitudinal Employer-Household Dynamics
Analysis: Bay Area Council Economic Institute

Alameda County also attracts a significant number of workers from other areas, and it reports a net commuter inflow of approximately 9,000 people. Fifty-three percent of workers employed in the county reside outside of its bounds – a higher percentage than neighboring counties such as Contra Costa and Santa Clara. Taken together, these data points exemplify the significant inbound and outbound commuter flows that Alameda County experiences each day, all of which rely on the transportation system.

While the Bay Area job market is often thought to be led by San Francisco and Silicon Valley, Alameda County actually has the second largest employment base in the region. Workers from around the Bay Area rely on Alameda County's diverse employment centers, such as UC Berkeley, Hacienda Business Park in Pleasanton, the downtown Oakland business district, the three national laboratories, and many hospitals. It is notable that more than 300,000 workers per day commute into the county – an amount comparable to both San Francisco and Santa Clara Counties – fully offsetting the number of residents that commute outside of Alameda County to reach their workplace.

Cross County Labor Flows, 2011

County	Residents Working within the County	Residents Working Outside the County	Workers Living Outside the County	Total County Employment	Net Inflows
Alameda	286,444	309,074	318,108	604,552	9,034
Contra Costa	156,706	243,083	152,721	309,427	(90,362)
Marin	36,289	55,404	56,925	93,214	1,521
Napa	29,586	26,466	28,106	57,692	1,640
San Francisco	216,910	139,260	321,849	538,759	182,589
San Mateo	118,985	183,949	184,544	303,529	595
Santa Clara	495,395	212,936	308,964	804,359	96,028
Solano	55,038	99,844	56,904	111,942	(42,940)
Sonoma	106,824	68,349	50,330	157,154	(18,019)
Bay Area	1,502,177	1,338,365	1,478,451	2,980,628	N/A

Note: Net Inflow is column 4 minus column 3.
Data Source: US Census Bureau, Longitudinal Employer-Household Dynamics
Analysis: Bay Area Council Economic Institute

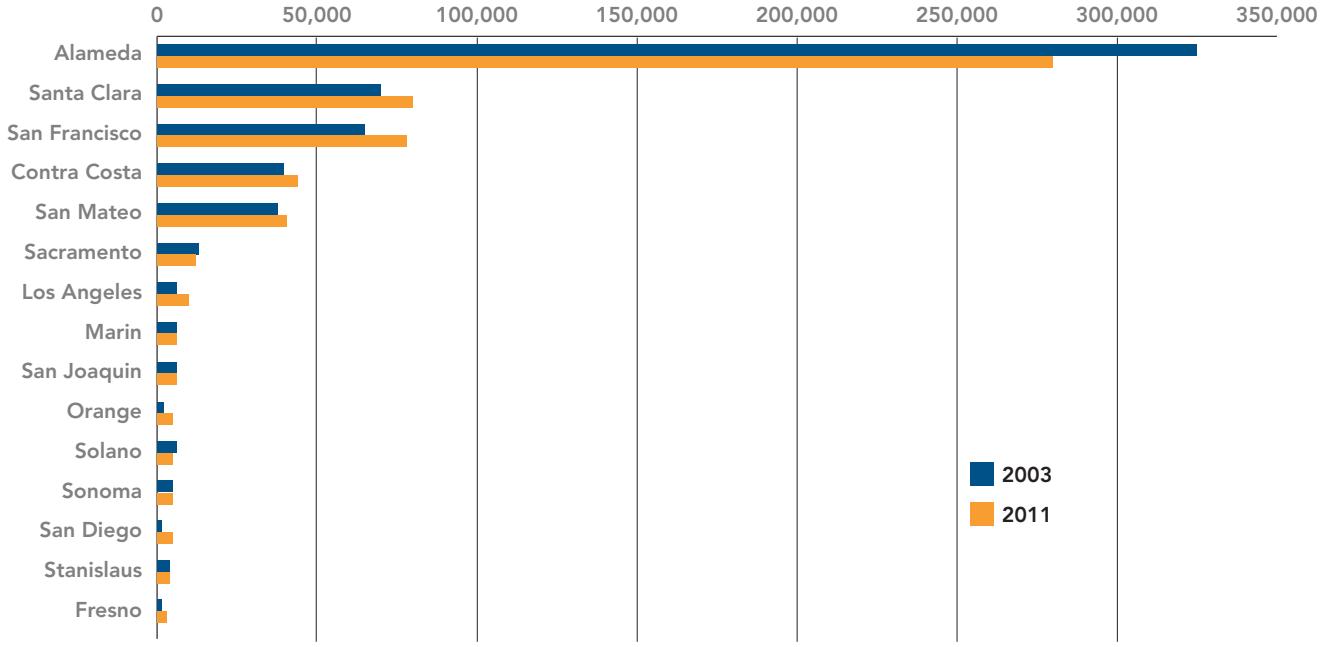
With over 300,000 residents leaving the county each day to reach their workplaces, Alameda County is the largest source of inter-county commuters in the Bay Area. The percentage of residents commuting elsewhere for work has also been rising. The 52 percent of Alameda County residents who crossed county lines to reach their workplaces in 2011 rose from 46 percent in 2003, an increase of 27,500 commuters over just eight years.

Alameda County's more than 600,000 jobs make it the second largest employment base of any Bay Area county, trailing only Santa Clara County.

The Bay Area has a number of job centers in San Francisco, Santa Clara, Contra Costa, and San Mateo Counties, which account for the vast majority of all commute destinations outside of Alameda County. The San Francisco and Santa Clara employer destinations produced significant growth, surging upward by 18 percent and 8 percent, respectively, in the number of Alameda County residents that commute there since 2003.

The largest flow of workers into Alameda County comes from Contra Costa County, a reflection of its geographic proximity and the fact that Alameda County has nearly twice as many jobs. Contra Costa County residents comprise 27 percent of all Alameda County workers commuting in from outside the county, though in absolute terms, numbers fell by 3,500 between 2003 and 2011. Approximately 89 percent of these workers from Contra Costa County drive to Alameda County.[37] The largest influx of workers since 2003 has come from Santa Clara County, which added 5,400 commuters to Alameda County over this period.

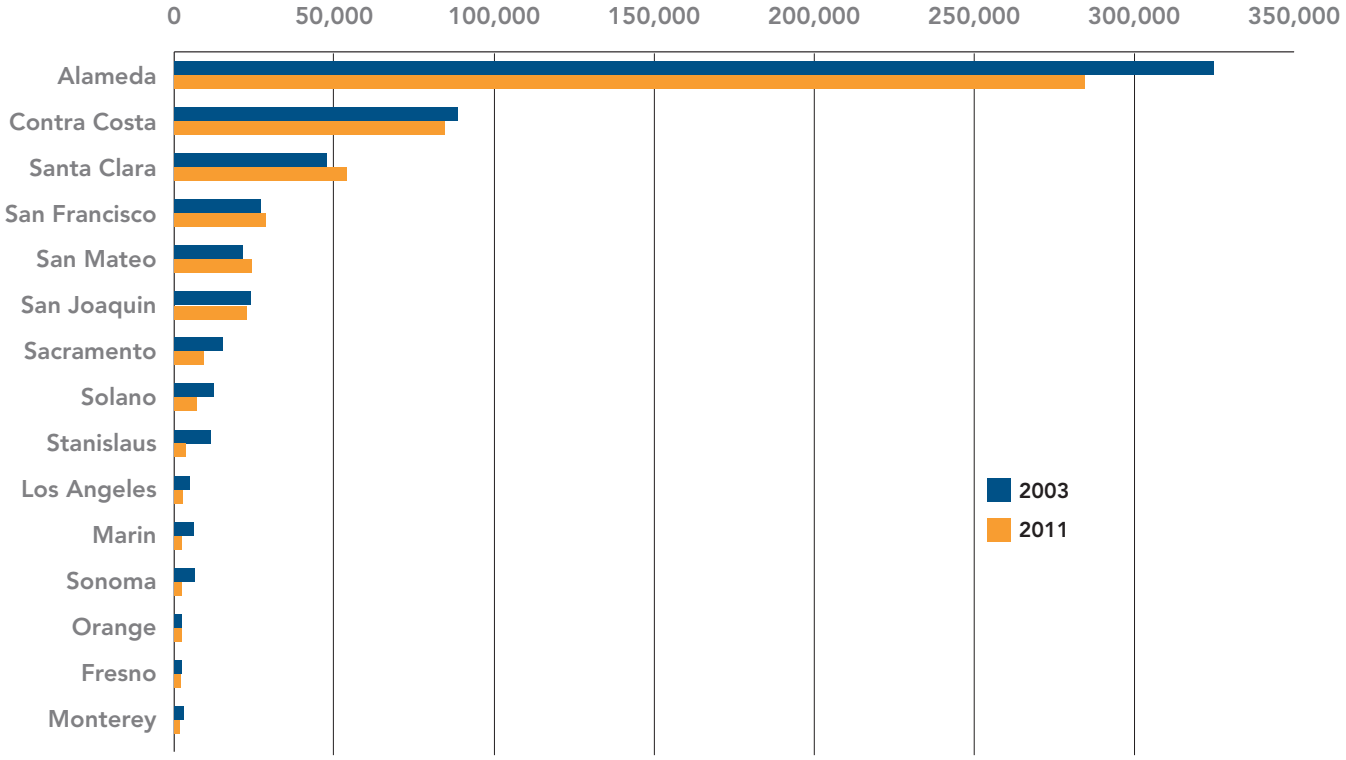
Workplace County of Alameda County Residents
2003 and 2011



Data Source: US Census Bureau, Longitudinal Employer-Household Dynamics
Analysis: Bay Area Council Economic Institute

[37] Calculated from American Community Survey data compiled by the US Census Bureau; the number of cross county car commuters is divided by all commuters moving between the two counties.

Residence County of Workers in Alameda County
2003 and 2011



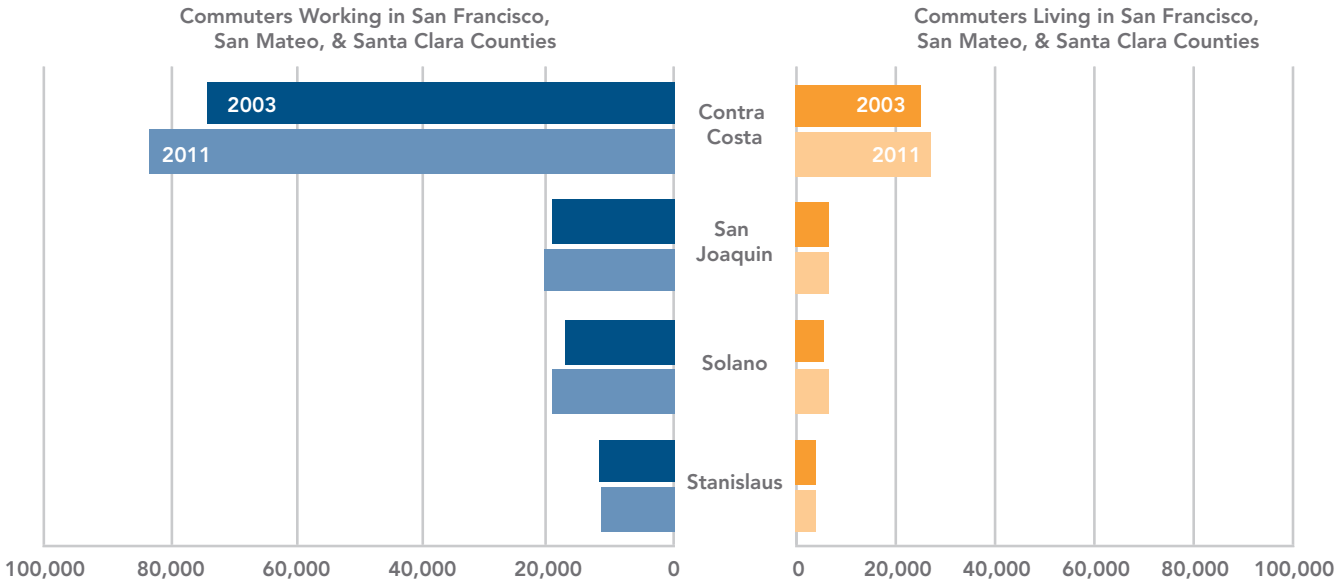
Data Source: US Census Bureau, Longitudinal Employer-Household Dynamics
Analysis: Bay Area Council Economic Institute

In addition to commute traffic originating from and destined to Alameda County, the county is centrally situated between several major residential and economic centers in the Bay Area. As a critical focal point in the region's transportation system, Alameda County has heavy volumes of through traffic on its roadways and on public transportation systems. In 2011, as many as 181,640 Bay Area commuters moved through Alameda County each day on their way to work.[38] Approximately 75 percent of these trips were associated with worker movements into San Francisco, San Mateo, and Santa Clara Counties – with nearly two-thirds of those commutes originating in neighboring Contra Costa County. Since 2003, the number of pass-through commuters has increased by 9 percent with influxes from all surrounding counties.

[38] Data include trips originating or ending in San Francisco, San Mateo, and Santa Clara Counties with connected origin or end in Contra Costa, San Joaquin, Solano, and Stanislaus Counties.

Commute Flow Through Alameda County

All Commuters 2003 and 2011



Note: Data includes commuters moving to and from San Francisco, San Mateo, and Santa Clara Counties.
Data Source: Source: US Census Bureau, Longitudinal Employer-Household Dynamics
Analysis: Bay Area Council Economic Institute

One cause of the increased commuting movement throughout the Bay Area has been the disparate effects of the recent recession on regional employment. The San Francisco and Silicon Valley metropolitan areas have produced steady job growth in recent years to the point where total employment now exceeds pre-recession levels. In contrast, the recession in the East Bay was deeper and recovery has been slower, leaving the East Bay region with fewer reported jobs than in 2007. While workers have had to broaden their job searches to encompass the entire region, they are less likely to change their housing when changing jobs;[39] thus contributing to the increasing trend in cross-county commutes.

Employment Trends in Bay Area Metropolitan Areas

	Annual Average Employment						
	2007	2008	2009	2010	2011	2012	2013
Oakland-Fremont-Hayward	1,059,208	1,044,592	983,617	962,892	970,900	999,925	1,033,867
year-over-year change		*-1.4%*	*-5.8%*	*-2.1%*	*0.8%*	*3.0%*	*3.4%*
San Francisco-San Mateo-Redwood City	1,002,100	1,013,633	963,933	954,942	978,708	1,024,825	1,070,058
year-over-year change		*1.2%*	*-4.9%*	*-0.9%*	*2.5%*	*4.7%*	*4.4%*
San Jose-Sunnyvale-Santa Clara	918,917	925,175	868,200	865,633	886,033	921,108	961,792
year-over-year change		*0.7%*	*-6.2%*	*-0.3%*	*2.4%*	*4.0%*	*4.4%*

Data Source: California Employment Development Department, CES
Analysis: Bay Area Council Economic Institute

[39] Farber, Henry S. (2010) Job Loss and the Decline in Job Security in the United States. *Labor in the New Economy, National Bureau of Economic Research,* 223-262.

Diverse Commute Modes

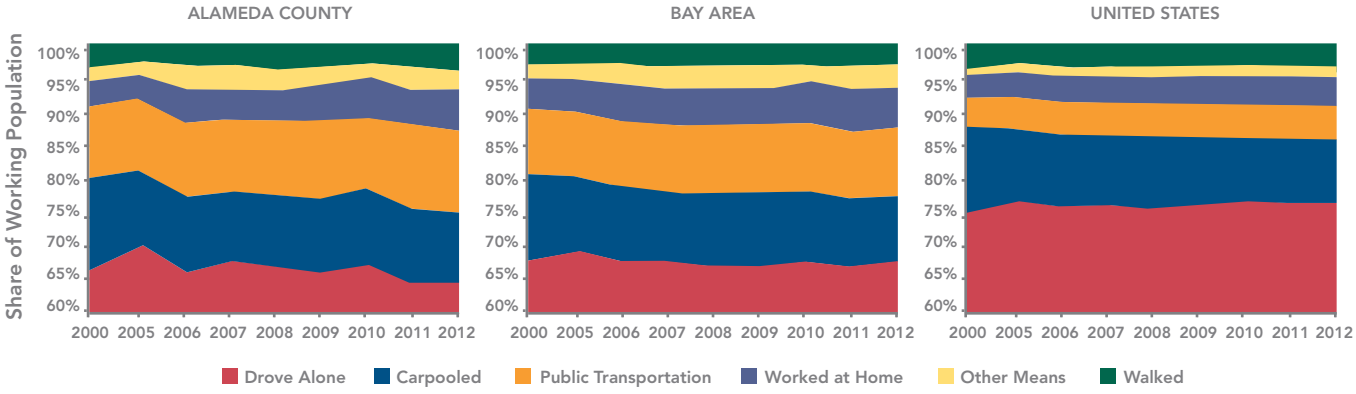
Over 1.3 million people in the Bay Area cross at least one county line to reach their workplaces. While the majority of these workers drive, the regional average of 77 percent is well below the 86 percent of Americans who rely on cars – either driving alone or in carpools—for their commutes.

Commute choices vary around the Bay Area. Alameda County's central location and heavy commute flows provide its commuters with more choices than most. For example, 40 percent of Alameda County residents who work in San Francisco travel by car, in contrast to 94 percent traveling from Santa Clara County into San Francisco.[40] Over 12 percent of Alameda County residents use public transportation to get to work, higher than the regional average of 10.4 percent and much higher than the national rate of 5 percent.

Bay Area commutes are becoming longer in distance and duration, and the total number of commuters is rising.

While usage of public transportation has maintained a steady share of overall Bay Area commute modes since 2005, public transportation's mode share in Alameda County expanded by 3 percentage points over the seven-year period from 2005 to 2012. A slow steady trend toward more multimodal commuting is also notable, as driving modes' combined share dropped from 80 to 75 percent of commuters between 2000 and 2012. Prior to this period, driving had grown or maintained its mode share in the Bay Area in each of the previous four decades.[41] Additionally, the growing trend of people working from home is observable throughout the Bay Area as technology allows more distributed work.

Means of Commute



Note:The area between 0-60 percent is occupied by the category "Drove Alone"
Data Source: U.S. Census Department, 2000 Decennial Census and American Community Survey one-year estimates
Analysis: Bay Area Council Economic Institute

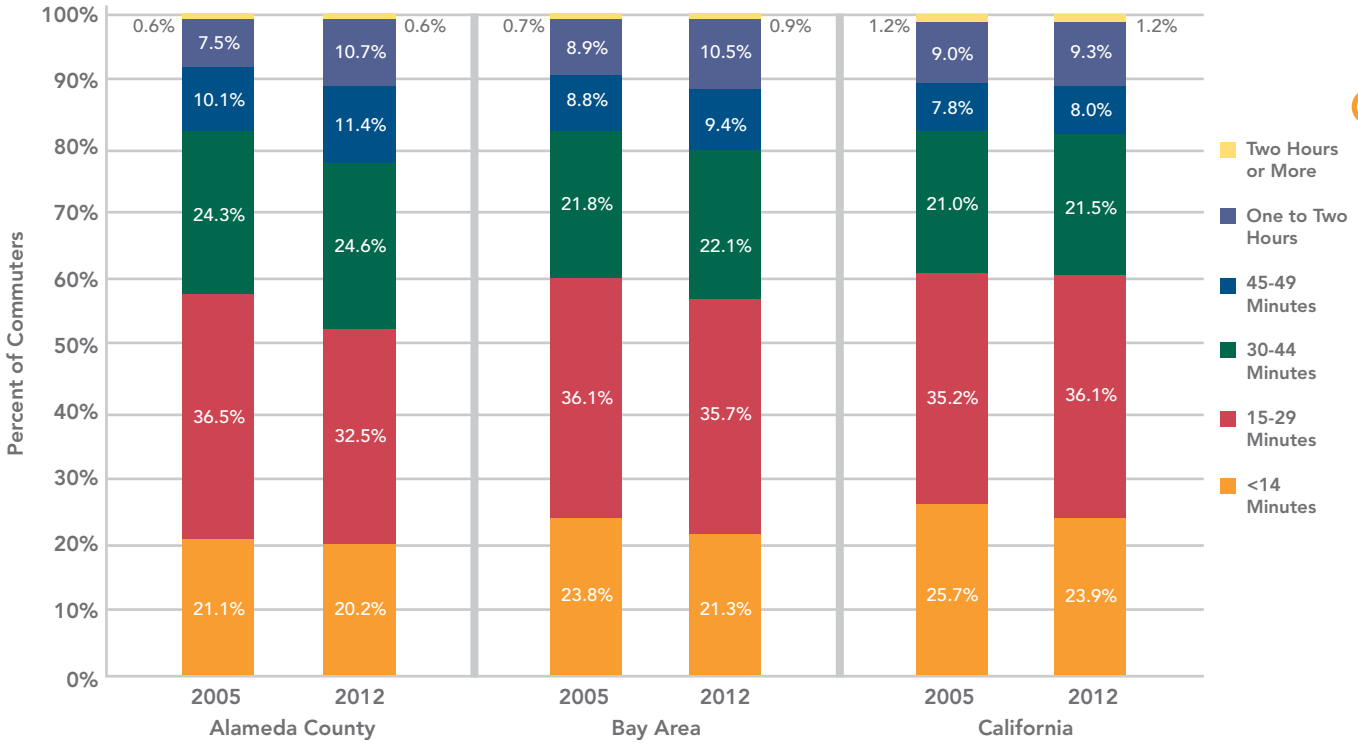
[40] Calculated from American Community Survey data compiled by the US Census Bureau; the number of cross-county car commuters is divided by all commuters moving between the two counties.
[41] SPUR, "The Urban Future of Work." September 2011.

Rising Commute Times

As populations grow and commuter preferences shift, average commute times of various transportation modes also change. For workers across California, commute times have crept upward from 2005 to 2012. The average commute in the Bay Area took 28.5 minutes in 2012, while the US average was 25.7 minutes. Commute times in Alameda County averaged 29.3 minutes and have outpaced the broader Bay Area as the number of Alameda County workers spending more than half an hour to get to work increased from 42.4 percent to 47.3 percent between 2005 and 2012. Additionally, the percentage of workers requiring more than one hour to arrive to work rose from 7.5 percent to 10.7 percent over the same period.

Commute Times

Minutes to Work for Alameda County, Bay Area and California Workers



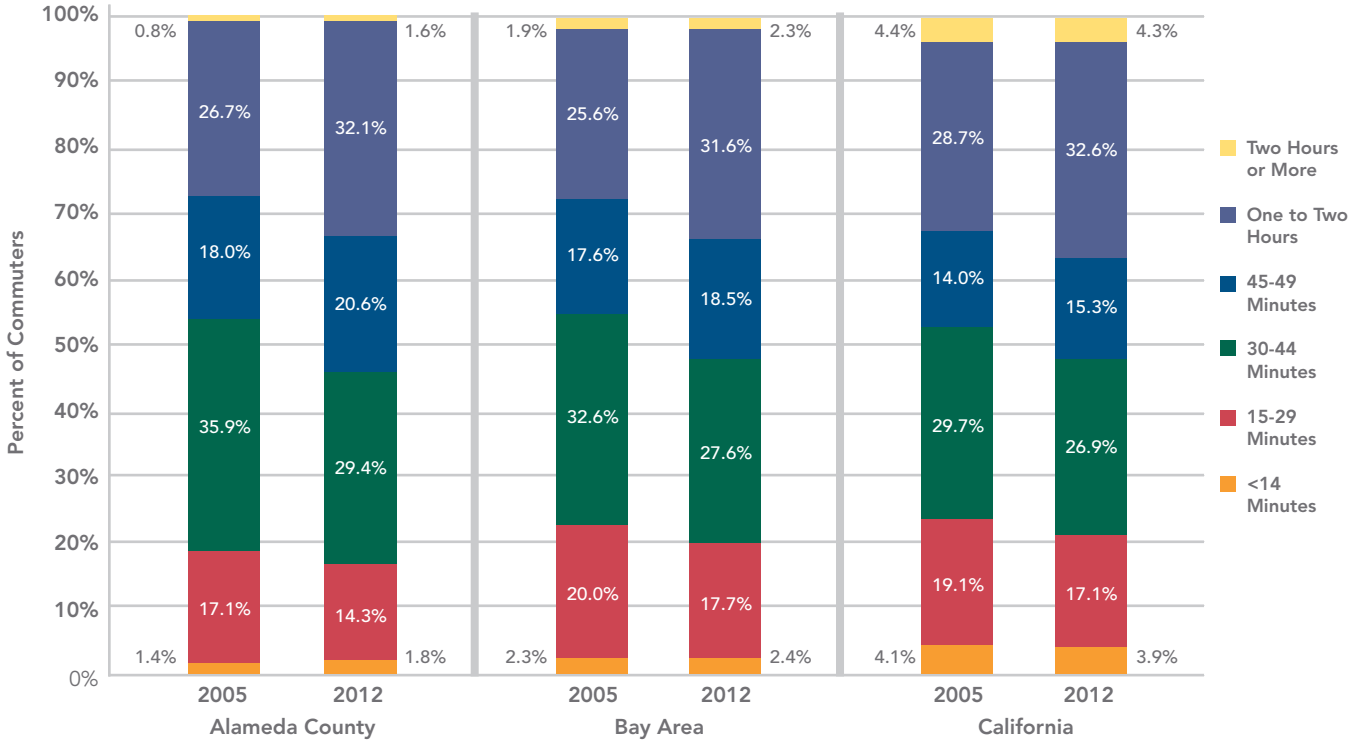
Data Source: U.S. Census Bureau, American Community Survey one-year estimates
Analysis: Bay Area Council Economic Institute

In short, Bay Area commutes are becoming longer in distance and duration, and the number of total commuters has increased by 100,000 since its low in 2009. Region-wide, more than 20 percent of commuters spend more than 45 minutes on their commutes, which is up from 2005. In Alameda County, longer commutes have become more prevalent, which is partly attributable to the increasing trend of Alameda County residents commuting greater distances to other counties for work, specifically to San Francisco and Santa Clara counties where recent job growth has been stronger. The distribution of the population farther from job centers is also reflected in the longer commute times on public transportation.

In Alameda County, 16.3 percent of commuters spent less than 30 minutes traveling to work on public transit in 2012, which is down from 18.5 percent in 2005. Those driving are generally less likely to accept long commutes as compared to users of public transit; 56 percent of vehicle commuters had commutes of less than 30 minutes.

Public Transit Commute Times

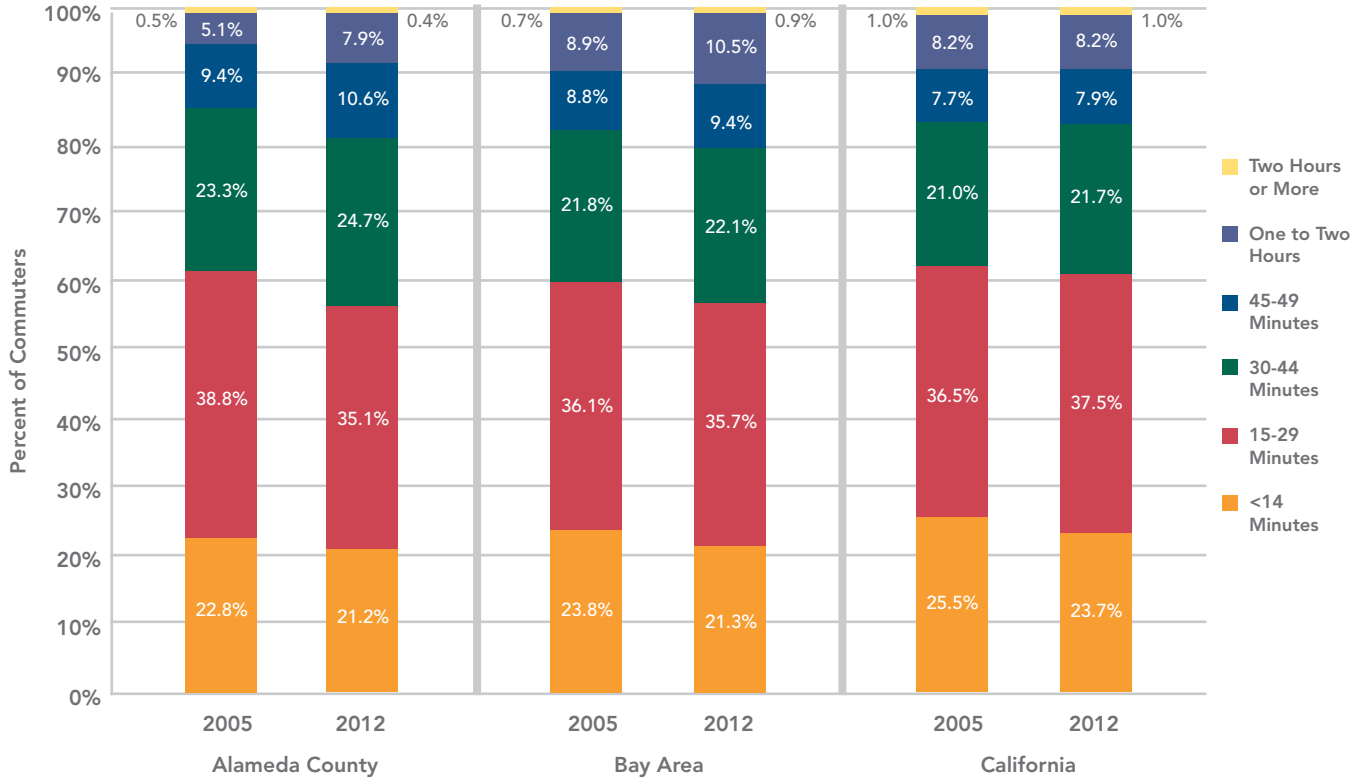
Minutes to Work for Alameda County, Bay Area and California Workers



Data Source: U.S. Census Bureau, American Community Survey one-year estimates
Analysis: Bay Area Council Economic Institute

Passenger Vehicle Commute Time

Minutes to Work for Alameda County, Bay Area and California Workers



Data Source: U.S. Census Bureau, American Community Survey one-year estimates
Analysis: Bay Area Council Economic Institute

Trends in Passenger Vehicle Commutes: Reflecting the Pulse of the Economy

With the total number of cars and trucks on the road in the Bay Area moving back above its pre-recession high, the amount of time spent en route is also rising. Given the region's growing economy and population, and Alameda County's central location, the county was home to four of the top 10 most congested freeway routes in the Bay Area in 2012.[42]

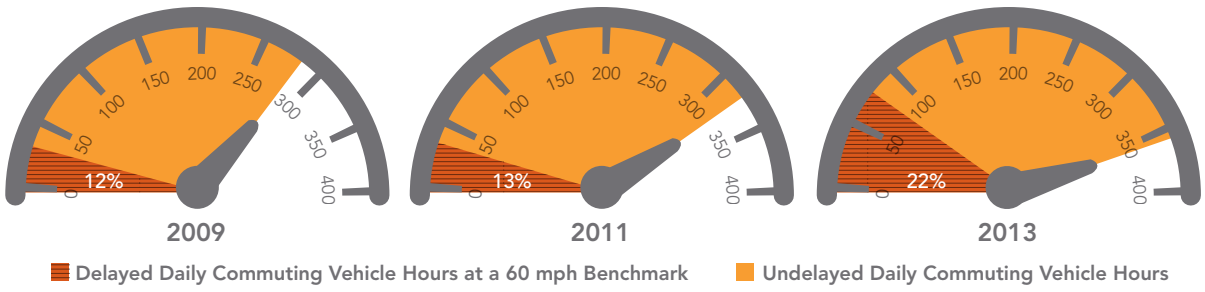
Between 2009 and 2013, daily vehicle hours spent on the road in Alameda County increased by 67,700 hours to 353,000 hours. Of this additional time, more than 63 percent can be attributed to delayed traffic. Most notably, Alameda County is home to the largest number of vehicle hours spent delayed in traffic in the Bay Area with an average of 77,400 vehicle hours delayed per day when compared to a 60 mile per hour (mph) norm. Santa Clara County follows with daily delays of 39,500 vehicle hours. Non-work travel is also becoming more congested in Alameda County than in the rest of the Bay Area. Between 2005 and 2013, weekend and holiday vehicle hours of delay grew by 87 percent in Alameda County, but by only 72 percent in the broader region.

As congestion rises, average speeds fall. Average speeds at peak commuter travel times have seen a noticeable decline across the Bay Area over the eight years since the Caltrans Mobility Performance database began tracking commute flows on highways and freeways. Between 2005 and 2013, Bay Area drivers experienced a decrease of 1 mph during the morning commute. Over the same period, morning commute traffic slowed in Alameda County by approximately 3 mph. Evening commutes have slowed more considerably. The broader Bay Area dropped 2.7 mph from 54.8 to 52.1 mph. Alameda County drivers experienced 3.4 mph of reduced speed in the evening, from 51.7 to 48.3 mph.

It is important to note that increasing traffic congestion is a common side effect of a growing economy. In analyzing Alameda County's average annual vehicle speeds over time, it becomes clear that decreasing speeds are a recent occurrence, tied directly to the economic upswing. Vehicle speeds actually increased during the busiest commute hours between 2006 and 2009, a period that included the global economic downturn. As the economy began picking up again, speeds began to decline. From 2009 to 2013, average morning commute speeds dropped by 9.7 percent, losing 5.8 mph. Evening commute speeds dropped even further by 6.8 mph, or 12.4 percent.

Average Daily Vehicle Hours on Freeways in Alameda County

Undelayed Vehicle Hours Traveled and Vehicle Hours of Delay in Thousands of Hours

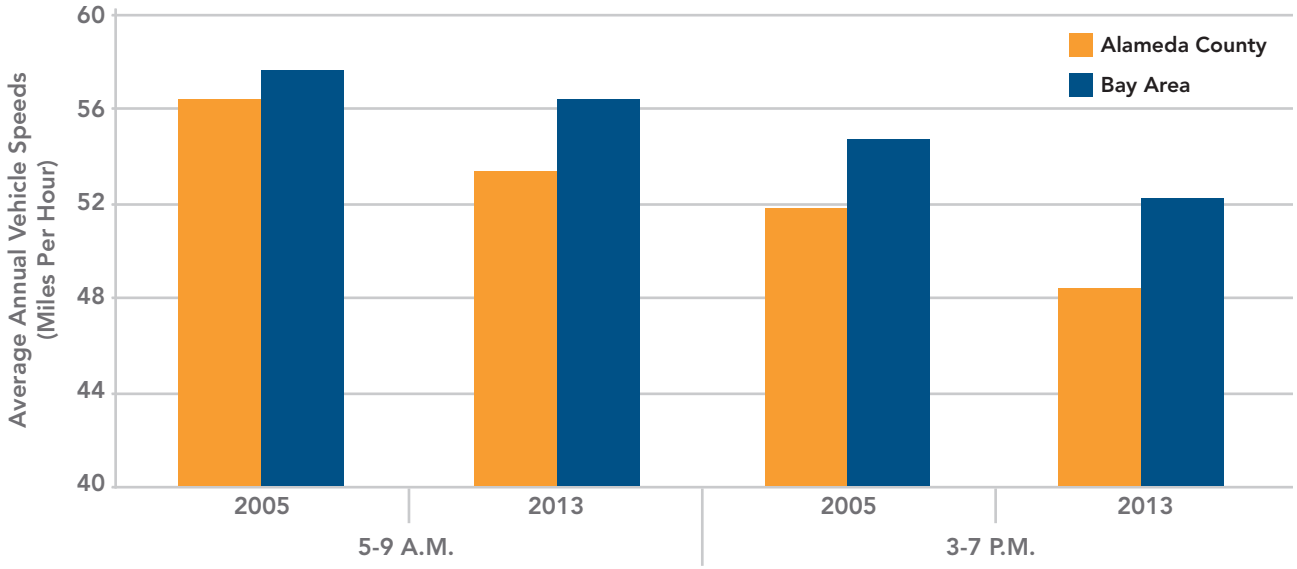


Note: Data only includes weekday commutes that were not holidays
Data Source: Caltrans Mobility Performance Report using Performance Monitoring System (PeMS) database
Analysis: Bay Area Council Economic Institute

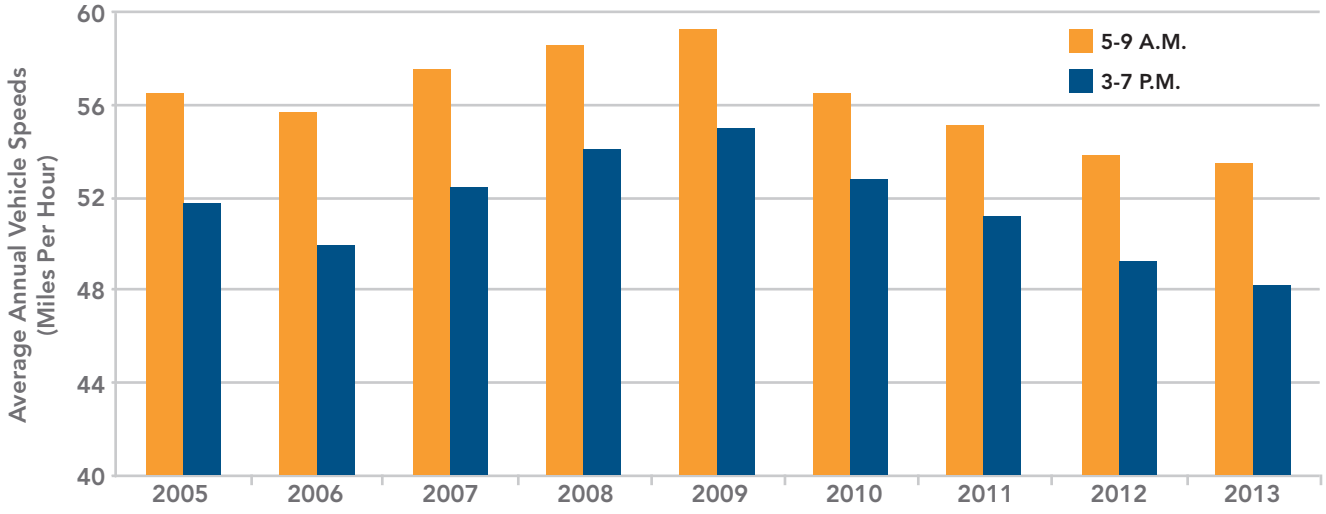
[42] Caltrans Mobility Performance Report using Performance Monitoring System (PeMS) database.

Peak Commute Hour Travel Speeds in Miles Per Hour

Eight-Year Change in Alameda County and The Bay Area



Annual Change in Peak Hour Travel Speeds in Alameda County



Note: "Peak Commute Hours" are defined as 5:00 - 9:00 A.M. and 3:00 - 7:00 P.M., Monday through Friday
Data Source: Caltrans Mobility Performance Report using the Performance Monitoring System (PeMS) Database
Analysis: Bay Area Council Economic Institute

Trends in Public Transit Commutes

In 2012, public transportation accounted for slightly more than 10 percent of the regional commuting mode share. The Bay Area has 23 separate transit systems that bring people into, out of, and through its counties via 4,271 total vehicles, which include buses, vans, rail vehicles, cable cars, and ferry boats.

Alameda County is integrated with six of these regional systems: Bay Area Rapid Transit (BART), Alameda-Contra Costa Transit (AC Transit), Altamont Commuter Express (ACE), Livermore/Amador Valley Transit Authority (LAVTA), the San Francisco Bay Area Water Emergency Transportation Authority (WETA),[43]

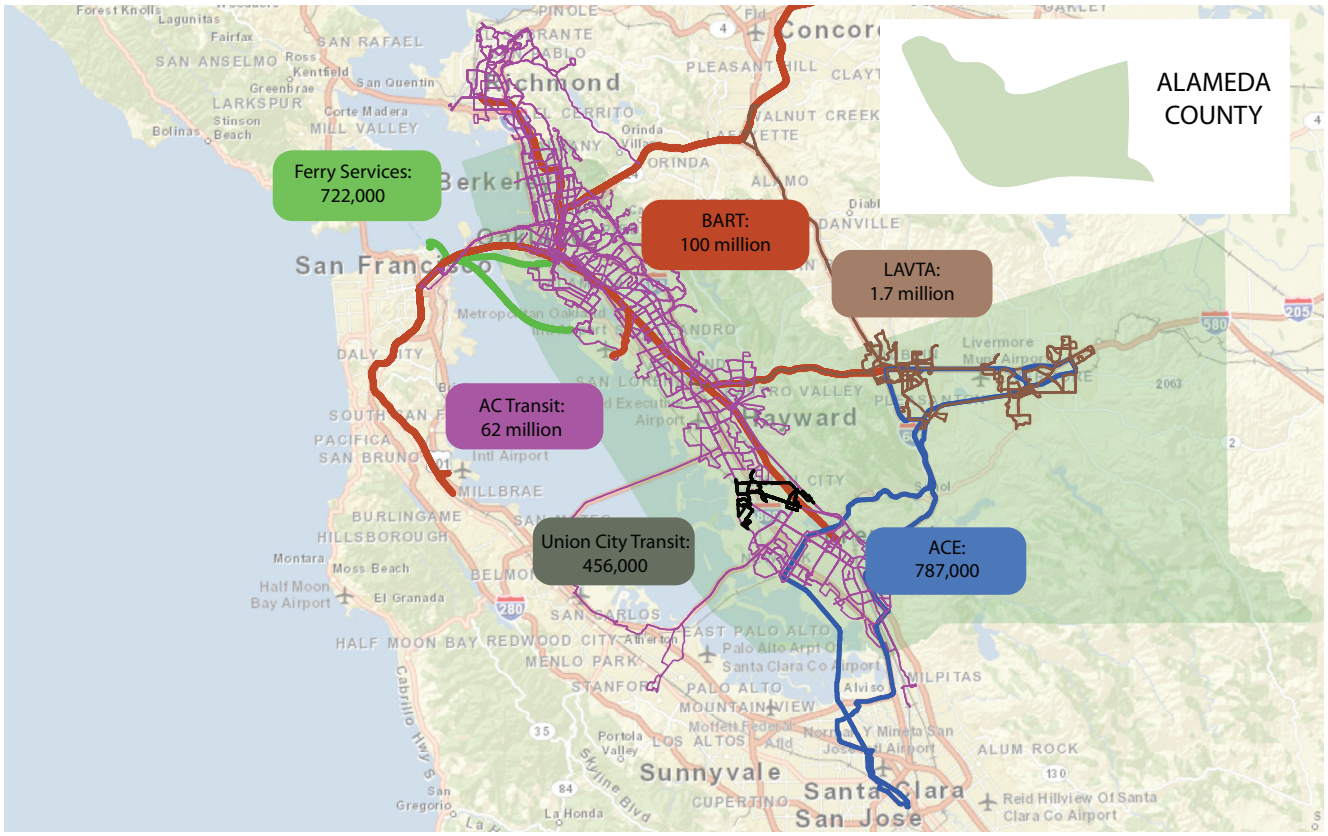
[43] WETA was formed in 2010 as a consolidation of regional ferry services. Prior to 2010, Alameda County residents were primarily served by ferry services operated by the City of Alameda and the Port of Oakland.

and Union City Transit. In 2010, these six systems together enabled approximately 93 million transit boardings within Alameda County, or approximately 20 percent of all transit trips taken in the Bay Area.[44] The vast majority of transit trips originating from Alameda County occur on either BART or AC Transit given their wider reach and relative ease of access compared to other systems. Other smaller transit systems serve as important links to both BART and AC Transit and also connect passengers to destinations outside of Alameda County as well as to interregional transit, such as the Amtrak Capitol Corridor and the Altamont Commuter Express Rail. While annual ridership growth across each of the six primary transit systems within the county has been mixed, the broader trend matches the general increase in the use of public transportation across the Bay Area.

Bay Area Rapid Transit

BART ridership has increased steadily over the last 15 years. Its upward trajectory has accelerated following the recession and demand continues to grow. In April 2014, average weekday boardings of nearly 404,000 represented a 1 percent year-over-year increase. While service levels have increased 17 percent since 1998, measured in vehicle-revenue hours – time spent in revenue-generating operation – passenger usage has grown at an even greater rate. Over the period from 1998 to 2012, the number of unlinked passenger trips (UPTs) has grown by 47 percent while the number of passenger miles traveled has ballooned by nearly 56 percent, reflecting a growing dependence on longer BART

Alameda County accounts for 20 percent of all public transit boardings in the Bay Area.



Transit Systems Serving Alameda County and Annual Ridership

Source: Bay Area Council Economic Institute

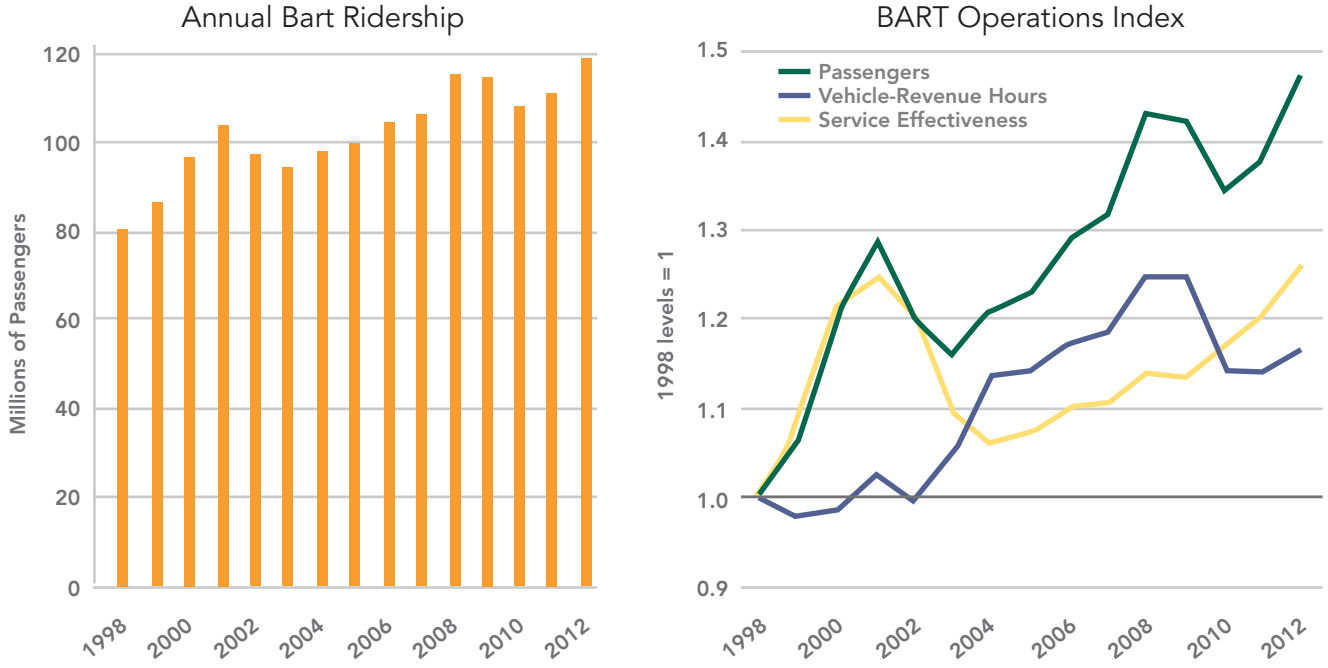
[44] National Transit Database, 2013 ACTC Performance Report.

trips across the Bay Area.[45] With these additional rides, BART's service effectiveness[46] has increased by 26 percent since 1998.

Alameda County accounts for 34 percent of all BART boardings.

Alameda County BART entries across the county's 20 stations accounted for 34 percent of the more than 390,000 average daily BART trips taken in the region in fiscal year 2013 – a proportion that has slowly grown since 2009 (for comparison, 44 percent of BART trips originated in San Francisco County, 13 percent in Contra Costa County, and 9 percent in San Mateo County). Passenger usage has jumped in recent years, with Alameda County BART entries growing by 14 percent from their trough in 2010 in the wake of reduced service following the recession. Alameda County BART entries also outpaced the 8 percent passenger growth of the rest of the system over that same period, reflecting both the county's increasing population and its residents' ability to shift travel modes.

Annual BART Ridership and Service Levels



Data Source: MTC Transit Performance Reports
Analysis: Bay Area Council Economic Institute

Alameda-Contra Costa Transit District

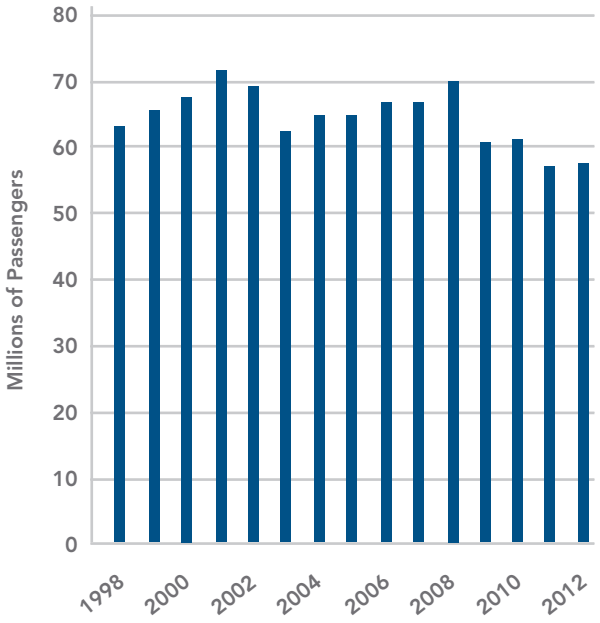
Unlike BART, AC Transit has seen fairly inconsistent passenger growth patterns over the last 15 years. After a decade of fluctuating annual trip numbers, there has been a significant decrease in trips related to cuts in service in the last five years. Total passenger trips for AC Transit have seemingly moved in tandem with the health of the broader economy, as ridership fell drastically in 2003 and 2009 in conjunction with economic recessions. In contrast to the 2003 reduction in usage that was followed by a rebound, passenger trips continued their lag through 2012.

[45] Transit services are often measured in terms of Passenger-Miles Traveled (PMT) and unlinked passenger trips or boardings (UPT). Unlinked Passenger Trips (UPTs) are an imprecise measure because they do not control for transfers: if a passenger's trip involves two different bus transfers, the trip is counted as three boardings. UPTs on bus systems likely overstate the number of passenger journeys, while UPTs on rail, such as BART, should approximate passenger journeys closely because passengers rarely leave the system and tag back in.

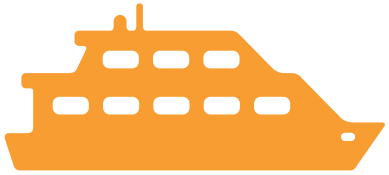
[46] Service effectiveness is defined as the number of passengers served per vehicle-revenue hour.

AC Transit has also experienced varying levels of service, with many routes cut in the past five years in the wake of decreasing state and local funding. These cuts produced sharp drops in the number of passengers, but the agency has witnessed a recent rebound in ridership. Average daily ridership grew by 8.2 percent during the 2013 calendar year, with 78 of 107 bus lines experiencing higher passenger levels.[47] AC Transit service continues to face challenges from traffic congestion and road conditions that other operators, such as BART, do not have to contend with. To combat these issues, AC Transit has revamped its fleet with 210 new buses for greater dependability and has instituted initiatives to improve on-time performance. AC Transit is also the largest recipient of projected 2014 TEP funds.

Annual AC Transit Ridership



Data Source: MTC Transit Performance Reports
Analysis: Bay Area Council Economic Institute



Transit systems not only provide Alameda County residents with a diverse set of transportation options, they play the important role of connecting people to jobs, education, and vital services – and they do so in a way that minimizes negative environmental impacts.

Other Transit Operators

Other operators serve to connect diverse communities to the Bay Area's job centers.

Altamont Corridor Express (ACE): In fiscal year 2012, ACE supported 787,000 trips between San Joaquin, Alameda, and Santa Clara Counties with an average weekday ridership of 3,123. ACE ridership has fluctuated over the past decade, though trips and passenger miles have rebounded in the past few years after a post-recession dip. Alameda County stations – Vasco, Livermore, Pleasanton, and Fremont – accounted for 33 percent of annual entries in fiscal year 2012, with Santa Clara County and San Joaquin County each accounting for another 33 percent.

Alameda Ferry Services: Ferry services supported 722,000 trips in 2012, continuing the rebound in passenger trips following the recent recession; ridership has grown by 33 percent since 2009. In 2010, the Alameda Ferry was consolidated into the San Francisco Bay Area Water Emergency Transportation

[47] AC Transit. (2014). AC Transit Ridership Swells [Press release]. Accessed at: http://www.actransit.org/2014/01/30/high-spiraling-rideship-for-ac-transit/.

Authority (WETA), along with the Harbor Bay Ferry, the South San Francisco Ferry, and as of 2011, the Vallejo Ferry. According to the most recent data, ridership has been rising across all ferry services.

Livermore Amador Valley Transit Authority (LAVTA) and Union City Transit: LAVTA and Union City Transit are more local transit system services with smaller footprints, but have significant ridership. In 2012, LAVTA ridership totaled nearly 1.7 million, while Union City Transit accommodated 456,000 trips. Both systems are critical connection points for the BART and ACE regional transit systems.

Goods Movement

The Bay Area has a robust and diverse trade profile, covering petroleum, electronics, chemicals, apparel, scrap metal, automobiles, machinery, agricultural products, and wine, among other goods. In 2011, the Bay Area exported an estimated $52 billion in goods and imported over $90 billion.[48]

Measured by weight, 99 percent of Bay Area imports and exports are water-borne and travel through the region's ports.[49] The Port of Oakland is central to Bay Area maritime trade for several reasons. Its trade balance is unique. Its exports, in twenty-foot equivalent units (TEUs), exceed its imports, making the Port a key export node for the United States. The Port is generally the second port of call on the West Coast for Pacific shipping lines, which drop cargo off in Southern California and then travel north with lighter loads to pick up containers in the Bay Area.

- Over the past decade, local and regional markets have comprised a larger amount of the Port of Oakland's trade profile. Rail-borne goods bound for the eastern United States can be offloaded at any major West Coast port. In other words, there is no unique geographic advantage for the Port of Oakland on such goods, and domestic port selection is often dictated by the cost and frequency of rail service.
- The trade outlook with Asia is positive, particularly with China, whose growing middle class is demanding more luxury goods. The Port of Oakland handles 99 percent of Bay Area wine exports, and China and Hong Kong are becoming major recipients.[50] As internal infrastructure in China improves, making the inland transportation of goods easier and cheaper, this trade will likely continue.
- Investments in cold storage are also supporting trade in California's high-value agricultural sector.
- Given the high cost of land in the Bay Area, much warehousing activity has gone inland to the San Joaquin Valley, which positions the Port of Oakland as a gateway destination for goods handled by major distributors, such as Amazon and Costco.

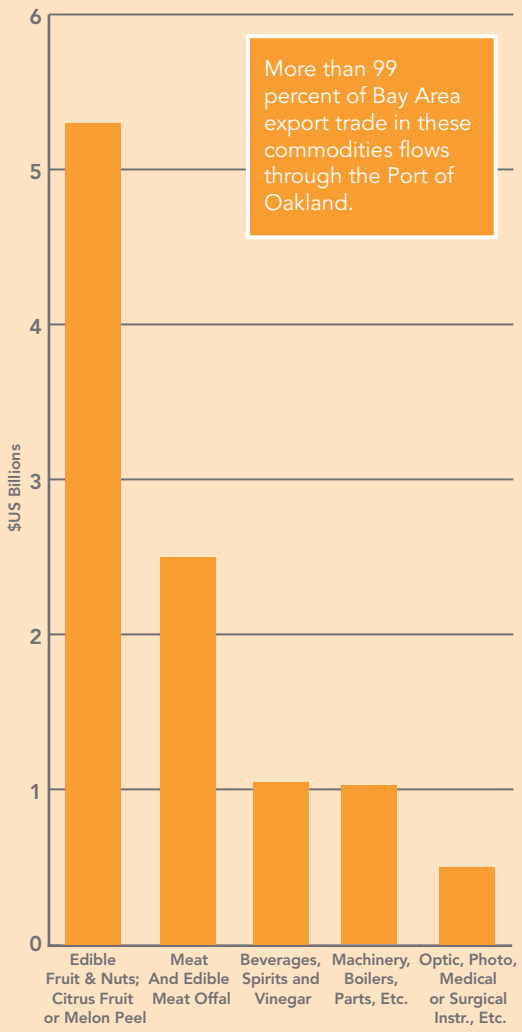
The Port of Oakland also handles 99 percent of *containerized* cargo that flows through Northern California. The Port of Oakland has 20 deepwater berths, which enable it to handle containerized cargo on massive cargo ships. In contrast, the Port of San Francisco has 6 deepwater berths but does not handle containerized cargo anymore due to poor rail access, height restrictions, and other limitations.[51]

[48] Bay Area Council Economic Institute, "International Trade and the Bay Area Economy," 2013; Freight Analysis Framework 2011 export estimates.
[49] Maritime freight is measured in a number of ways. Tonnage refers to the cargo volume and is correlated with the TEU (twenty-foot equivalent unit) measure of cargo containers. However, not all cargo is shipped in containers, so bulk cargo is often converted to an estimated equivalent tonnage. Some databases also measure tons of cargo in weight or mass, using tonnes (metric tons) or short tons (tons in pounds). Value is measured in dollars. TEUs are generally the best measure of trade volume, since weight varies so much by product (automobiles versus electronics) and value can fluctuate with exchange rates, which can change rapidly and are not necessarily correlated with trade product volumes.
[50] Interview with Port of Oakland Business Development representative. February 28, 2014.
[51] California DOT, "Port of San Francisco Fact Sheet."

The Port of Oakland's Role in Bay Area Trade and Transportation

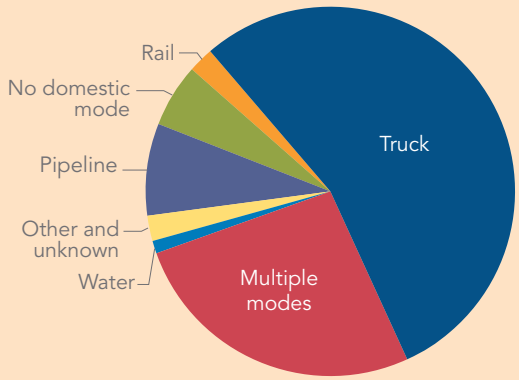
The Port is Necessary for Important Commodities

Port of Oakland Exports:
Select Commodities, by value in 2013

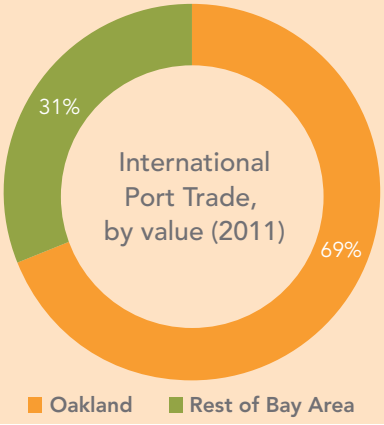


This Trade Relies on the Surface Transportation Network

Mode of domestic travel when goods reach ports (by value)



Port of Oakland Supports International Trade



Data Source: Freight Analysis Framework and US Trade Online
Analysis: Bay Area Council Economic Institute

Each of the Bay Area ports has different specializations. The Port of San Francisco specializes in tourism and non-containerized cargo. The Ports of Richmond and Benicia handle crude petroleum exports and automobile imports. The Port of Richmond also handles dry bulk goods. The Port of Redwood City mostly handles construction materials and scrap metal. In contrast, the Port of Oakland handles electronics, machinery, agricultural products, and apparel, as well as scrap metal and paper. Its unique role in Bay Area trade cannot be overstated, and it dominates Bay Area imports and exports.

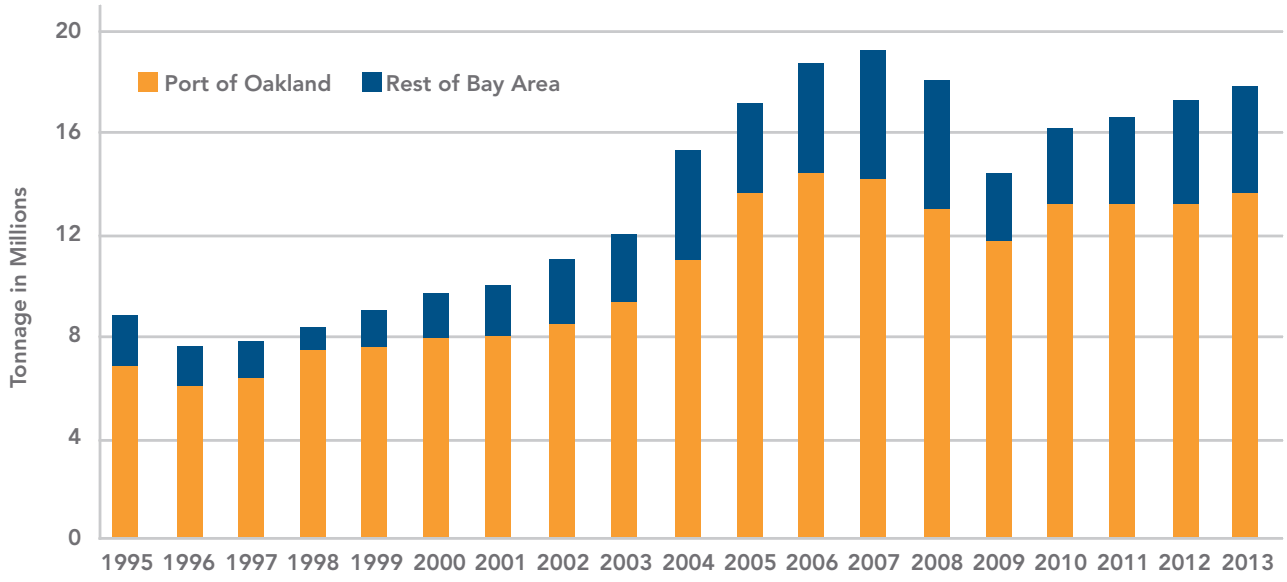
In addition to its distinctive role in Bay Area trade, the Port of Oakland's maritime operations sustain approximately 29,000 regional jobs, or eight jobs for every 1,000 containers imported or exported.[52] These jobs include those related to port operations – logistics, longshoremen, and waterfront workers – and those related to off-site rail and truck transportation and warehousing. The Port's economic impact reaches far beyond just Alameda County as every container moved at the Port begins and ends with a truck – contributing to job growth throughout the Bay Area and points beyond.

Bay Area Port Trade is Active and Growing

The Port of Oakland's ability to handle containerized cargo has helped Bay Area imports and exports grow over the past decade. The Port of Oakland also handles the majority of Bay Area water-borne foreign imports and exports by value. However, its share of certain product types varies widely, and in many commodity categories it is responsible for almost all Bay Area imports or exports. Most of the valuable Bay Area water-borne trade that does not flow through the Port of Oakland is petroleum and vehicle imports that go through the Ports of Richmond and Benicia and the waste/scrap exports that go through the Port of Redwood City.

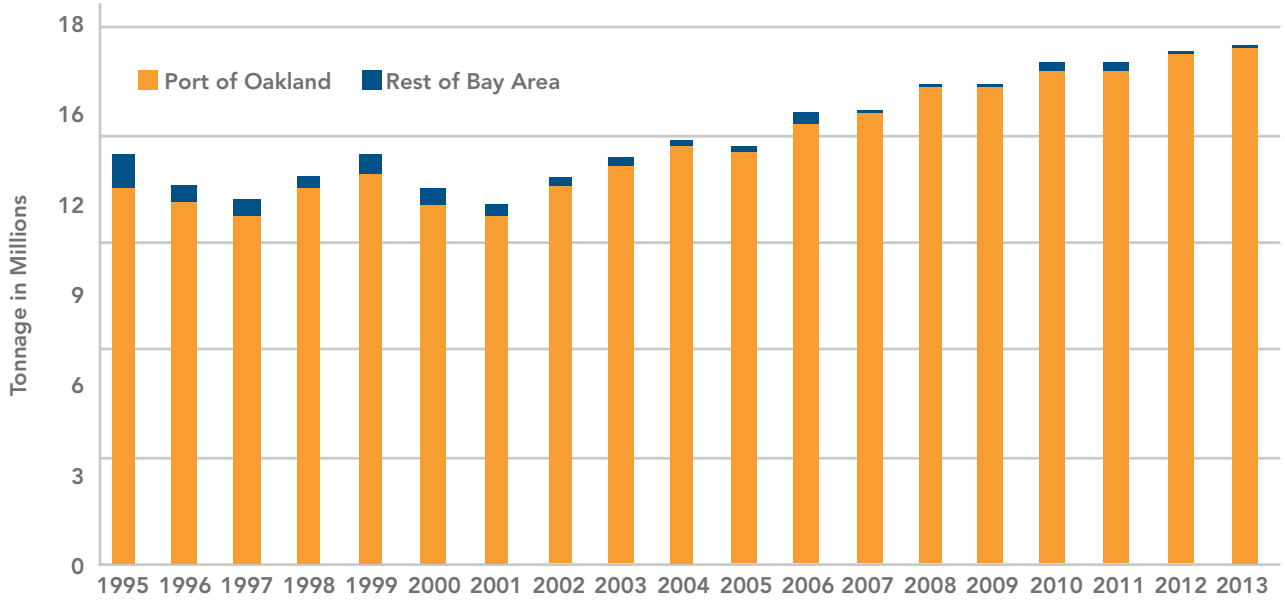
Bay Area Port Cargo

Inbound Cargo



[52] Port of Oakland, "Powering Jobs, Empowering Communities." Prepared by Martin Associates, 2010.

Outbound Cargo



Data Source: US Trade Database; Pacific Maritime Association
Analysis: Bay Area Council Economic Institute

The types of products handled by the Port of Oakland reflect its critical role in supporting the Northern California economy. These products include produce and meats from the Central Valley and the North Bay; electronics and machinery from Bay Area manufacturing companies; medical precision instruments from Silicon Valley and the East Bay; and wine from Napa and Sonoma. Given their reliance on containerization, many of these products would otherwise need to go south to the Ports of Los Angeles or San Diego.

Exports from the Bay Area grew 56 percent by weight from 2007–2011 and 22 percent in value – by approximately $8 billion. This was led by growth in agricultural products, meat, waste/scrap, and machinery. The fact that this growth occurred in the middle of a recession in the US economy implies deepening integration of US food production with the global food supply chain.

Air Freight Connects Bay Area Goods with the Country and the World

Air freight constitutes half of Bay Area imports and exports by value, although it accounts for just a fraction of trade by weight. When analyzing exports alone, air freight moves a 60 percent share of trade by value. The three Bay Area airports support the regional manufacturing sectors specialized in semiconductors, electronics, and high-precision products. Though manufacturing employment has declined in the Bay Area, it still comprised almost 10 percent of total Bay Area employment in 2011.[53]

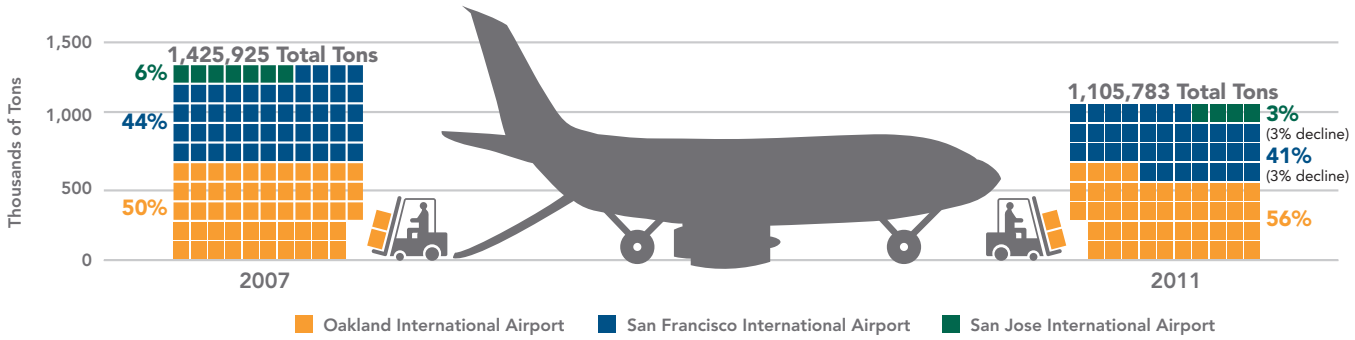
Measured by weight, air freight has been declining at all Bay Area airports over the past several years, largely due to the economic recession, though the share of air cargo going through Oakland International Airport (OAK) has increased. The California Department of Transportation (DOT) estimates that by 2035, air cargo is expected to increase at OAK by 65 percent.[54]

[53] Bay Area Council Economic Institute, "The Bay Area: A Regional Economic Assessment," 2012.
[54] California DOT, "Oakland International Airport Fact Sheet."

In 2011, the Oakland International Airport ranked as the 13th largest cargo airport in the nation and was responsible for over 50 percent of Bay Area air freight, estimated in 2011 at 550 kilotons. However, OAK does not handle much international cargo, over 95 percent of which (by weight) travels through San Francisco International Airport (SFO), even though much of that incoming and outgoing cargo will pass through Alameda County on trucks via I-580, I-80, or I-880.[55]

Instead, OAK is central to the Bay Area's domestic air cargo movement, as it is home to FedEx's west coast shipping hub. In 2007, OAK handled 70 percent of domestic air cargo, and in 2011, it handled 80 percent. Domestic air freight from the Bay Area in 2011 was valued at approximately $13.7 billion, primarily in electronics and precision instruments, which combine to deliver over 90 percent of the value of domestic exports. Domestic air trade dipped from 2007 to 2011, likely due to the economic recession.

Bay Area Air Freight
Regional Airports



Data Source: MTC, "Regional Airport Aviation Tracking Report," 2012
Analysis: Bay Area Council Economic Institute

Trucks Play a Critical Role

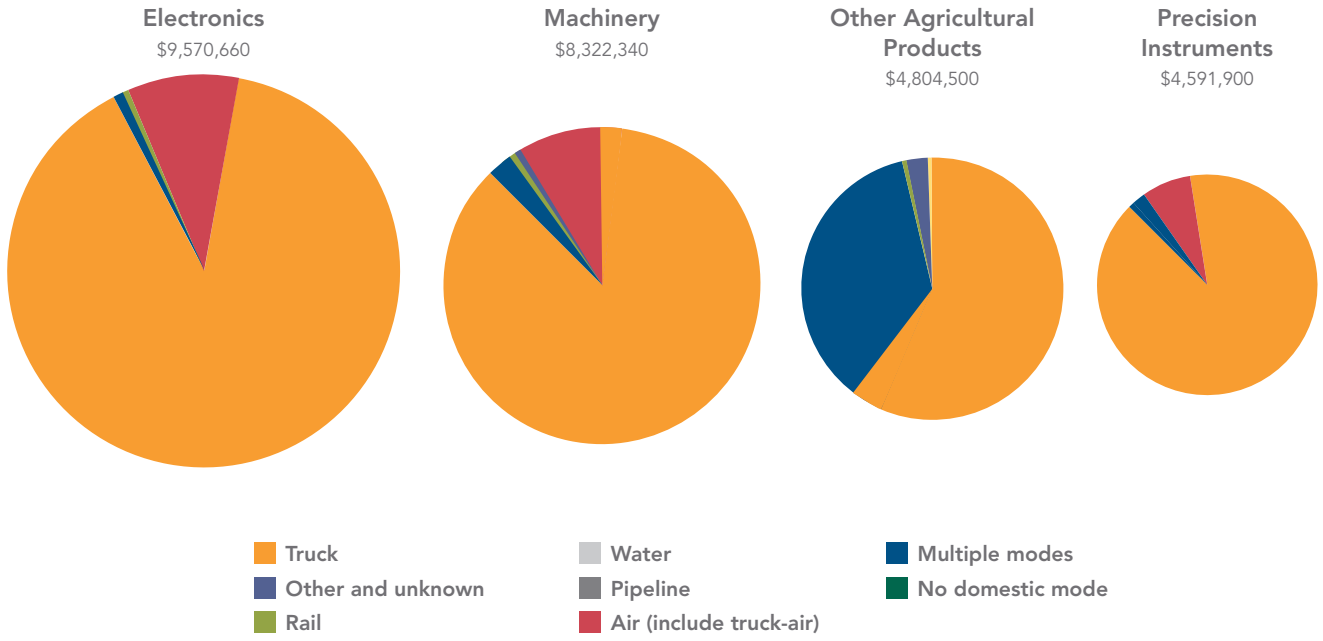
Alameda County also serves as a major conduit between the Central Valley and the Bay Area via the I-580, I-880, and I-80 highways. These routes are also heavily traveled by trucks conveying Central Valley produce to the Port of Oakland and goods arriving at the port to distribution centers in the Central Valley.

The highway system is also a critical component of Bay Area international trade. Approximately 72 percent of all Bay Area exports, by value, rely on domestic trucks to reach their physical port of exit, and 51 percent of water-borne exports (flowing through regional ports) require trucking.[56] The surface freight system in the Bay Area is therefore critical to the region's trade. Given the Port of Oakland's central role in water-borne exports, much of this surface freight is flowing through Alameda County. Some of the Bay Area's core exports – electronics, machinery, precision instruments, agricultural products, meats and seafood – rely almost exclusively on trucks.

[55] California DOT, San Francisco International Airport Fact Sheet.
[56] Data covering commodity category, mode of travel, and commodity value were determined using the Freight Analysis Framework. Records include all goods leaving the San Francisco Combined Statistical Area (CSA), regardless of point of origin. Data can be filtered by domestic mode of travel and foreign mode of travel. Calculations on the share water-borne international trade relying of trucks are taken from 2011 data.

2011 Bay Area Exports

Select Commodities by their Domestic Mode of Travel



Data Source: Freight Analysis Framework
Analysis: Bay Area Council Economic Institute

While the Port of Oakland and the Oakland International Airport generate significant numbers of truck trips in Alameda County, goods movement for end consumption domestically also plays a significant role in producing truck traffic. According to the Metropolitan Transportation Commission's 2004 Bay Area Regional Goods Movement Report, trucks haul 80 percent of freight tonnage moving through the Bay Area. The Federal Highway Administration also estimates that by 2040 the tonnage of goods moved in the Bay Area for domestic consumption will grow by approximately 70 percent from 2011 levels. This speaks to the need to invest in Bay Area urban goods movement, while also supporting national and international needs.

Alameda County's roads and highways will continue to be populated by truck traffic as more industrial developments are built in the county. At least eight new industrial centers, totaling about 3.6 million square feet, are under construction or planned in East Bay cities stretching from Fremont north to Richmond.[57] These developments are likely to be highly reliant on Alameda County infrastructure as trucks complete the initial legs in moving their products to customers in the Bay Area, across the nation, and overseas.

[57] San Francisco Business Times, "New industrial frenzy is all about demand." April 4-10, 2014.

The Sources of Transportation Funding in Alameda County

Infrastructure anywhere in the world is immensely complicated to develop and involves large sums of money. The US is no different. In 2008, the total estimated national budget for highways and mass transit was well over $200 billion dollars.[58]

The system that governs how these dollars are collected and how they are spent is also complex. This section provides an overview of that funding system to contextualize county sales tax measures in the larger scheme of transportation funding trends. Over the past decade, the transportation finance system has undergone significant changes that make future funding uncertain and create a potentially growing funding gap. In addition to allowing Alameda County to plan for the region's growing transportation needs, the 2014 TEP also addresses this funding uncertainty by providing a dedicated source of long-term funding.

Federal Transportation Funding

At the aggregate national level, the bulk of transportation funds comes from several sources, primarily taxes on gasoline and diesel, taxes on vehicle parts and activities, and general revenues from various levels of governments. In 2010, these together accounted for almost 40 percent of total transportation funding, estimated at over $260 billion across the US at all levels of government.[59] Key sources include the following:

Gas and Diesel Taxes: Federal and state taxes are applied to each gallon of gas consumed in the US. The gas tax comprises the bulk of federal transportation funding and is a major source of state transportation funding. The federal gasoline tax is $0.184 per gallon and has not changed since 1993. California's excise gasoline tax rate was $0.36 per gallon, as of January 2013; additional fees and local taxes add an average of $0.127 per gallon.[60] State gasoline taxes vary widely, from New York's effective average of $0.506 per gallon to Alaska's $0.08 per gallon. The unweighted average across states for state gas taxes was $0.27 per gallon in 2012.

[58] Research and Innovation Technology Administration, Bureau of Transportation Statistics, "Government Transportation Financial Statistics," 2012.

[59] Statistics compiled from National Transit Database and Highway Statistical Series. Given the complexity in data collection, these numbers may be subject to reporting errors.

[60] American Petroleum Institute, "State Motor Fuel Taxes," 2013. Calculating state gas taxes is not as straightforward as it seems. Some states charge sales taxes on gasoline, which fluctuate based on oil prices. Many counties and localities charge additional local taxes, which the American Petroleum Institute averages out across the state. As such, calculations from different sources will vary slightly.

Recent transportation funding measures in Alameda County

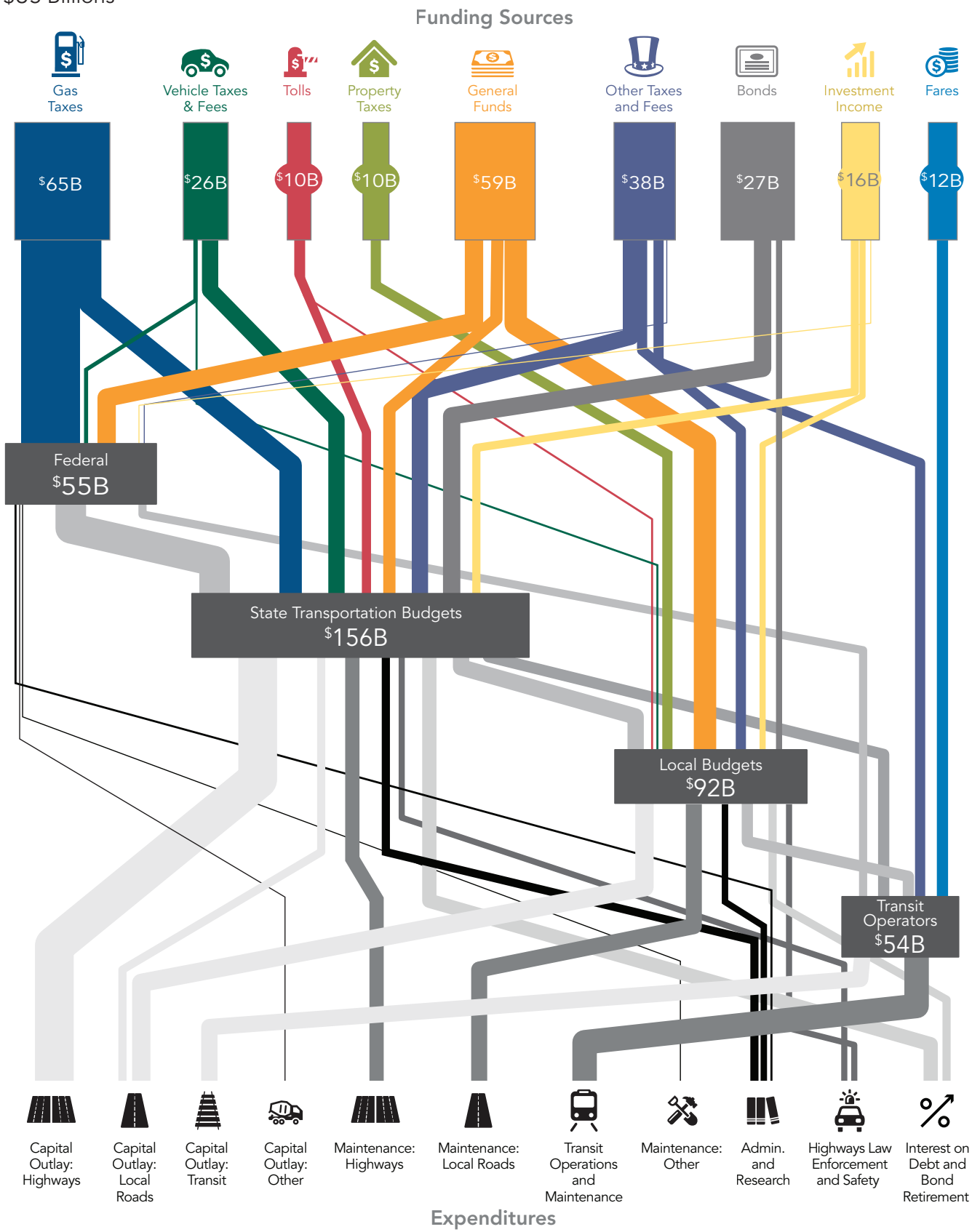
Measure B: In 1986, Alameda County voters approved California's second locally enacted county transportation sales tax, known as Measure B, supporting a 15-year investment package. In 2000, 81.5% of Alameda County voters approved the continuation of Measure B and the Transportation Expenditure Plan (TEP) for 20 more years.

Measure B1: Measure B1 was a permanent sales tax measure that lost by a fraction of a percent (721 votes) in 2012. The measure would have augmented and extended the existing sales tax to fund Alameda County transportation improvements according to a new TEP.

2014 TEP: The 2014 Transportation Expenditure Plan proposes approximately $8 billion in investments spread over 30 years.

US Transportation Funding (2010)

$US Billions



Note: Intergovernmental transfers between levels of government create budget amounts that, when taken together, are larger than the funding sources in aggregate. For example, when federal funds are passed down to states, they are counted in both the federal and state budgets as depicted by the boxes.

Data Sources: Highway Statistical Series and National Transit Database

Vehicle Taxes and Fees: Many vehicle-related sales, such as tires and trailers, carry special taxes earmarked for transportation purposes. Each state also charges its own set of fees and taxes. California charges fees for commercial vehicles based on weight; in FY11–12, these fees generated almost $1 billion.[61]

Tolls: Paying to cross roads and bridges also raises revenues for transportation. While small in the grand scheme of funding, tolls are significant revenue sources in their localities. Tolls also include dynamic pricing mechanisms such as express lanes, which allow lanes to be priced based on traffic conditions and demand.

Property Taxes: Transportation-related property taxes come through many channels, including property taxes around major transportation investments, such as transit stations. Tax increment financing (TIF) and developer fees are two ways in which local jurisdictions can better capture the economic value generated by infrastructure projects in the form of government revenue.

General Funds: Many levels of government supplement transportation funding through general fund transfers. This practice is common at the local level, although the federal government has also appropriated over $50 billion for transportation from its General Fund over the past five years.

Other Taxes: Each state has its own regulations about what goods or services can be taxed for transportation purposes, and revenue sources include developer impact fees, parking charges, and sales taxes. California counties and transit agencies can pass local option sales tax measures to support transportation needs. In California, 20 of the 58 counties currently levy this tax, including Alameda County through Measure B, which was passed in 2000 and expires in 2022.[62]

Bonds: States and localities can issue bonds to fund transportation projects and dedicate revenue streams to pay off bond debt. In 2006, California voters approved Proposition 1B, which authorized almost $20 billion in bonds over 10 years for transportation purposes.

Fares: Purchasing a ticket supports transit operations, although the significance of fares varies greatly by transit agency.

The Growing Burden at the Local Level

The transportation funding system is also highly localized, in that each state and each locality leverages its own funding mechanisms, special taxes and fees, and bonds. In some places, certain revenue sources are much more important. For example, bridge and highway tolls accounted for less than 5 percent of total transportation funds across the US, but they are a significant source of funds in the Bay Area.

In addition, transportation funds are not quite like personal income or many corporate revenues, which can be easily shifted from one use to another. Instead, transportation funding is composed of many smaller funds, the use of which is tightly regulated. For example, at the federal level, most funding is returned directly to states according to a series of formulas; in turn, states pass this money along to local agencies according to their own formulas, although agencies generally must demonstrate that their projects fit within

[61] California Transportation Funding Overview, Legislative Analyst's Office, February 28, 2011.
[62] Transportation Funding in California, Division of Transportation Planning California Department of Transportation, 2014.

current policy frameworks. These frameworks and the formulas that distribute funds also change over time. Money also flows through various smaller funds that can only be used for particular purposes.

These practices result in complex funding systems that are highly particular to different areas. The federal government establishes transportation policy objectives and guides spending. In California, metropolitan planning organizations and regional transportation planning agencies have transportation plans that are subject to public comment and review. At all levels, transportation plans spell out the anticipated transportation system investments, policy objectives, community aspirations, and the needs to accommodate social, economic, environmental, and regulatory change.

The various layers of the transportation funding system include the following:

- **Congress and the Highway Trust Fund:** The primary instrument of transportation funding at the federal level is the Highway Trust Fund. Established in 1922, it is funded primarily through taxes on fuel. Congress approves multi-year transportation bills that establish policy frameworks, distribution formulas, and overall funding levels. A small portion of federal funding is put into programs that state and local agencies can compete for in a grant-like application process, though not all such funds come from the Highway Trust Fund.

- **State Legislatures:** Legislatures create and pass transportation budgets, apportion parts of the general fund for transportation purposes, and create new funding sources, such as bonds. Each state can set its own fuel tax rates and vehicle fees, and these vary widely across the US. The California Department of Transportation (Caltrans) oversees transportation needs across the state and helps develop the California Transportation Plan (CTP), which sets forth a long-range vision of transportation needs and strategies for addressing them. This plan is updated every five years, and Caltrans is beginning to develop CTP 2040.

- **Regional Metropolitan Planning Organizations:** Each major metropolitan area in California has a metropolitan planning organization (MPO) that helps distribute state and federal money. MPOs are generally pass-through entities, which redistribute money instead of raising it. MPOs also oversee regional transportation plans, which build upon, integrate, and ensure regional coordination among the county plans. The Bay Area's MPO is the Metropolitan Transportation Commission (MTC) and MTC's 2040 Regional Transportation Plan is included as part of Plan Bay Area,[63] an integrated long-range transportation and land use/housing plan that was jointly developed with the Association of Bay Area Governments (ABAG) to meet the regulatory requirements of Senate Bill 375, the Sustainable Communities and Climate Protection Act of 2008. MTC also oversees Bay Area bridge toll revenues.

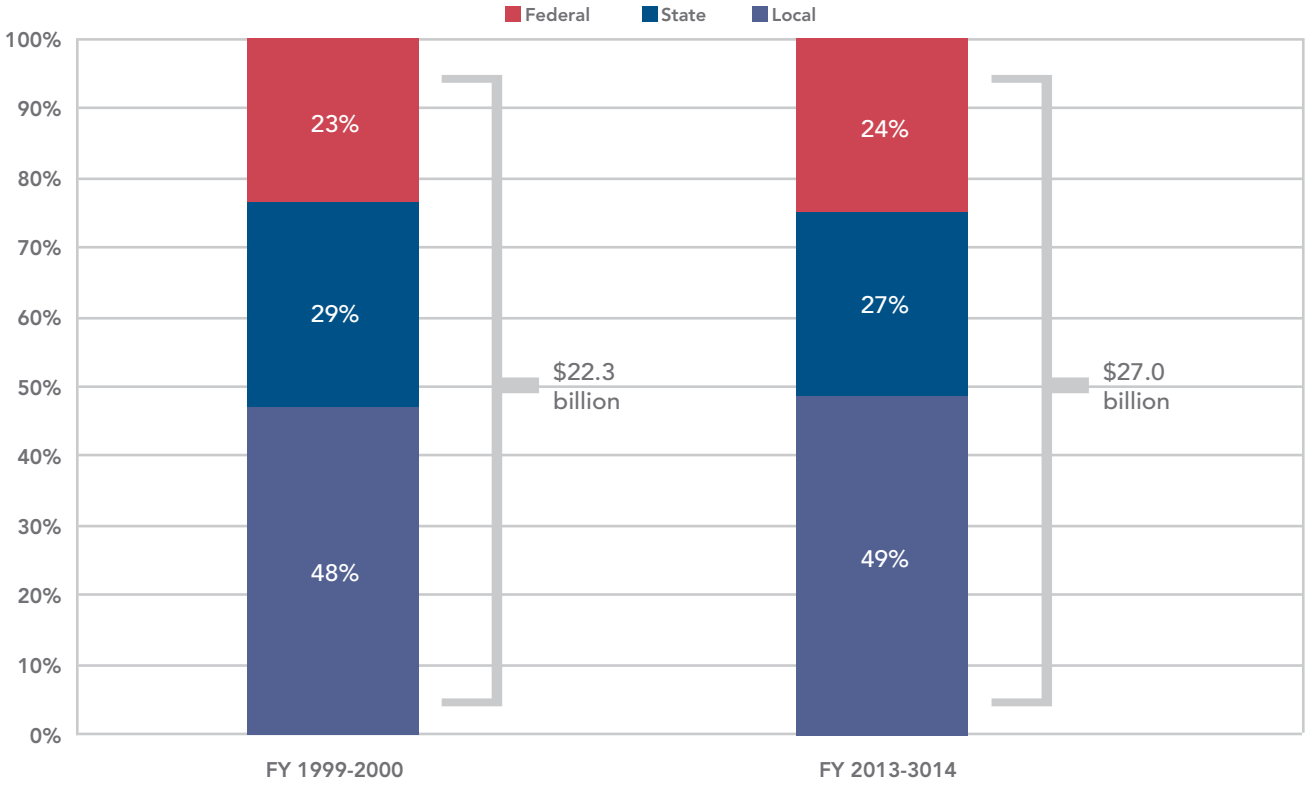
- **County Agencies:** Many California counties have one or several transportation entities that can raise funding to support county-wide transportation needs. The Alameda County Transportation Commission (ACTC) is one such agency and it helps oversee the Alameda Countywide Transportation Plan (CWTP),[64] which is developed in coordination with residents, communities, and cities. ACTC also manages the transportation expenditure plans (TEPs) that guide the expenditure of revenues from special transportation funding sources, such as Measure B and vehicle registration fee funds approved by voters.

[63] Accessible at http://www.mtc.ca.gov/planning/pla_bay_area/.
[64] Accessible at http://www.alamedactc.org/app_pages/view/795.

- **Transit Operators:** Transit operators are generally independent entities responsible for their own budgets, operating practices, and capital plans for long-term system maintenance, upgrades, and expansion. Most rely heavily on funding from federal, state, and local sources, as well as from fares.
- **Cities:** Each city has a department that plans capital projects, infrastructure upgrades, and road maintenance. A citywide General Plan has a transportation component that lays out priorities in the city transportation system.

California Transportation Funding

By funding source



Note: Dollar values are inflation-adjusted to show constant 2013 dollars
Data Sources: California Department of Transportation and California Legislative Analyst's Office
Analysis: Bay Area Council Economic Institute

It is important to have this broad system in focus in order to understand how recent developments have impacted this funding system and have helped to shift the burden to local jurisdictions. In the 1960s and 1970s, the federal government was responsible for almost 30 percent of transportation funding for highways nationwide. By the 1990s, that proportion had moved lower, with states and local governments making up the difference. This shift in transportation funding mix has been more pronounced in California, where local option sales taxes to fund transportation have been widely used. In California, local funding makes up nearly half of all transportation spending.

The evolution toward increased local funding continued over the past decade, though the federal government has recently stepped up its role in funding transportation. Following the recent global economic crisis, federal stimulus funds were heavily allocated toward infrastructure. But these funds were for projects that were deemed "shovel ready", and reliance on federal dollars is unlikely to be a sustainable source of

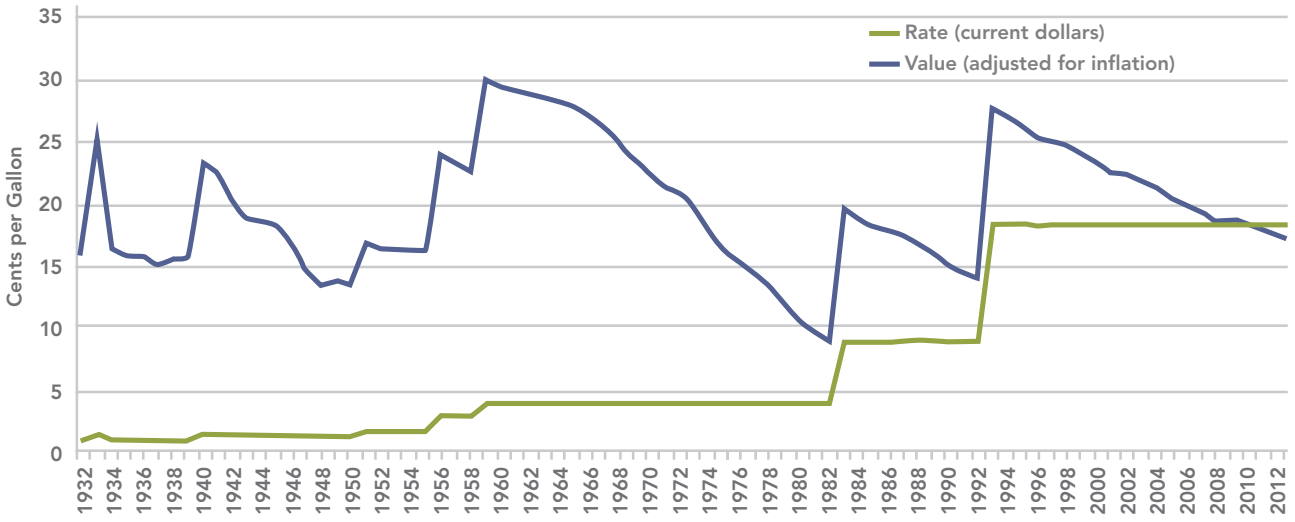
funding going forward. Looking ahead, the combination of federal and state transportation funding's reliance on taxes from slowing fuel consumption and the growing costs of steel and other construction materials will place greater pressure on local jurisdictions to fill the infrastructure financing gap.

Looking Forward: Trends in Transportation Finance

The current state of the US transportation funding system poses risks for local transportation systems. In 2010, a federal commission evaluated the transportation funding system in the US and found that there was a $172 billion *average annual* investment gap across the US just to properly maintain the current transportation system through 2035. Improving this system with necessary upgrades and investments would produce a $214 billion average annual gap. Just at the federal level, this points to gaps of $78 billion for maintenance and $96 billion for necessary upgrades. Revenue from taxes on gasoline comprises the single biggest source of funding across the system, determined by gas tax rates and by gas gallon purchases. In turn, these are determined by how much people drive and how many gallons of gas are consumed.

The federal gas tax has not increased in 20 years. The gas tax rate at the federal level is $0.184 per gallon, and its value has eroded immensely due to inflation. A 2008 report estimates that the gas tax would need to have been raised by almost $0.10 per gallon just to restore purchasing power it had when it was raised in 1993.[65] This situation has contributed to major shortfalls in the Highway Trust Fund. Over the past decade, the balance has been steadily diminishing, from almost $40 billion in 2000 to almost $9 billion in 2008, and without major and unprecedented contributions from the General Fund, totaling nearly $53 billion since 2008, the Highway Trust Fund would have been insolvent. As of April 2014, the Congressional Budget Office projects that the Highway Trust Fund will have insufficient revenues to meet its obligations starting in the latter part of fiscal year 2014.

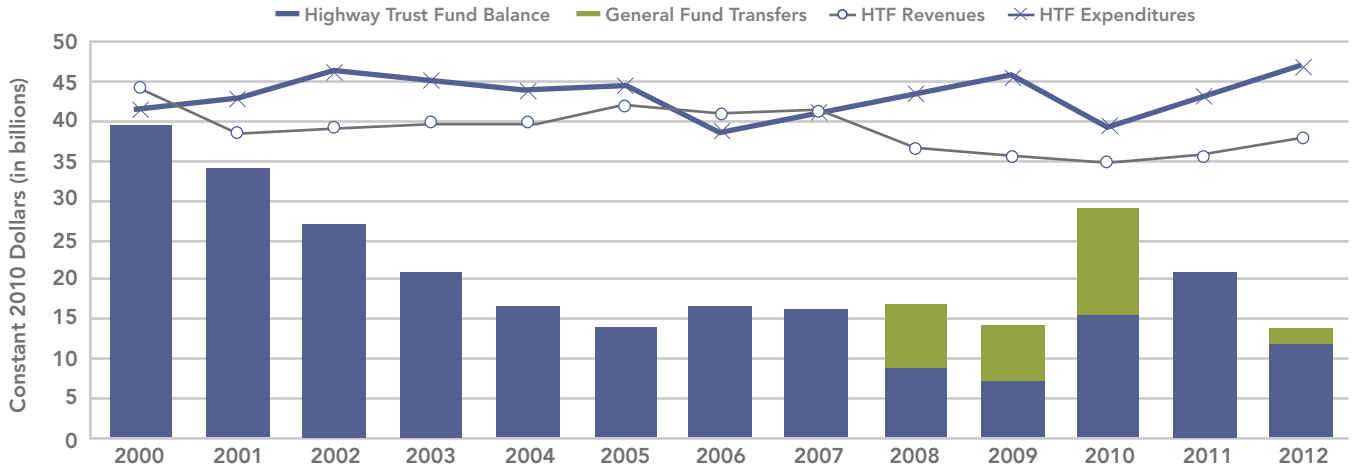
Value of the US Gas Tax
1932 - 2012



Data Source: Tax Foundation (Gas tax rates), Bureau of Labor Statistics (CPI)
Analysis: Bay Area Council Economic Institute

[65] National Surface Transportation Infrastructure Financing Commission, "Paying our Way: A New Framework for Transportation Finance," 2008.

Federal Transportation Funding: Revenues, Expenditures, and the Balance of the Highway Trust Fund, 2000 - 2012

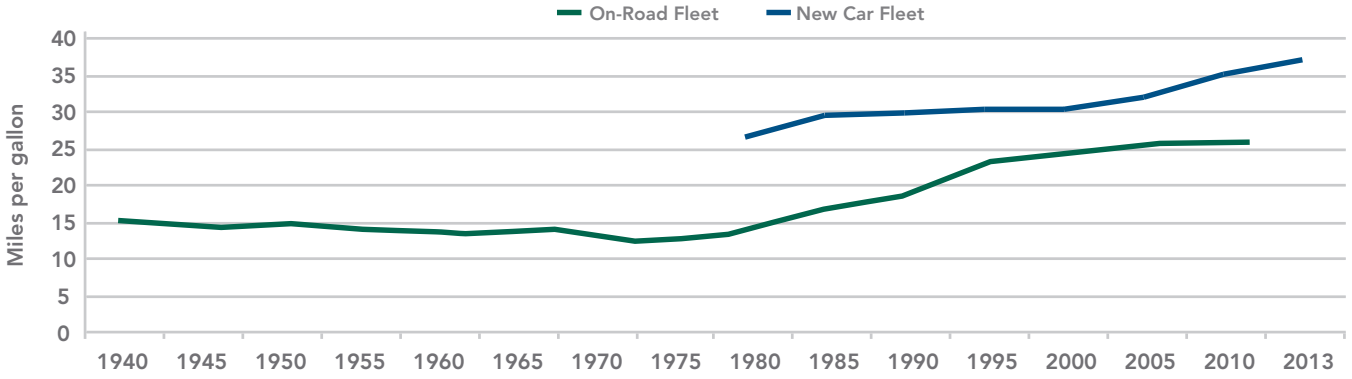


Data Source: Federal Highway Statistical Series, Tables FE-210
Analysis: Bay Area Council Economic Institute

Americans have been driving less – on a per-capita basis and overall. This can partially be explained by the recession, but the trend actually started in 2007. Driving behavior is partially driven by gas prices, which fluctuate in a market environment. Because the gas tax rate is flat, revenues do not increase when gas prices rise. A reduction in driving is theoretically good, but the resulting funding shortfall creates short-term dilemmas. Will vehicle miles traveled (VMT) plateau – and hence make more road investments less necessary? If VMT rises again, cars will be driving on the same system, now lacking billions in unfunded investments. The long-term planning horizon of transportation infrastructure makes this calculation particularly complicated.

Increasing fuel efficiency means Americans can drive more miles on less gas. In the long term, this efficiency will lead to more strain on the transportation system while generating less funding to maintain and manage it. Today, a Toyota Prius averaging 50 miles per gallon, would provide only half the tax revenue of a 1985 25-mile-per-gallon vehicle while still creating the same amount of congestion, road wear and tear, and parking needs. Average US fuel economy has been climbing slowly since the 1970s as individual vehicle models become much more efficient. Looking ahead, radical increases in fuel efficiency through clean-fuel vehicles and higher CAFE standards are likely to improve overall fleet economies.

Average Fuel Economy of US Passenger Cars

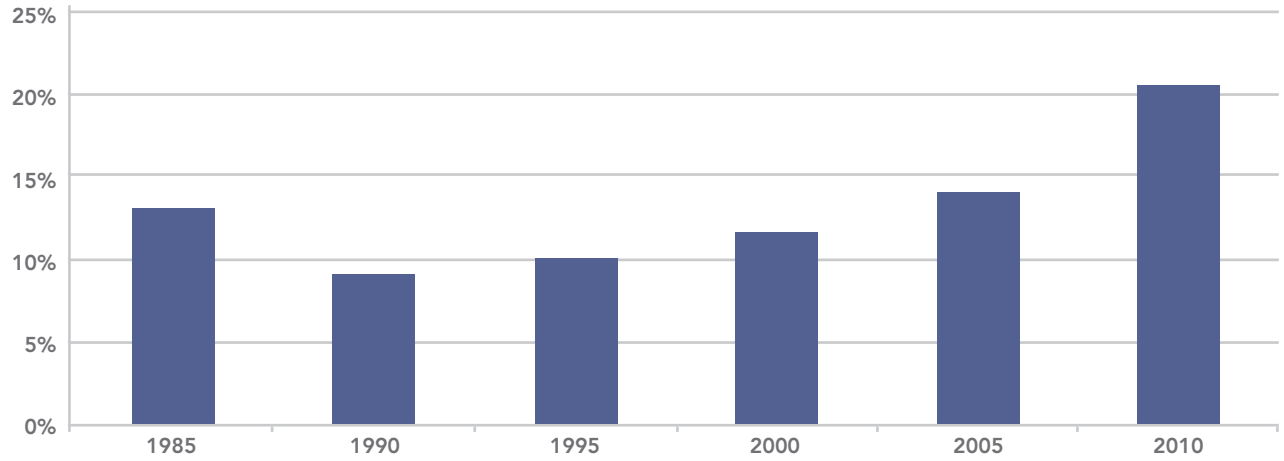


Data Source: Summary of Fuel Economy Performance April 2013, U.S. Department of Transportation
Analysis: Bay Area Council Economic Institute

The growing use of bonds to fund transportation projects brings risk. Over the past two decades, bonds and general funds at all levels of government have become critical sources of transportation funding, which entails several risks. Bonds create long-term liabilities that can soak up potential revenue sources or strain general funds through interest payments. Relying on general funds makes transportation funding increasingly political and dependent on uncertain budgets, whereas dedicated funding streams smooth out revenues, enabling long-term investment strategies. In addition, general fund budget surpluses do not seem likely in the future, and many public budgets are already burdened by debts and other liabilities.

Bonds as a Percent of Total State and Local Funding for Highways

United States (1985 - 2010)



Data Source: Highway Statistical Series, Tables HF-10
Analysis: Bay Area Council Economic Institute

Political volatility increases funding uncertainty. Over the past several decades, transportation bills have been passed as approximately five-year spending packages, which have guaranteed funding streams for long-term projects and partially insulated transportation from political cycles. However, the last federal transportation act to span a full election cycle, known as SAFETEA-LU, expired in 2009 and was temporarily extended 10 times amid much political wrangling before Congress could agree on a new bill in 2012.[66] The current act, known as MAP-21, has only a two-year lifespan and is set to expire in 2014.

These changes have helped to create a turbulent environment for transportation funding that makes long-range planning difficult, particularly at the local level. Uncertainty over federal funding has shifted risk to local jurisdictions that are ultimately responsible for meeting the mobility needs of residents today and in the future. As infrastructure finance evolves from a national model to one dominated by self-financing regions and localities, the importance of having multiple streams of funding for transportation systems grows. Construction costs continue to outpace inflation[67] and aging infrastructure needs to be updated,[68] leaving local governments looking for new ways to create funding for their necessary transportation improvements. Some experts advocate for long-term reforms that

[66] SAFETEA-LU (Safe Accountable Flexible Efficient Transportation Equity Act – a Legacy for all Users, often referred to as "safety-lew") originally called for almost $200 billion over five years. It was passed in 2005 and was finally succeeded by the current act, MAP-21 (Moving Ahead for Progress in the 21st Century Act) in 2012.

[67] National Highway Construction Cost Index, U.S. Department of Transportation Federal Highway Administration. Accessed at: https://www.fhwa.dot.gov/policyinformation/nhcci/pt1.cfm.

[68] 2013 Report Card for America's Infrastructure, American Society of Civil Engineers. Accessed at: http://www.infrastructurereportcard.org/

would shift the bulk of transportation funding directly to users,[69] but given the political complexities of this shift, meeting near-term funding shortfalls requires multiple approaches. Municipalities and counties have increasingly turned to sales tax measures as one way to ensure dedicated funding for a suite of infrastructure enhancements,[70] thereby providing greater transparency to the ultimate use of the tax revenue. Alameda County's 2014 TEP and proposed sales tax increase employ a similar strategy to address the county's transportation needs both now and into the future.

Uncertainty over federal funding has shifted the risk to local jurisdictions that are ultimately responsible for meeting the mobility needs of residents today and in the future.

Transportation Funding in Alameda County

It is difficult to precisely measure transportation revenues and expenditures at the local level, given the inconsistencies and complexities of funding reporting. In many cases, one agency's expenditures are another's revenues, and a given dollar might be counted multiple times as it makes its way from pocket to pavement. In addition, many transportation improvements, such as signal upgrades or some maintenance, are handled through the development process, on a project-by-project basis, and do not enter a city budget. Finally, the local financing scene is full of small funds, benefit districts, special measures, bonds, and other funding vehicles. In the words of a local transportation expert, it is an "unholy hodgepodge."

Transportation funding in Alameda County must be assessed within the broader context of transportation funding in California as a whole. Transportation funds for roads and transit in California in fiscal year 2014 are estimated at $27 billion, with almost half coming from local revenue sources.[71] Approximately 24 percent will come from federal government sources, primarily through MAP-21, and another 27 percent from state sources, primarily through the state gas tax. Over the past 13 years, state funding has come to represent a smaller portion of total funding: in 1999–2000, state funds comprised 29 percent of total funding, federal government 23 percent, and local funds 48 percent.[72]

The sales tax is an important piece of the funding puzzle. It is also a large piece in Alameda County. City transportation budgets in Alameda County totaled $655 million in FY 2010–2011.[73] Transit system operating expenditures in Alameda County were budgeted at $668 million, roughly based on Alameda County ridership.[74] In FY 2012-2013 Measure B direct allocations to cities and transit operators were $64.8 million.[75]

[69] See "Paying Our Way: A New Framework for Transportation Finance," National Surface Transportation Infrastructure Financing Commission, 2008; "CA 2025: Transportation," PPIC; "Infrastructure Productivity: How to save $1 trillion in Infrastructure Spending," McKinsey Global Institute, January 2013.
[70] The Atlanta Regional Transportation Referendum and Los Angeles' Measure R are two recent examples of ballot initiatives that would provide dedicated revenue for pre-approved transportation projects.
[71] Legislative Analyst's Office, "Overview of Transportation Funding in California," 2014.
[72] Legislative Analyst's Office, "California Travels: Financing Our Transportation," 2000.
[73] California State Controller's Office, "Local Government Annual Financial Report, FY2010-11," 2012. Note: This excludes "public transportation" spending, which is captured in the transit operator expenditures, and minor spending on ports and airports, which are considered separately.
[74] National Transit Database, "Table 1: Summary of Operating Funds Applied, 2011." This number has been normalized reflecting estimates of Alameda County ridership of LAVTA (100%), Union City Transit (100%), AC Transit (90%), ACE (50%), and BART (32%). These calculations are based on the number of boardings that occur in the county. This is only intended as a rough estimate.
[75] Alameda County Transportation Commission, "Measure B Pass-through Fund Program Compliance Report," May 2013.

Total Transportation Funding in California

FEDERAL 24%	Reliance on federal sources remains tenuous due to the uncertainty over the Highway Trust Fund and the politically turbulent environment of transportation bills over the past several years.
STATE 27%	At the state level, transportation revenues have nearly doubled over the past 15 years, primarily in the seven years leading up to the recession.[76] Revenue has remained relatively flat since the beginning of the recent recession, with the state's gas tax swap shifting taxation away from the point of sale to production. • Between the early and late 1990s, inflation-adjusted gas tax revenues generally kept pace with vehicle miles traveled, but between 1999 and 2006, these levels diverged, leading to maintenance backlogs as revenues could not keep up with California's growing transportation needs. • In 2006, voters approved Proposition 1B, a $20 billion dollar general obligation bond to fund various transportation needs across the state. Much of that funding has been committed or spent already, so Proposition 1B funds are no longer a readily available funding source. • The State Transportation Improvement Program (STIP) allocates a combination of federal and state revenue to counties for regional road and transit improvements. In FY 2012-2013, Alameda County received $62.5 million of the $4.0 billion allocated statewide for two years worth of investments.
LOCAL 49%	**At the local level, transportation revenues come primarily from transit fares, transportation sales taxes, special transportation tax measures (such as Measure B), property taxes, and bridge tolls.** • The state returns approximately 3 percent of total sales tax revenues to the counties in which they originated, much of which is passed through to cities and agencies. Most of these funds must be used for transit purposes, but they can be allocated to local streets and roads if all transit needs are met. In FY 2012–13, this funding amount was $1.5 billion, barely up from $1.4 billion in FY 2007–2008, and up from $1.1 billion in FY 2002–2003. Alameda County's portion of these funds has not significantly increased over the past 10 years, despite population growth. As the economy climbs out of the recession, sales tax revenues might increase, but this gap has left massive funding shortfalls. • Counties in California can also pass special measures for transportation funding, which generate between $3.5 and $4.5 billion per year. Almost half of that overall amount is generated in Los Angeles County, which has passed three sales tax measures for a combined total rate of 1.5% through 2039. In Alameda County, Measure B receipts are anticipated at $125 million in the current fiscal year. Alameda is one of 20 counties – collectively representing over 80% of Californians – that have transportation sales taxes. These tax revenues have become a large portion of transportation funding in California. • In California, transit fares in 2012 generated an estimated $1.6 billion.[77] The transit systems serving Alameda County generated $437 million, of which $367 million was produced by BART. • Much of the rest of local transportation revenues is composed of general fund transfers, toll revenues, developer impact fees, and various smaller dedicated funds. Developer impact fees are difficult to track and are closely linked to economic cycles. When development slows, funding slows, even though people continue using the transportation system. General funds are not ideal transportation funding sources because they are not dedicated, thereby making long-term projects risky and, accordingly, more expensive.

[76] California Legislative Analyst's Office, "Overview of Transportation Funding in California," 2014.
[77] National Transit Database.

Forty percent of these funds were allocated for local streets and roads projects, 37 percent for mass transit, 7 percent for bicycle and pedestrian projects, and 16 percent for paratransit.[78]

This does not account for the critical role Measure B funds play on a project-by-project basis. For example, the BART Warm Springs Extension is a 5.4-mile extension of the existing Fremont line into southern Alameda County scheduled to be completed in 2015. The project receives funding from numerous sources, which include state transportation programs, Metropolitan Transportation Commission bridge tolls, and contributions from BART and San Francisco International Airport. The largest source, Alameda County's Measure B, provided funding for just over 25 percent of the $890,000 project. Without these funds serving as an anchor, it is unlikely that the extension would have moved forward, and eventual BART service to Silicon Valley would go unrealized. By leveraging other resources, Measure B funding is critical to the completion of many massive transportation projects in the county.

Measure B projects have leveraged almost $3 billion in external funding sources – almost four times the funding from Measure B to date.

Local taxes play a special role in the overall profile of transportation funding sources in California because they provide dedicated funding, have significant impact, and are approved by residents.

- **Dedicated Funds:** These funds are not subject to political cycles, apportionments, or grant processes, and they provide a level of funding certainty that helps major capital projects get off the ground. While revenues will fluctuate with general economic cycles, dedicated funds cannot be raided or leveraged by other governments. They also serve fundamental maintenance and operations needs.
- **Significant Impact:** According to Caltrans data, these transportation taxes across California provide almost 15 percent of the state's transportation funding. In 2013, Measure B sales tax revenues provided 70 percent of the Alameda County Transportation Commission's budget, and they often comprise the majority or entirety of funding for specific transportation projects. In 2011-2012, cities in Alameda County spent approximately $227 million on streets, highways, and storm drains,[79] and Measure B pass-through funding for these cities was $60.5 million. In short, these funds make a difference.
- **Approved by Residents:** The actual distribution of funds is governed by a Transportation Expenditure Plan, which is developed through stakeholder engagement and voted on as a local tax measure.
- **Local Accountability:** All decisions regarding funding are made by local officials in public meetings. A citizen watchdog committee oversees expenditures to ensure that the funds are being spent in accordance with the plan. It reviews and reports directly to the public on Measure B expenditures, and has found expenditures consistently in line with voter-approved plans since Measure B expenditures began.

[78] Alameda County Transportation Commission, "FY 2012-2013 Program Allocations," August 2013.
[79] California State Controller's Office, "Local Government Annual Financial Report, FY2011-12," 2013.

Reviewing the Performance of Measure B, 2000

For over 25 years, Alameda County has benefitted from voter-approved transportation sales tax measures. The most recent, Measure B – the half-cent transportation sales tax approved by 81.5 percent of Alameda County voters in 2000 – has been successful in enabling critical transportation projects.

In accordance with the Alameda County 20-year Transportation Expenditure Plan (TEP), a major portion of Measure B funds (approximately 60 percent) is distributed in direct payments to cities and transit agencies. Over the last five fiscal years, these distributions have totaled $288 million for road maintenance, transit service, paratransit services, and bicycle and pedestrian safety. For example, in FY 2012-2013, Measure B program funds were distributed as follows:

- $25.7 million for local streets and roads
- $24.4 million for mass transit operations
- $10.3 million for special transportation solutions for seniors and people with disabilities
- $4.3 million for bicycle and pedestrian safety funds

The remaining 40 percent of Measure B funds has been spent on capital projects and grant programs for infrastructure upgrades, expansions, extensions, and other local projects. As of 2014, the Alameda County Transportation Commission (ACTC) had delivered on 95.6 percent of all Measure B capital project investments.

Successfully completed improvements include the following examples.

Fruitvale Transit Village: A livable community surrounding the Fruitvale BART station, this mixed-use development, including office, retail, and residential space, is the successful and effective result of a broad-based partnership among public, private, and nonprofit organizations working together to revitalize a community using transit-oriented development.[80]

Local street rehabilitation: In addition to direct funding for maintenance, Oakland and Newark both received a combined $6.7 million to improve local streets, and $6.4 million went to streetscape improvement in downtown Oakland.

SR-84 / I-580 interchange: Caltrans and the City of Livermore designed and constructed a new interchange at I-580 designed to improve the connection from I-580 to the Route 84 alignment along Isabel Avenue.

Fruitvale Transit Village in Oakland *Photo Credit: ACTC*

[80] Federal Highway Administration, "Case Studies: Fruitvale Transit Village Project," http://www.fhwa.dot.gov/environment/environmental_justice/case_studies/case6.cfm.

Downtown Livermore after Measure B Investment

Photo Credit: ACTC

Measure B funded the re-routing of SR-84 from downtown Livermore to Isabel Avenue, which allowed for revitalization in the downtown area, including new restaurants, retail shops, and a theater. This work also supported existing Measure B funded improvements to SR-84 to ease congestion, increase local traffic circulation, and improve pedestrian and cyclist safety in the area.

Other investments will be completed in the next few years:

I-80 Integrated Corridor Mobility (ICM): This project will implement intelligent transportation systems (ITS) upgrades to the 20-mile stretch of I-80 between the Bay Bridge and the Carquinez Bridge. The new technologies will include adaptive ramp metering, incident management, and digital signs to communicate with drivers. The project area includes the most congested stretch of highway in the Bay Area: I-80 north of the Bay Bridge. ACTC has a variety of projects aimed at improving this corridor.

BART Warm Springs Extension: The Warm Springs Extension is a 5.4-mile extension of the BART Fremont line. The line will run in a tunnel under Fremont Central Park and then at grade to a new station in southern Fremont. Given the growth in commuters from Alameda County to Santa Clara County, extending BART south has the potential to relieve congestion on I-880. This extension is also the first step in a planned BART extension into Silicon Valley.

I-580 Express Lanes: Environmental approval has been received to convert the new HOV lanes on I-580 to high occupancy toll/express lanes over a total distance of 22 miles. The conversion to express lanes will give individual drivers the option to pay an electronic toll while using the lane; carpool users will continue use for free. Dynamic pricing will also be utilized, whereby the cost to use the express lane for individual drivers will vary based on real-time traffic levels and deducted automatically from

BART Oakland Airport Connector *Photo Credit: ACTC*

Construction on BART Warm Springs Extension *Photo Credit: ACTC*

drivers' FasTrak accounts. The conversion will maximize the efficiency of the HOV lanes and will help reduce congestion by giving drivers an alternative way to speed their trip. Existing HOV lanes will begin their conversion to express lanes in late 2014, to be open for use in 2015. This project builds upon a series of investments including HOV lanes, auxiliary lanes, and new interchanges along the I-580 corridor.

BART Oakland Airport Connector: The Oakland Airport Connector project will provide a 2.2-mile automated guideway transit system to connect the BART Coliseum station with the Oakland International Airport. Those trying to reach the airport from BART were previously shuttled using the AirBART bus system. Vehicle and system testing began in January 2014, while construction of the Coliseum Station Transition Building continues through mid-2014. Revenue service will begin in the fall of 2014.

These projects and improvements have come in the face of Measure B shortfalls. The tax has produced less revenue than originally anticipated,[81] largely due to depressed consumer spending during the Great Recession, which has been the case across California. Even with less revenue, ACTC has executed on 95.6 percent of proposed Measure B capital investments. Because of the availability of the local sales tax funds, ACTC has been able to move projects through the development, right-of-way acquisition, engineering, and construction processes.

With Measure B funding enabling the early phases of project delivery, ACTC has leveraged almost $3 billion in external funding sources – almost four times the funding from Measure B itself. This has included major funding from the $20 billion California transportation bond and from other regional, state, and federal funding sources. The matching requirements of many transportation grants make Measure B funds a critical tool for local transportation finance efforts, and without Measure B funds, it is difficult to estimate how much of this essential funding Alameda County would have been able to secure.

[81] ACTC Citizen Watchdog Committee, "9th Annual Report to the Public," July 2011.

The Alameda County 2014 Transportation Expenditure Plan

The Alameda County Transportation Commission (ACTC) has developed a plan to address the county's immediate and future transportation needs. Following on the success of the last county spending measure approved by the voters 2000, ACTC has developed a new 2014 Transportation Expenditure Plan (TEP), which lays out the spending for a 30-year sales tax measure to advance the County's transportation.

The proposed 2014 TEP has been developed through extensive public and stakeholder engagement. An independent watchdog committee made up of Alameda County residents will oversee the disbursement of funding to ensure compliance with the TEP.

Following on the last county spending measure approved by voters in 2000, ACTC has developed a new 2014 Transportation Expenditure Plan.

The 2014 Transportation Expenditure Plan responds to emerging needs in Alameda County's transportation system, which supports the broader Bay Area economy and that of Northern California. A growing population, increased global freight, changing mobility patterns, and normal wear and tear already demand major investments. These needs are critical at a time when transportation infrastructure faces major funding shortfalls across the US and California. In addition, as noted before, the future of state and federal funding is uncertain in California. The revenue from the Measure B sales tax has filled a funding gap but has also helped Alameda County compete for these diminishing dollars by providing matching funds for competitive grants. The Measure B funds from the 2000 TEP have been successful in leveraging almost four times their amount in other funding.[82]

Sales tax measures are one of the few levers accessible to local jurisdictions to improve the future of their transportation systems. Across the US, federal funding has averaged around 25 percent of total highway costs and 18 percent of transit costs, with state and local sources making up the difference.[83] As explained above, local funding makes up almost 50 percent of transportation funding in California. In Alameda County, local sources have come to represent over 60 percent of the funding available for transportation, largely a result of Measure B.[84]

The 2014 TEP lays out investments of almost $8 billion over 30 years in key areas designed to increase mobility, relieve congestion, and upgrade technology. The 2014 TEP aims for five objectives, reached through engagement with Alameda County community members.

[82] As of FY 2010 –2011, the Citizens Watchdog Committee reports that $756 million has been distributed to projects totaling $3.55 billion.
[83] National Surface Transportation Infrastructure Financing Commission, "Paying our Way: A New Framework for Transportation Finance," 2008, p 35.
[84] Alameda County Transportation Commission, "2014 Alameda County Transportation Expenditure Plan," January 2014, p 9, http://www.alamedactc.org/files/managed/Document/12934/2014_Transportation_Expenditure_Plan.pdf.

- **Expand and improve transit services,** which produce fewer emissions, are more convenient than cars for many people, and help to relieve auto congestion for those who choose to drive.
- **Keep fares affordable** for seniors, youth, and people with disabilities – as fares do not cover the full cost of operating and maintaining transit services.[85]
- **Provide traffic relief,** through road maintenance, upgrades, and new traffic management technology.
- **Improve air quality** and clean transportation, by supporting pedestrian, bicycle, and transit infrastructure.
- **Create jobs in Alameda County,** through local contracting – in addition to the economic development benefits that come from well-functioning transportation systems.

Below is a snapshot of these investments and the broader role they will play in the future of Alameda County, the Bay Area, and California.

Expand and Improve Transit Services

Almost half of the planned investments are dedicated to transit in Alameda County. Increased transit ridership meets a broad array of policy goals for people riding transit, driving, cycling, and walking.

- Transit systems can increase property values or, in the case of the most recent recessions, make them more resilient in the face of dipping housing demand. A recent report commissioned by the American Public Transportation Association (APTA) and the National Association of Realtors found in a five-region study that residential properties located in proximity to high-frequency transit (rail, light rail, and bus rapid transit) maintained their value as compared to residential properties without transit access. Across the study regions, the transit shed outperformed the region as a whole by 41.6 percent.[86]
- More riders on transit also means fewer vehicles on the road, relieving congestion for those who choose to drive. The Texas A&M Transportation Institute's 2012 Urban Mobility Report calculates that public transportation in the San Francisco-Oakland metropolitan area annually saves almost 37 million hours of delay and $775.9 million in costs.[87]
- Public transit helps to reduce CO2 emissions and saves energy. A 2007 ICF International report estimated that reduced fuel consumption and congestion relief from public transit saved 37 million metric tons of CO2 in the US. To put that in context, California's 2011 emissions – across all sources of emissions – were estimated at approximately 450 million metric tons, and the goal is to lower that figure to 427 million by 2020.[88]

[85] Just as taxes pay for roads to help subsidize driving, public entities support transit services. In 2012, fares on AC Transit covered just 17% of operating and capital costs.
[86] The Center for Neighborhood Technology, "The New Real-Estate Mantra: Location Near Public Transportation," March 2013.
[87] Texas A&M Transportation Institute, "2012 Urban Mobility Report," December 2012. The San Francisco Oakland MSA, also known as the San Francisco-Oakland-Fremont MSA, includes Alameda, Contra Costa, Marin, San Mateo, and San Francisco counties.
[88] ICF International, "The Broader Connection between Public Transportation, Energy Conservation and Greenhouse Gas Reduction," 2008. Note: Studies have suggested that meeting emissions targets will require a multi-pronged approach, and the discussion above is not meant to imply that public transit is a single solution for California. Such analysis is beyond the scope of this discussion.

- A high-quality transit system can support riders who have limited options and can attract riders for whom transit is one option among many. A survey of older Americans revealed that 83 percent agree that transit provides them more freedom, mobility, and access to everyday needs.[89]

ALAMEDA-CONTRA COSTA TRANSIT DISTRICT (AC TRANSIT)

The largest recipient of the proposed 2014 TEP funding is AC Transit, which will receive over $1.8 billion for operations and maintenance. Spending related to AC Transit operations and maintenance programs comprises 18.8 percent of total estimated spending put forward by the 2014 TEP. These funds will be used to expand services and to perform maintenance that will allow AC Transit to improve its vehicle fleet. Additionally, the plan calls for AC Transit to receive $348 million to be put toward meeting its responsibilities under the Americans with Disabilities Act. Lastly, a total of $35 million in sales tax funds will be allocated to projects that enhance the reliability and speed of bus transit services in the East Bay. These projects include bus rapid transit along three proposed corridors – the East 14th/International Boulevard project; the Grand/MacArthur bus rapid transit project; and the Alameda to Fruitvale BART rapid bus.

AC Transit Zero Emission Bus — *Photo Credit: Noah Berger, ACTC*

Alameda Ferry — *Photo Credit: "Bay Bridge & Ferry" by Daniel Ramirez*

SAN FRANCISCO BAY AREA WATER EMERGENCY TRANSPORTATION AUTHORITY

The San Francisco Bay Area Water Emergency Transportation Authority (WETA) is slated to receive almost $40 million over 30 years from the 2014 TEP. The funds from Alameda County's Measure B were instrumental in supporting the Alameda/Oakland transbay ferry service over the past decade. The 2000 TEP called for over $11 million in funding over 20 years for Alameda/Oakland ferry services, which grew rapidly in ridership over the past decade and in 2010 merged with the Harbor Bay and South San Francisco Ferry services into WETA. In FY12–13, the ferry services received approximately $788,000, which constituted almost 20 percent of the cost of operating the ferries and supplemented the fares received. That year, the ferry services received no federal or state funding for operations, even while supporting over a half million trips.

[89] Harris Interactive, "Older American Attitudes Toward Mobility and Transportation," 2005.

BAY AREA RAPID TRANSIT (BART)

BART system investments outlined in the 2014 TEP total nearly $1 billion spread across expansion, operations, and maintenance. BART projections call for over 700,000 daily riders by the end of the 30-year TEP period (as compared to approximately 400,000 average daily riders today). The 2014 TEP will provide $710 million in funding to four key projects that will better allow BART to accommodate these additional future riders.

- The BART extension to Livermore will be allocated $400 million to expand transit in the I-580 corridor.
- The Bay Fair Connector/BART METRO project ($100 million for the Alameda County portion) will provide tracks to allow trains to travel directly from the Dublin/Pleasanton line toward the Fremont line and into Santa Clara County.
- BART station modernizations will receive $90 million for improvements at all stations within Alameda County.
- The proposed Irvington BART station along the Warm Springs extension will receive $120 million in funding.

Provide Traffic Relief

Traffic congestion in the Bay Area is a constant struggle. The INRIX Traffic Scorecard ranked the San Francisco-Oakland metro area as the 7th most congested metro area in the world, with Los Angeles as the only US metro area ranked higher.[90] The Texas A&M Transportation Institute's 2012 Urban Mobility Report estimates that congestion in the San Francisco-Oakland metro area translates to 61 hours wasted and 25 gallons of fuel wasted per auto commuter – the equivalent of sitting in a car, not moving, from a Monday morning through Wednesday evening. As noted earlier, average commute times in Alameda County have grown, outpacing California and the nation. In 2012, more than 50 percent of Alameda County drivers endured a commute of at least 30 minutes, with over 10 percent suffering a commute of an hour or more. Congestion plays a critical role in lengthening these commutes.

The 2014 TEP addresses congestion in a variety of ways:

- Increased transit utilization will take cars off the road and make driving easier for those who choose or need to drive.
- Thirty percent of the net revenue will support road maintenance, repair, and local seismic safety. Road maintenance is critical to safety and road performance. The American Society of Civil Engineers estimates that 68 percent of California's major roads are in poor or mediocre condition, and that driving on such roads costs California motorists almost $14 billion a year, or $586 per driver.[91]
- Projects identified for funding will mitigate traffic bottlenecks. For example, major investments at the Ashby and Gilman interchanges north of the Bay Bridge will relieve two critical bottlenecks.

[90] http://scorecard.inrix.com/scorecard/, accessed February 8, 2014.
[91] American Society of Civil Engineers, "2012 Report Card for California's Infrastructure."

This is the most congested stretch of freeway in the Bay Area. Improvements at these areas will also enable safer and easier access to recreational activities west of I-80, including the Bay Trail. The plan also calls for investments in more efficient interchange infrastructure along I-880, I-580, and State Route 84.

- HOV/express lanes on I-680 will help manage congestion and encourage carpooling.
- Certain interchange improvements will support more efficient goods movement.

HIGH-OCCUPANCY VEHICLE/HIGH-OCCUPANCY TOLL LANES

HOV/HOT lanes are emerging as a preferred strategy for mitigating congestion, expanding transportation choices, and improving efficiency of existing highways, especially when expansion is not feasible or cost effective. Most transportation policy experts have advocated for road charges – effectively pricing congestion – to reflect the various social, economic, and environmental problems that driving causes. While many congestion pricing schemes were initially unpopular with the public, experiments around the world have proven both successful and acceptable to drivers. The 2014 TEP makes modest investments – approximately $80 million over 30 years – to create such lanes. This aligns with transportation policy trends and recommendations from various experts, including RAND, the Public Policy Institute of California, and the National Surface Infrastructure Financing Commission.

Proposed I-580 HOV/HOT Lanes

Source: Alameda County Transportation Commission

Freight and Economic Development

Freight plays a critical role in Alameda County's economy and the economy of Northern California. Over $40 billion worth of imports and exports flowed through the Port of Oakland in 2012, and these goods rely on a surface transportation network to get to and from the Port.

The 2014 TEP includes several critical investments that will support transportation and freight movement:

- Road maintenance will improve truck performance.
- A freight and economic development program will set aside discretionary funds to support critical freight projects that enhance safety, reduce environmental impacts, and relieve freight-related congestion. For example, the proposed Seventh Street grade separation will relieve major delays caused by trains conflicting with arterial roadways in Oakland, allowing more efficient truck flows.

Artist Rendering of East Bay Greenway

Source: Alameda County Transportation Commission

Bicycle and Pedestrian Paths

Cycling has taken off across the US as a means of transportation, exercise, and recreation. In Alameda County, counts of cyclists increased by 75 percent between 2002 and 2011 along monitored locations. The Bay Area's annual Bike to Work Day has seen increasing participation, and in 2012, over 17,000 cyclists were tallied at energizer stations, up from just over 10,000 in 2009. In addition, the number of female cyclists has been steadily rising in Alameda County over the last five years. Research suggests that women are less likely than men to cycle when facilities are not sufficiently safe. Cycling, safety, and infrastructure are intertwined, and the TEP sets aside funds for bicycle planning, facility expansion and maintenance, and education programs about cycling safety and rules of the road.

Many cities in Alameda County have bicycle plans, developed with community input and support, that can guide local investments. The 2014 TEP also devotes funds for the completion of three key trails: the East Bay Greenway from Oakland to Fremont and the Bay Trail and Iron Horse Trail in Alameda County.

Critical Timing

The investments envisioned in the 2014 TEP come at a critical time. The recession and uncertain state and federal support have contributed to cuts in regional transit services, which are subject to a vicious cycle of scaling back operations – as a transit system becomes less reliable as a means of mobility (fewer routes, less frequency), people stop using it, further eroding financial and public support. The TEP can mitigate against that. The Bay Area remains a desirable location for people and companies around the world, and as populations grow, transportation needs intensify. In 2012, an estimated 309,000 people commuted out of Alameda County, 318,000 commuted in, and 286,000 commuted to jobs from within Alameda County. As the economy grows, the transportation network needs to efficiently connect workers and jobs throughout the region. Finally, the estimated $8 billion in transportation spending will stimulate further economic activity in and around the Bay Area, as described in the following section.

Transportation Spending: Estimating the Return on Investment

The expenditures laid out in the 2014 Alameda County Transportation Expenditure Plan (TEP) will translate into multiple economic impacts. This spending will stimulate the local economy through local contracting and support on-going operations and maintenance jobs. Further, this funding will allow Alameda County to leverage additional funds for greater investment from other sources and therefore create greater impact. The direct spending will have ripple effects across the economy as dollars change hands and translate into new jobs and new business revenues, totaling $20 billion in estimated economic activity.

Investments planned in the 2014 TEP are estimated to generate $20 billion in economic activity and nearly 150,000 jobs over the 30-year period.

There are multiple aspects to explaining economic impacts. Expenditures associated with a particular activity have the potential to generate significant increases in economic output, local employment, and government tax revenues. There are three different types of impacts that contribute to estimating the full economic impact of an activity. To highlight these impacts, the case of spending to extend a rail transit system provides a useful example. First, there is a direct effect: the number of jobs and dollars in tax revenue that are directly linked to the original expenditure. Second, there is an indirect effect: when a contractor is hired to build new tracks, this stimulates activity directly related to this contractor, but also indirectly stimulates activity at the concrete and steel companies that supply the materials. Finally, there is an induced effect that results from the employees at the construction and steel companies spending their increased take-home pay.

Economic Impact of Spending

The analysis presented below provides an estimate for the broader regional economic impacts of Alameda County's planned spending on transportation. **The total projected impact exceeds $20 billion.**

Broader Economic Impacts
of the Alameda County 2014 Transportation Expenditure Plan

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	92,380	$8,031,986,888	$275,488,644	$7,788,469,876
Indirect Effect	22,353	$2,002,494,205	$3,464,538,008	$6,675,117,179
Induced Effect	35,175	$2,263,023,798	$3,853,599,195	$5,761,183,609
Total Effect	149,908	$12,297,504,891	$7,593,625,847	$20,224,770,664

Data Source: These figures were calculated using the 2012 IMPLAN database
Analysis: Bay Area Council Economic Institute

Employment: Expenditures included in the 2014 TEP are projected to produce nearly 150,000 jobs (in equivalent one-year, full-time positions) in the 30-year period, over 60 percent of which are directly related to spending on capital investments, operations, and maintenance. The sectors projected to produce the greatest number of jobs include state and local government passenger transit administration, construction, and maintenance and repair.

Labor Income: These additional jobs will directly produce a corresponding $8 billion in wages. Additionally, income will increase by over $2 billion in related industries, most notably in the wholesale trade and architecture, design, and engineering businesses. The impact of these increased wages stimulating broader economic spending is projected to produce an additional $2 billion, for a total labor income increase of $12.3 billion.

Total Value Added: Value added consists of compensation of employees, taxes on production and imports less subsidies, and gross operating surplus. For example, an industry buys goods and services and remanufactures those goods and services to create a product of greater value than the sum of the goods that goes into it. That increase in value is the value added as a result of the production process. This value added is then used to pay labor and taxes with some remainder for profit.

Breakdowns of project impacts by industry are detailed below.

Economic Impact by Industry
of the Alameda County 2014 Transportation Expenditure Plan

	Direct	Indirect	Induced	Total
Agriculture, Forestry, Fishing, & Hunting	$ -	$ 7,296,834	$ 15,177,010	$ 22,473,844
Mining	$ -	$ 91,574,017	$ 6,021,745	$ 97,595,762
Utilities	$ -	$ 86,296,030	$ 72,427,396	$ 158,723,426
Construction	$4,982,679,780	$ 75,136,489	$ 42,132,327	$5,099,948,597
Manufacturing	$ 15,480,000	$3,071,170,591	$ 486,565,992	$3,573,216,583
Wholesale Trade	$ -	$ 413,473,205	$ 248,991,453	$ 662,464,657
Retail Trade	$ -	$ 98,869,787	$ 572,469,622	$ 671,339,408
Transportation & Warehousing	$ -	$ 243,092,525	$ 128,639,450	$ 371,731,975
Information	$ -	$ 237,904,850	$ 293,504,347	$ 531,409,197
Finance & Insurance	$ -	$ 513,336,799	$ 695,770,631	$1,209,107,430
Real Estate, Rental, & Leasing	$ -	$ 169,011,550	$1,018,399,677	$1,187,411,227
Professional, Scientific, & Technical Services	$ 15,480,000	$1,113,023,978	$ 249,851,713	$1,378,355,691
Management	$ -	$ 49,484,104	$ 44,525,802	$ 94,009,906
Administration	$ -	$ 227,810,784	$ 128,129,510	$ 355,940,295
Educational Services	$ -	$ 3,233,194	$ 147,685,453	$ 150,918,648
Health Care & Social Assistance	$ -	$ 35,547	$ 868,503,840	$ 868,539,387
Arts, Entertainment, & Recreation	$ -	$ 23,090,472	$ 109,946,853	$ 133,037,326
Hospitality	$ -	$ 51,121,888	$ 311,017,803	$ 362,139,690
Other Services (Except Public Admin)	$ -	$ 140,683,626	$ 252,164,272	$ 392,847,898
Public: Primarily Transit Related	$2,774,830,096*	$ 59,470,910	$ 69,258,712	$2,903,559,718
Total	$7,788,469,876	$6,675,117,179	$5,761,183,609	$20,224,770,664

* Direct TEP spending reported in the broad category of Public Administration consists of direct spending on passenger transit operations, maintenance, transit administration, and paratransit services.
Data Source: These figures were calculated using the 2012 IMPLAN database
Analysis: Bay Area Council Economic Institute

Employment Impact by Industry
of the Alameda County 2014 Transportation Expenditure Plan

	Direct	Indirect	Induced	Total
Agriculture, Forestry, Fishing, & Hunting	-	39	93	132
Mining	-	175	11	186
Utilities	-	90	96	186
Construction	27,083	432	238	27,753
Manufacturing	37	1,271	579	1,887
Wholesale Trade	-	1,669	1,005	2,674
Retail Trade	-	1,089	6,197	7,286
Transportation & Warehousing	-	2,165	823	2,988
Information	-	469	617	1,086
Finance & Insurance	-	1,563	2,582	4,145
Real Estate, Rental, & Leasing	-	692	1,719	2,411
Professional, Scientific, & Technical Services	139	6,984	1,387	8,510
Management	-	188	169	357
Administration	-	2,553	1,421	3,974
Educational Services	-	35	1,701	1,736
Health Care & Social Assistance	-	0	6,963	6,963
Arts, Entertainment, & Recreation	-	230	1,383	1,613
Hospitality	-	721	4,436	5,157
Other Services (Except Public Admin)	-	1,289	3,311	4,600
Public: Primarily Transit Related	65,121*	699	444	66,264
Total	92,380	22,353	35,175	149,908

* Direct TEP spending reported in the broad category of Public Administration consists of direct spending on passenger transit operations, maintenance, transit administration, and paratransit services.
Data Source: These figures were calculated using the 2012 IMPLAN database
Analysis: Bay Area Council Economic Institute

The employment and output impacts of TEP spending were aggregated into sector designations using standard industry categories. While more specific breakdowns are difficult to model, the projected economic impacts and jobs can be described in more detail.

- While the total impact on the Public Administration sector includes a broad spectrum of government jobs, the direct impact in this sector was focused solely on jobs related to local government passenger transit. Jobs in this sector include vehicle operators, maintenance technicians, transit administrators, and paratransit services.
- Direct impacts from Construction projects were split between the non-residential construction sector and maintenance, improvement, and repair construction.
- Direct impacts in Professional, Scientific & Technical Services are from the technical consultant services associated with the technology-spending portion of the TEP. This is also true of the direct impacts in Manufacturing, which assumes the purchase of new road monitoring and navigation equipment as a portion of spending on new technology. The significant indirect impacts in these categories are likely related to engineering, architecture, and environmental services.

Implications for Tax Revenue

Increased spending in the region brings in additional government revenues with taxes on purchases, payrolls, and incomes. These revenues come from the sources detailed below.

Impact on Tax Revenues
of the Alameda County 2014 Transportation Expenditure Plan

Tax Source	State & Local Impact	Federal Tax Impact	Total Tax Revenue
Employee Compensation	$ 26,332,704	$1,062,148,272	$1,088,480,976
Proprietor Income	$ -	$ 34,338,636	$ 34,338,636
Tax on Production & Imports	$363,942,569	$ 39,814,263	$ 403,756,832
Households	$372,224,197	$ 874,796,183	$1,247,020,380
Corporations	$(79,936,403)	$ (336,096,053)	$ (416,032,456)
Total Tax Source	$682,563,067	$1,675,001,301	$2,357,564,368

Data Source: These figures were calculated using the 2012 IMPLAN database
Analysis: Bay Area Council Economic Institute

Employee Compensation: With $12 billion in labor income increases projected, nearly $1.1 billion will return to government agencies coffers in the form of payroll taxes. Local and state payroll tax receipts are likely to be revolved back into local communities in the form of spending on education, infrastructure, safety, and healthcare.

Households: A significant portion of both the state/local and federal revenues impact stems from income taxes. Seventy percent of the $1.2 billion impact falls into the category of federal taxes, with the remaining 30 percent in the category of state and local taxes.

Tax on Production and Imports: In addition to household taxes, state and local governments produce much of their revenues from production taxes. The approximately $364 million in state and local production tax revenues comes from the following sources: sales taxes, real estate taxes (commercial and residential property), motor vehicle taxes, severance resource taxes, business license and stamp taxes, fines, park fees and donated funds and permits, and excise and gross receipts taxes.

Corporations: The projected decrease in corporate tax receipts offsets the increase in production tax – representing a shift in taxation from corporate profits to corporate spending. Expenditures by businesses related to infrastructure projects are taxed initially at the local level. These increased expenses will lower federal taxable incomes and can generate future tax deductions, thus explaining these reductions in corporate taxes. For example, when a firm buys a new construction vehicle, that purchase is initially taxed at the state level. The firm will account for that expense not immediately but over a period of time through depreciation, which will decrease federal taxable income in the future.

In sum, investing in the transportation systems needed today will not only prepare the Bay Area economy for success in the future, but will also translate into broad economic stimulus in the near term. The ripple effects of this investment begin with the ability to leverage additional funding sources for local projects. Local businesses will experience new demand, suppliers of goods and services will have an increase in activity, new workers will be hired, and their earnings will be spent throughout different corners of the economy.

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Appendix B: Methodology

Section 2. Alameda County: A Critical Hub for the Movement of Goods and People in the Bay Area

Bay Area Commute Patterns by County, 2011: Data covering employment status, place of residency, and commute destination was provided by the US Census Bureau's Longitudinal Employer-Household Dynamics database. In defining the universe of workers, only the primary jobs were considered. The line with the county label "Bay Area" is a summation of all the nine preceding counties in the Bay Area and is not representative of commute movement into and out of the Bay Area as a single entity.

Cross County Labor Flows, 2011: Data covering employment status, place of residency, and commute destination was provided by the US Census Bureau's Longitudinal Employer-Household Dynamics database. In defining the universe of workers, only the primary jobs were considered. Net Inflow is the number of workers living outside the county minus the number of residents working outside the county. The line with the county label "Bay Area" is a summation of all the nine preceding counties in the Bay Area and is not representative of commute movement into and out of the Bay Area as a single entity.

Workplace County of Alameda County Residents: Data covering employment status, place of residency, and commute destination was provided by the US Census Bureau's Longitudinal Employer-Household Dynamics database. In defining the universe of workers, only the primary jobs were considered. Counties are ranked by their 2011 commute destination value.

Residence County of Workers in Alameda County: Data covering employment status, place of residency, and commute destination was provided by the US Census Bureau's Longitudinal Employer-Household Dynamics database. In defining the universe of workers, only the primary jobs were considered. Counties are ranked by their 2011 commute destination value.

Commute Flows Through Alameda County: Data covering employment status, place of residency, and commute destination was provided by the US Census Bureau's Longitudinal Employer-Household Dynamics database. In defining the universe of workers, only the primary jobs were considered. Commuter values are the sum of all workers traveling from the indicated county to or from San Francisco County, San Mateo County, or Santa Clara County. Counties are ranked by their 2011 commute destination value.

Employment Trends in Bay Area Metropolitan Areas: Historic data is reported by the California Employment Development Department's Current Employment Statistics (CES). Data is reported by metropolitan statistical area and by metropolitan division.

Means of Commute: Data covering employment status, number of passengers, and means of commute was provided by the US Census Bureau's American Community Survey 1-Year Estimates. The term, "carpool", refers to vehicles with more than one passenger. "Other means" includes motorcycles, taxis, bicycles, and the census category "other means." The term "Bay Area" refers to the nine counties of Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara, San Mateo, and San Francisco.

Commute Times: Data covering employment status, location, and minutes to work was provided by the US Census Bureau's American Community Survey 1-Year Estimates. Data excludes all records reported as "unemployed" and all those with no employment response. The term "Bay Area" refers to the nine counties of Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara, San Mateo, and San Francisco.

Public Transit Commute Times: Data covering employment status, location, minutes to work, and means of commute was provided by the US Census Bureau's American Community Survey 1-Year Estimates. Only records reported as taking a bus, trolley bus, streetcar, trolley car, subway, elevated rail, railroad, or ferryboat to work were included. Data excludes all records reported as "unemployed" and all those with no employment response. The term "Bay Area" refers to the nine counties of Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara, San Mateo, and San Francisco.

Passenger Vehicle Commute Times: Data covering employment status, location, minutes to work, and means of commute are from the US Census Bureau's American Community Survey 1-Year Estimates. Only records reported as taking a car, van, or truck to work were included. Data excludes all records reported as "unemployed" and all those with no employment response. The term "Bay Area" refers to the nine counties of Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara, San Mateo, and San Francisco.

Average Daily Vehicle Hours on Freeways in Alameda County: Data covering time of day, vehicle miles traveled, vehicle hours traveled, vehicle hours delayed, and highway/freeway boundaries was provided by the Caltrans Mobility Performance Report using the performance monitoring system. The term "vehicle hours delayed" is defined as the number of additional hours vehicles spent on freeways while traveling less than 60 miles per hour. The term "vehicle hours traveled without delay" is defined as the total vehicle hours traveled minus vehicle hours delayed.

Peak Commute Hour Travel Speeds in Miles Per Hour: Data covering time of day, vehicle miles traveled, vehicle hours traveled, and highway/freeway boundaries was provided by the Caltrans Mobility Performance Report using the performance monitoring system. The term "Bay Area" refers to the nine counties of Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara, San Mateo, and San Francisco. "Average annual vehicle speeds for the Bay Area" is a function of total vehicle miles traveled divided by vehicle hours traveled. Peak hours are roughly equivalent to high occupancy vehicle lane operation hours.

Annual BART Ridership and Service Levels: Data covering service effectiveness, number of passengers, and vehicle-revenue hours for the Bay Area Rapid Transit system was provided by the MTC Transit Performance Reports. This chart presents system-wide data.

Annual AC Transit Ridership: Data covering service effectiveness, number of passengers, and vehicle-revenue hours for the Alameda-Contra Costa Transit system was provided by the MTC Transit Performance Reports. This chart presents system-wide data.

Bay Area Port Cargo: Outbound and Inbound cargo tonnage records were provided by US Trade Online database and the Pacific Maritime Association. Bay Area ports include the Ports of San Francisco, Richmond, Redwood City, Oakland, Crockett, Alameda, and Benicia. Cargo data includes containerized cargo, autos, bulk cargo, lumber and logs, and general cargo. Values do not include oil imports or exports.

Bay Area Air Freight: Historic records of tons of trade goods moving through Bay Area airports was provided by the Metropolitan Transit Commission's 2012 Regional Airport Aviation Tracking Report. "Bay Area Air Freight" is defined as all cargo passing through San Francisco International Airport, San Jose International Airport, and Oakland International Airport.

2011 Bay Area Exports: Data covering commodity category, mode of travel, and commodity value was determined using the Freight Analysis Framework. Records include all goods leaving the San Francisco Combined Statistical Area (CSA), regardless of point of origin. Dollar values have been adjusted to 2010.

Section 3. The Sources of Transportation Funding in Alameda County

US Transportation Funding (2010): Data was obtained from the Highway Statistical Series (Table HF-10) and the National Transit Database (Tables 1 and 7). The Highway Statistics Series is a set of annual reports containing analyzed statistical information on a variety of US highway transportation subjects, including highway finance. Most data is submitted by the states to the Federal Highway Administration and compiled by the Office of Highway Policy Information, and some data is imputed. Funding sources do not count intergovernmental payments, which are captured in expenditures as flows from one government level to another. The National Transit Database (NTD) is a set of statistics on the transit systems of the United States, covering performance, finance, and other system issues. Recipients of federal funding are required to submit data to the NTD. This analysis uses codes given in the Highway Statistical Series, and when categories do not match between the two datasets, values are put into "other taxes and fees." Values are in constant 2010 dollars, adjusted by the CPI from the Bureau of Labor Statistics.

California Transportation Funding: Data for fiscal year 2013-2014 was obtained from the California Department of Transportation, specifically the report titled, "Transportation Funding in California, 2014." Data for fiscal year 1999-2000 was obtained from the California Legislative Analyst's Office, specifically the report titled, "California Travels – Financing Our Transportation, 2007." Inflation adjustments were made using Consumer Price Index information between 1999 and 2013.

Value of the US Gas Tax: Data was obtained from the Tax Foundation and cross-checked across multiple sources. Values were adjusted to constant 2010 dollars.

Federal Transportation Funding: Revenues, Expenditures, and Highway Trust Fund Balance, 2000–2012: Data was obtained from the Highway Statistical Series, Tables FE-210 and HF-10. Data includes both the Highway Account and the Mass Transit Account within the Highway Trust Fund. Values shown for "Expenditures" and "Revenues" do not include general fund transfers, some of which were spent on transportation and some of which went into the balance of the Highway Trust Fund. Values given are in constant 2010 dollars.

Average Fuel Economy of US Passenger Cars: Data was obtained from the National Transportation Statistics, Table 4-23, of the Bureau of Transportation Statistics, and the Highway Statistics Series Summary to 1995, table VM-201a. "Passenger cars" include motorcycles and exclude buses, vans, pickup trucks, and sport/utility vehicles.

Bonds as a Percent of Total State and Local Funding for Highways: Data was obtained from the Highway Statistical Series, Table HF-10. Bond proceeds are often spent erratically, depending on when they are passed and how they are spent; this data was checked against adjacent years to ensure that the graph does not simply show outlier years. Values are given as a percentage of total spending, as reported in Table HF-10. Values given are in constant 2010 dollars.

Total Transportation Funding in California: Data was obtained from the California Legislative Analyst's Office (LAO), specifically the LAO memo, "Overview of Transportation Funding," from March 13, 2014 and in conversations with LAO staff. The California Legislative Analyst's Office only includes revenue funding available for distribution to local and state agencies for transportation purposes and excludes bonds and funding for the Department of Motor Vehicles and the California Highway Patrol. Values given are in constant 2013 dollars and constant 2010 dollars.

Section 5. Transportation Spending: Estimating the Return on Investment

The Alameda County 2014 Transportation Expenditure Plan (TEP) served as the source of the inputs for the economic impact analysis. Spending for projects outlined in the TEP was broken down into industry categories defined by the IMPLAN model, an industry standard for estimating economic impact, and treated as additional revenues for each sector. Funding was assigned to the following categories:

- Construction projects were divided into two groups: Construction of New Non-Residential Structures and Maintenance/Repair Construction of Non-Residential Structures.
- Operational expenditures for the individual agencies were categorized as State and Local Governmental Passenger Transit.
- Technology spending was split between Scientific and Technical Services, Sensor and Navigation Instruments, Construction of New Non-Residential Structures, and State and Local Governmental Passenger Transit.

Capital purchases of buses and other transit equipment are budgeted through fleet replacement funds which are not included in the TEP project spending.

See Appendix C for the methodology on the IMPLAN modeling system.

Appendix C: IMPLAN Input-Output Methodology

The IMPLAN modeling system combines the US Bureau of Economic Analysis' Input-Output Benchmarks with other data to construct quantitative models of trade flow relationships between businesses, and between businesses and final consumers. From this data, we can examine the effects of a change in one or several economic activities to predict its effect on a specific state, regional, or local economy (impact analysis). The IMPLAN input-output accounts capture all monetary market transactions for consumption in a given time period. The IMPLAN input-output accounts are based on industry survey data collected periodically by the US Bureau of Economic Analysis and follow a balanced account format recommended by the United Nations.

IMPLAN's Regional Economic Accounts and the Social Accounting Matrices are used to construct region-level multipliers that describe the response of the relevant regional economy to a change in demand or production as a result of the activities and expenditures related to Alameda County Transportation Commission (ACTC) projects. Each industry that produces goods or services generates demand for other goods and services and this demand is multiplied through a particular economy until it dissipates through "leakage" to economies outside the specified area. IMPLAN models discern and calculate leakage from local, regional, and state economic areas based on workforce configuration, the inputs required by specific types of businesses, and the availability of both inputs in the economic area. Consequently, economic impacts that accrue to other regions or states as a consequence of a change in demand are not counted as impacts within the economic area.

The model accounts for substitution and displacement effects by deflating industry-specific multipliers to levels well below those recommended by the US Bureau of Economic Analysis. In addition, multipliers are applied only to personal disposable income to obtain a more realistic estimate of the multiplier effects from increased demand. Importantly, IMPLAN's Regional Economic Accounts exclude imports to an economic area so the calculation of economic impacts identifies only those impacts specific to the economic impact area. IMPLAN calculates this distinction by applying the area's economic characteristics described in terms of actual trade flows within the area.

Impact studies operate under the basic assumption that any increase in spending then has three effects. First, there is a direct effect on that industry itself. Second, there is a chain of indirect effects on all the industries whose outputs are used by the industry under observation. Third, there are induced effects that arise when employment increases and household spending patterns are expanded.

It is clear that there are several aspects to the overall economic impact. First, there is an effect on value added—the take-home pay of all the people affected will be supplemented by that amount. The secondary and tertiary effects of the industry on the rest of the local economy are not very large. Second is the employment effect, with some jobs created in the industry itself, and the others spread throughout the California economy. Third is the output, where the difference between value-added and output is that the former concentrates on people's pay-checks, whereas the latter includes the costs of intermediate inputs. National income accounting avoids double counting by excluding the costs of intermediate inputs.

It is also important to note that different types of capital investment can lead to different multipliers. The reason for this is that a sector can have a large multiplier if it induces economic activity in industries whose employees have a high propensity to spend from take-home pay. Also, if the sector does not import many

materials from abroad or from out of state, then its multiplier effect on the local economy will be high. In essence, some of the spending in the local economy may "leak out" into other states and countries. If raw materials are imported, then a shock to a local sector will result in decreased economic activity abroad. The same is true if a California business buys inputs from firms in different states.

In sum, our analysis using input-output accounts is based on three important assumptions. First, there are constant returns to scale. This means that a 10 percent cut in spending will be ten times as severe—across every sector in the economy—as a 1 percent cut. Second, there are no supply constraints. This means that any marginal increase in output can be produced without having to worry about bottlenecks in labor markets, commodity markets, or necessary imports. This assumption is quite realistic in a free-market economy like California's, where there is some unemployment. It is even more reasonable in times of high unemployment, such as the present economic environment, because there are many under- and un-utilized resources that can be activated without detracting from other industries. Third, the flow of commodities between industries is fixed.

Explaining Economic Impacts: The Clam Chowder Example

There are multiple aspects to explaining economic impacts. Expenditures associated with a particular activity as discussed in this report, have the potential to generate significant increases in economic output, local employment, and government tax revenues. These effects are measured as having three separate impacts. First, there is a direct effect: how many jobs and how much in tax revenues are directly linked to these expenditures. Second, there is an indirect effect: when a restaurant sells 100 orders of clam chowder in a bread bowl, this stimulates activity directly at the restaurant, but indirectly at the bakeries that provide the bread bowls. Finally, there is an induced effect that results from the employees at the restaurant spending their increased salaries.

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