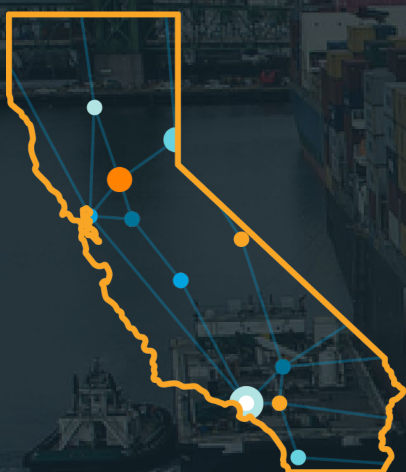
FREIGHT PLAN
California Freight
Mobility Plan



California Freight
Mobility Plan 2023

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Fellow Californians:

On behalf of the California State Transportation Agency (CalSTA), I am pleased to present the California Freight Mobility Plan 2023 (CFMP). The CFMP is a statewide plan that governs California's immediate and long-range freight planning activities and capital investments. The CFMP was developed to comply with the freight provisions of the Infrastructure and Investments Jobs Act (IIJA), which requires each state that receives funding under the National Highway Freight Program to develop a freight plan, as well as California Government Code Section 13978.8 pertaining to the State freight plan.

Freight is a critical component of the global, national, and state economies. Californians depend on a goods movement system that provides communities with their most vital necessities including food, medicine, and supplies for manufacturing in a timely, efficient manner. Technological advancements, economic fluctuations, supply-chain challenges, environmental concerns, impacts to communities, and the COVID-19 pandemic have disrupted the freight system and will continue to do so. In the face of these changes and challenges, the CFMP articulates a vision of California having "the world's most innovative, economically competitive, multimodal freight system that is efficient, reliable, modern, integrated, resilient, safe, and sustainable, where the benefits of freight are realized by all while supporting healthy communities and a thriving environment."

At CalSTA, we view everything through the lens of our "Core Four" priorities: safety, climate action, equity, and economic prosperity. The CFMP aligns with the "Core Four" and supports many of the actions proposed within the Climate Action Plan for Transportation Infrastructure by envisioning a freight system that avoids and mitigates environmental impacts, reduces criteria and toxic air pollutants, improves freight's economic competitiveness and efficiency, and integrates multimodal design and planning into infrastructure development on freight corridors.

I would like to thank the California Freight Advisory Committee, local, regional, state, and federal partners, stakeholders, the public, tribal governments, and private industries for the invaluable input they have provided. CalSTA is a committed partner in creating a freight system that benefits all Californians.

Sincerely,

TOKS OMISHAKIN
Secretary

California Transportation Commission • Board of Pilot Commissioners • California Highway Patrol • Department of Motor Vehicles
Department of Transportation • High Speed Rail Authority • Office of Traffic Safety • New Motor Vehicle Board

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Executive Summary

California's freight transportation system is the most advanced, environmentally friendly, and multimodal in the nation. This impressive goods movement system provides communities with their most vital necessities including food, medicine, and inputs for manufacturing, in a timely, efficient manner. Improvements focusing on efficiency and reliability in the freight industry will continue to positively impact the economy and California's communities. In an effort to further strengthen these impressive ranks, and remain a national leader, California is working towards more efficiency, less-pollution, and higher-capacity in its freight facilities, equipment, and operations.

California Freight Mobility Plan 2023 Vision Statement

As the largest national gateway for international trade and domestic commerce, California strives to have the world's most innovative, economically competitive, multimodal freight system that is efficient, reliable, modern, integrated, resilient, safe, and sustainable, where the benefits of freight are realized by all while supporting healthy communities and a thriving environment.

California Freight Mobility Plan 2023 Background

In alignment with the goals and principles of the California Transportation Plan (CTP) 2050 and the California Sustainable Freight Action Plan (CSFAP), the California Freight Mobility Plan (CFMP) 2023 is a complete update to California's previous Freight Mobility Plan adopted in 2018, the CFMP 2018. The creation of a state freight plan is required by Assembly Bill (AB) 14 (Lowenthal, 2013), codified under California State Government Code (GC) Section 13978.8, and the Infrastructure Investment and Jobs Act (IIJA, 2021), codified under 49 United States Code 70202 to update the plan every four years to receive programmatic funding.

In the past decade, there have been several significant achievements for California's freight industry. A detailed list of achievements is available in **Appendix A**. Examples of these achievements include:

- Adoption of the California Sustainable Freight Action Plan in July 2016
- Passage of Senate Bill 1 (Beall and Frazier), the Road Repair and Accountability Act of 2017, including $300 million annually for freight projects
- Adoption of the SB 1 Trade Corridor Enhancement Program (TCEP) Guidelines in October 2017
- 60 to 98 percent reduction of criteria pollutants and 13 percent reduction of carbon dioxide emitted at the San Pedro Ports from 2005 to 2017
- Awarded $1.39 billion of SB 1 TCEP funding to multimodal freight projects throughout the state
- 98 percent reduction in truck emissions, and 76 percent reduction in vessel emissions at the Port of Oakland from 2009 to 2018
- Establishment of the Community Air Protection Program (pursuant to Assembly Bill - 617) to reduce exposure in communities most impacted by air pollution

- Executive Order N-79-20 stipulates that 100 percent of in-state sales of new passenger cars and trucks will be zero-emission by 2035, which is a further goal of the State that 100 percent of medium-and heavy-duty vehicles in the State be zero-emission by 2045
- The 2022 Budget Act provided $1.2 billion over multiple years for the Port and Freight Infrastructure Program (PFIP) to help ease supply chain congestion and increase the capacity to move goods in California.
- The Infrastructure Investment Jobs Act (IIJA) signed into law in November 2021
- Adoption of the PFIP Guidelines in October 2022

In June 2018, the State adopted the Addendum to the CFMP 2014 to address the new requirements under the Federal FAST Act and maintain eligibility for National Highway Freight Program (NHFP) funding. The Addendum recapped all the Moving Ahead for Progress in the 21st Century (MAP-21) elements addressed in the CFMP 2014, including, in detail, the three new FAST Act elements:

- Designation of Critical Urban Freight Corridors (CUFC) and Critical Rural Freight Corridors (CRFC) [element #3],
- Consideration of any significant congestion or delay caused by freight movements and any strategies to mitigate that congestion or delay [element #8], and
- A freight investment plan [element #9].

The CFMP 2023 builds upon the 2018 Addendum and addresses the new requirements under the IIJA. These new elements include:

- The most recent commercial motor vehicle parking facilities assessment conducted by the State [element #10],
- The most recent supply chain cargo flows in the State, expressed by mode of transportation [element #11],
- An inventory of commercial ports in the State [element #12],
- If applicable, consideration of the findings or recommendations made by any multi-State freight compact to which the State is a party [element #13],
- The impacts of e-commerce on freight infrastructure in the State [element #14],
- Considerations of military freight [element #15],
- Strategies and goals to decrease-

    (A) the severity of impacts of extreme weather and natural disasters on freight mobility,
    (B) the impacts of freight movement on local air pollution,
    (C) the impacts of freight movement on flooding and stormwater runoff, and
    (D) the impacts of freight movement on wildlife habitat loss [element #16].

The CFMP 2023 development was guided by the California Freight Advisory Committee (CFAC). The CFAC is a committee required by Government Code Section 13978.8 to advise the California State Transportation Agency (CalSTA) and Caltrans on all aspects of the development of the CFMP. The CFAC is composed of diverse representatives from public and private sector freight stakeholders, including representatives of seaports, railroads, airports, trucking, shippers, carriers, freight-related associations, the freight industry workforce, regional and local governments, State and federal agencies, tribal governments, and environmental, safety, and community organizations.

CFMP 2023 Structure

- **Chapter 1: Vision, Goals, and Objectives** – Provides a consistent vision across the state in relation to the California Transportation Plan 2050 (CTP), the California Sustainable Freight Action Plan (CSFAP), the Caltrans 2020-2024 Strategic Plan, and the Interregional Transportation Strategic Plan (ITSP). This section showcases overarching goals and objectives to enhance California's economy, protect the environment, and support a transportation system that can meet current and future freight demands.
- **Chapter 2: California Economic Competitiveness** - Establishes a framework for sound policy decisions in relation to the overall economy by developing competitiveness in the twenty-first century. A summary of findings based on an in-depth study (Appendix C) of the freight industry labor force, warehousing, logistics, key economic drivers, challenges to doing business in the state, and alternative avenues for thriving industry are all explored in detail.
- **Chapter 3: Existing Freight System Conditions & Performance-Based Needs Assessment** – A review of the current performance and conditions of California freight infrastructure that are critical to making proper investments to enhance the movement of goods. This chapter highlights key freight performance measures. This chapter also has a discussion on agricultural freight.
- **Chapter 4: Future of Freight** - E-commerce, omni-channel distribution, first-and-last mile delivery, 3-D printing, and autonomous vehicles all pose opportunities for exploring new processes to move goods and for addressing the State's aging infrastructure, as technology advancements speed forward, placing excess burden on highway capacity and travel demand. Safety, Security, and Resiliency - A discussion of the threats of terrorism, economic recession, and environmental disasters (amongst others) to the freight system, and current efforts that support resiliency to these threats. A detailed look at the current state of trends, issues, and challenges facing the State's freight network and supply chain are explored in-depth. Also a comprehensive freight forecast.
- **Chapter 5: Environmental Challenges, Opportunities & Engagement** – As one of the largest economies in the world, California is challenged with maintaining and preserving its environmental assets including air and water while reducing negative environmental impacts on communities due to land development and transportation practices specifically related to goods movement. A strategic public outreach and engagement effort was conducted and resulting feedback is reported in this chapter.
- **Chapter 6: Implementation** - Bringing it all together, the elements of each chapter including trends, opportunities, and outcomes of public outreach and engagement efforts are developed and refined into specific strategies that enact the plan's goals and objectives. This chapter also includes seven Regional Freight Investment Strategies that highlight the uniqueness of each region's freight needs.

APPENDICES:

A. 2014 CFMP Goals, Objectives, Strategies, and Accomplishments - Goals, Objectives, Strategies from the 2014 CFMP, and accomplishments since the adoption of the 2014 CFMP.
B. Freight System Policy Framework - Federal, State, regional and local policies and plans that have implications for freight in California.
C. California's Competitive Position - Analysis of California's competitiveness in attracting and retaining businesses.

D. National Highway Freight Network Mileage - Reports the routes and mileages associated with each component of the National Highway Freight Network within California.
E. Critical Urban Freight Corridor CUFC/CRFC Designation Process - The process adopted by Caltrans and the CUFC/CRFC Technical Advisory Committee to designate CUFCs and CRFCs in California.
F. Bi-national and Multistate Corridor Efforts - Descriptions of bi-national and multistate efforts that California participates in with other nations and states.
G. Truck Technology Types - An assessment of available truck technologies with descriptions, including Zero Emission and Near Zero Emission technologies.
H. Outreach Efforts Summary - A summary of outreach efforts that have been undertaken for the development of the CFMP, with locations, dates, and results.
I. SB 671 Clean Freight Corridor Project List – a list of potential projects proposed for the top five clean freight corridors in California from the Clean Freight Corridor Assessment.
J. Smart Growth and Land Use – An analysis of the interactions between land use, real estate, and freight economics.
K. Future Freight System Scenarios - Three distinct scenarios that can be tested through modeling to show how freight may change in the future with specific inputs and outputs.
L. 2023 California Freight Investment Plan – A list of projects awarded Trade Corridor Enhancement Program funds. This includes projects that utilize the Federal Formula funds.

CFMP 2023 Goals

The guiding vision influencing freight sustainability in California is derived from three perspectives: economic vitality, environmental stewardship, and social equity. Building on the previous plan, the CFMP 2023 includes seven goals described below, which are further discussed in **Chapter 1B**. These goals were created through an extensive outreach and engagement process.

1. MULTIMODAL MOBILITY

Strategic investments to maintain, enhance, and modernize the multimodal freight transportation system to optimize integrated network efficiency, improve travel time reliability, and to achieve congestion reduction.

2. ECONOMIC PROSPERITY

Grow the economic competitiveness of California's freight sector through increased system efficiency, productivity, and workforce preparation.

3. ENVIRONMENTAL STEWARDSHIP

Support strategies that eliminate, reduce, avoid and/or mitigate adverse environmental and public health impacts of the freight transportation system while promoting and enhancing public health and ecological restoration in the planning process.

4. HEALTHY COMMUNITIES

Enhance community health and wellbeing by distributing the benefits of the goods movement system equitably across California's communities while making sure the environmental and public health costs of the system are not disproportionately borne by goods movement communities.

5. SAFETY & RESILIENCY

Eliminate freight-related deaths and serious injuries and improve system resilience by addressing infrastructure vulnerabilities associated with security threats, effects of climate change, and natural disasters.

6. ASSET MANAGEMENT

Maintain and preserve infrastructure assets using cost-beneficial treatment as indicated in the State Highway System Management Plan (SHSMP), per the federal FAST Act, State and Highway Code 164.6, and Caltrans Director's Policy 35 (DP-35), and other applicable State and Federal statutes and regulations.

7. CONNECTIVITY & ACCESSIBILITY

Provide transportation choices and improve system connectivity for all freight modes.

Freight and California's Economy

Freight transport is a vital component of California's regional and statewide economies. In 2021, California's economy was comparable to the fifth largest economy in the world, with the State's GDP at $3.36 trillion.[12] The State's freight sector is broadly defined to encompass industries that heavily rely on the transportation of their raw materials, intermediate goods and components, as well as their finished products. The sector includes businesses in the transportation, warehousing, utilities, trade, manufacturing, construction, agriculture, and mining industries. California's economy depends on an efficient, integrated, sustainable, and multimodal freight transport system. Understanding the relationship between freight transportation and the economy is critical for State and local agencies to consider future freight transport system actions and how to optimize opportunities for growth in California. For more information on California's freight competitive position, refer to **Chapter 2** and **Appendix C**.

California's Freight Assets

California's freight system includes a vast inventory of infrastructure, which support the various freight dependent industries within the state. Currently, California has 12 seaports, 12 airports with major cargo operations, two Class I railroads and 27 Class III railroads, three existing and one future commercial land border ports of entry (POE) with Mexico, approximately 19,390 miles of hazardous liquid and natural gas pipelines, and a large warehousing and distribution sector. (**Chapter 3A** provides more information). Below, **Figure 0.1** shows California's major freight facilities mentioned above.

Seaports	County
Port of Benicia	Solano
Port of Hueneme	Ventura
Port of Humboldt Bay	Humboldt
Port of Long Beach	Los Angeles
Port of Los Angeles	Los Angeles
Port of Oakland	Alameda
Port of Redwood City	San Mateo
Port of Richmond	Contra Costa
Port of San Diego	San Diego
Port of San Francisco	San Francisco
Port of Stockton	San Joaquin
Port of West Sacramento	Yolo

Freight Intermodal Facilities	City	County
City of Industry Intermodal Facility (UP)	City of Industry	Los Angeles
Fresno Intermodal Facility	Fresno	Fresno
ICTF Long Beach (UP)	Long Beach	Los Angeles
Los Angeles Intermodal Facility (UP)	City of Commerce	Los Angeles
Los Angeles Transportation Center (UP)	Los Angeles	Los Angeles
Lathrop Intermodal Facility	French Camp	San Joaquin
Oakland International Gateway Intermodal Facility (BNSF)	Oakland	Alameda
On-Dock Intermodal Facility (PHL)	Wilmington	Los Angeles
Railport Intermodal Yard (UP)	Oakland	Alameda
San Bernardino Intermodal Facility	San Bernardino	San Bernardino
Santa Fe Hobart Yard (BNSF)	Los Angeles	Los Angeles
Stockton Intermodal Facility	Stockton	San Joaquin

Airports with Major Cargo Operations
Bob Hope (Burbank) Airport (BUR)
Fresno Yosemite International Airport (FAT)
John Wayne Airport, Orange County Airport (SNA)
Long Beach Airport Daugherty Field (LGB)
Los Angeles International Airport (LAX)
Metropolitan Oakland International Airport (OAK)
Ontario International Airport (ONT)
Sacramento International Airport (SMF)
San Diego International Airport (SAN)
San Francisco International Airport (SFO)
San Jose International Airport, Norman Y. Mineta (SJC)

Ports of Entry	Route	County	Status
Andrade	186	Imperial	Existing
Calexico East	7	Imperial	Existing
Calexico West	111	Imperial	Existing
Cross Border Xpress	0	San Diego	Existing
Otay Mesa	905	San Diego	Existing
Otay Mesa East	11	San Diego	Future
San Ysidro	5	San Diego	Existing
Tecate	188	San Diego	Existing

Figure 0.1: Major Freight Facilities in California. (Source: Caltrans, 2023)

Trends and Issues

The CFMP 2023 covers several technological innovations and potentially disruptive trends such as e-commerce, autonomous trucks, and the greening of the freight industry. These innovations could potentially impact established supply chains, and the CFMP provides some insight into future implications these innovations may have for California's freight system.

Over the past 10 years, California and the world have been experiencing the implications of shifting consumer behaviors from in-store (brick and mortar) to e-commerce (via the internet). The advent of e-commerce has not only altered how land is used in communities, but also how, when, and where goods are delivered. E-commerce is driving changes in warehouse construction from 30 to 40-foot-high, 100,000 square-foot facilities operated through manual labor to high cube 60-foot high, 500,000+ square-foot, automated, fully electrified warehouses employed with highly trained/ skilled workers.

The continued shift to home delivery means more brick and mortar businesses are closing, causing local governments and property owners to consider how land use and zoning codes may need to be adjusted. Therefore, businesses are rethinking site selection, while educators and skilled workers are seeking out opportunities to gain skills needed to compete in this new economic reality. E-commerce has been greatly accelerated by the COVID-19 pandemic, which is discussed in **Chapter 4**. During the pandemic, many brick and mortar stores were closed and many consumers decided to buy consumer goods through online retailers which has continued post-pandemic. There has also been a significant rise in online purchasing and home delivery of perishable goods (such as food), and home delivery of prepared meals from restaurants. These developments and disruptions are now factors that businesses must consider before opening a physical store.

Similarly, semi-automated marine terminals and warehouses, and the increasing use of robotics in logistic facilities are improving supply chain efficiencies while improving workplace safety. Ongoing policy development around these technologies is necessary to understand and respond to how these new technologies will impact the freight industry and its workforce. While technological advancements may result in significant changes to freight transportation, these advancements may also provide benefits to the transportation system through improvements in efficiency, reliability, and safety. These benefits and costs need to be considered when planning the future freight system in California. As California's freight industry evolves to be cleaner and more efficient, the State must continue to closely monitor and derive the necessary policies and activities to grow California's economy while protecting its most-valued resources, its environment, and people.

CFMP 2023 Outreach

The CFMP 2023 tells the story of the freight industry in California. Stakeholders representing disadvantaged communities, freight-related industries, regulators, non-governmental organizations, and the CFAC were consulted extensively during various stages throughout the development of the plan. These stakeholders provided multifaceted perspectives on statewide freight issues, as well as potential solutions. Through engagement efforts including large public forums, and at other times through industry specific workshop, telephone, in-person discussions, or online surveys, stakeholders identified critical concerns and issues from their perspectives. The issues and concerns generally fell into one of the following six categories:

1. Competitiveness
2. Regulatory burdens
3. Congestion
4. Technology adaptation
5. Workforce
6. Sustainability

CFMP 2023 Implementation

Considering the many dimensions of the freight system and its impacts on the economy and environment, developing a freight strategy is an extensive process. The CFMP 2023 proposes specific objectives and strategies to support the accomplishment of the seven goals. The goals, objectives, and strategies of the CFMP 2023 incorporate many of the strategies of the CFMP 2018, as well as the CSFAP. The CFMP 2023 also contains several new strategies, which are reflective of changes in legislation, department policy, and private industry trends, public outreach, and engagement efforts, amongst other changes since the 2018 CFMP was adopted.

Examples of these strategies are listed below:

- Strategy EP-3-A: Identify and actively advocate for workforce mobility, accessibility, and training needs and job training programs through collaboration with the freight industry and California's higher education system
- Strategy EP-4-A: Identify incentives for the retention, expansion, and new development of logistics industry facilities (warehouses)
- Strategy ES-2-D: Explore decarbonization of last mile delivery to decrease the freight system's impact on air quality in dense urban environments
- Strategy HC-2-B: Establish development standards to avoid and mitigate environmental and social impacts of freight on communities
- Strategy CA-1-A: Freight plan priority for projects implementing state-of-the-art and demonstration technologies
- Strategy CA-6-B: Support off-hour delivery/pick-up strategy development

In addition to these strategies, the State recognizes the need to develop more projects that reflect and align with California's climate change goals. **Chapter 6A** identifies several objectives and strategies that will reduce GHG emissions from the freight sector, while **Chapter 6B** highlights a number of policies and project types that the State is working towards to achieve better protection of its communities and environment while leading to further innovation within the freight industry.

1

Chapter 1: Vision, Goals, and Objectives

1A. Background

Moving Ahead for Progress in the 21st Century Act (MAP-21) was signed into law on July 6, 2012. The MAP-21 funded federal surface transportation programs at over $105 billion for fiscal years (FY) 2013 and 2014 and was the first long-term highway authorization enacted since 2005. This authorization included several provisions to improve the condition of the national freight network (NFN) and to support investment in freight-related surface transportation projects. Section 1118 [State Freight Plans (SFP)] of MAP-21 directed the U.S. Secretary of Transportation (Secretary) to encourage states to develop comprehensive SFPs, specified certain minimum contents for SFPs, and declared that SFPs may be developed separate from, or incorporated into the statewide strategic long-range transportation plan required under 23 United States Code (U.S.C.) 135. Section 1117 [State Freight Advisory Committees] directed the Secretary to encourage states to establish a State Freight Advisory Committee (FAC) to help guide the aforementioned plans. Furthermore, Section 1116 [Prioritization of Projects to Improve Freight Movement] authorized the Secretary to increase the federal share payable for any project to 95 percent for projects on the Interstate Highway System and 90 percent for any other project if the Secretary certifies that the project meets certain criteria.

On December 4, 2015, the Fixing America's Surface Transportation (FAST) Act was signed into law, and it is the first federal authorization in over a decade to provide long-term funding certainty for surface transportation infrastructure planning and investment. The FAST Act authorizes $305 billion over FY 2016 through 2020 for highway, highway and motor vehicle safety, public transportation, motor carrier safety, hazardous materials safety, rail, and research, technology, and statistics programs. Section 1116 [National Highway Freight Program (NHFP)] of the FAST Act required the development of the National Highway Freight Network (NHFN), which replaced the National Freight Network and the Primary Freight Network established under MAP-21. FAST Act Section 1116 also requires the re-designation of the NHFP every five-years.

FAST Act Section 8001 added Section 70202 to Title 49 of the U.S.C. that requires state governments receiving NHFP (23 U.S.C. 167) funds to develop an SFP, in consultation with the State FAC (if applicable). The SFP must cover a five-year forecast period, be fiscally constrained, include a freight investment plan that includes a list of priority projects, and describe how the state will invest and match its NHFP funds.

FAST Act Section 1105 [Nationally Significant Freight and Highway Projects (NSFHP) program] established a discretionary competitive grant program, known formerly as Fostering Advancements in Shipping and Transportation for the Long-term Achievement of National Efficiencies (FASTLANE), and presently known as Infrastructure for Rebuilding America (INFRA). This program includes $4.5 billion over five years to provide financial assistance to nationally and regionally significant highway, rail, port, and intermodal freight and highway projects.

On October 14, 2016, the Office of the Federal Register and the National Archives and Records Administration replaced the Department of Transportation Interim Guidance on SFPs (July 6, 2012) and State FACs (77 FR 62596, October 15, 2012) which were developed to address MAP-21 provisions with the guidance on SFPs and State Freight Advisory Committees (Federal Register Volume 81, Issue 199). The new guidance provides direction regarding the required elements of

SFPs established under 49 U.S.C. 70202, as well as recommended approaches and information that state governments may include in their SFPs, including the establishment of State Freight Advisory Committees.

In September 2013, California passed Assembly Bill (AB) 14 (Lowenthal, 2013) requiring the California State Transportation Agency (CalSTA) to establish the FAC by the U.S. DOT, prepare an SFP consistent with federal law, and submit the plan to designated recipient State agencies by December 31, 2014, and every five years thereafter. The Secretary of CalSTA delegated their responsibility for developing the CFMP to the California Department of Transportation (Caltrans) in consultation with the CFAC formed in compliance with AB 14.

The Infrastructure Investment Jobs Act (IIJA) signed into law in November 2021, builds upon FAST Act investments and establishes a new Office of Multimodal Freight Infrastructure and Policy under the U.S. DOT Secretary to develop and manage the National Freight Strategic Plan (49 U.S.C. §70102), the National Multimodal Freight Network, oversee the development and updating of the State Freight Plans (SFP), provide SFP guidance and best practices, administer the multimodal freight grant programs and establish procedures for analyzing and evaluating grant applications, assist States in establishing State freight advisory committees, multi-State freight mobility compacts, and provide to the Bureau of Transportation Statistics input regarding freight data and planning tools.

Table 1.1 shows the Federal Highway Administration (FHWA) requirements for freight plans and corresponding chapters in the CFMP. Caltrans worked extensively with CalSTA, CFAC, and other freight stakeholders to develop the CFMP. The CFMP is structured so it can be readily updated by section in response to changes within the dynamic freight industry and public policy arena. As emerging federal and state freight-related policy and guidance is issued, the CFMP will be amended to align with those policies and guidance. Additionally, as regional freight plans receive approval from their respective boards or commissions, relevant sections of the CFMP may be updated to reflect the new information.

The State of California is looking beyond the CFMP development and is working through an integrated State agency effort that is committed to a broader freight vision that will guide California toward a future with a sustainable freight system.

Table 1.1: FHWA Requirements and Chapter Contents

Element	Requirements	Descriptions
1	An identification of significant freight system trends, needs, and issues with respect to the state.	**Chapter 1** identifies background, vision, goals, and objectives for the freight plan. **Chapter 2** outlines the State's needs and challenges in various sectors to increase economic growth and remain competitive. **Chapter 3** outlines needs and issues under existing conditions. **Chapter 4** identifies regional and global trends and what it means for California's Freight industry. **Chapter 5** identifies environmental progress and opportunities for freight within California.

		Chapter 6 provides an overview of the Statewide Investment strategy and the regional freight investment strategies. **Appendix K** evaluates various alternative future scenarios with respect to long term trends and needs.
2	A description of the freight policies, strategies, and performance measures that will guide the freight-related transportation investment decisions of the state.	**Chapter 3B** and **Chapter 5** present the performance measures. **Chapter 6A:** Strategies and Objectives outlines freight policies and strategies, grounded in the Freight Plan vision, goals, and objectives. **Chapter 6B** explains State and regional freight investment strategies.
3	When applicable, listings of multimodal critical rural freight facilities and corridors designated within the state under section 70103 of Title 49: National Multimodal Freight Network (NMFN) and critical rural and urban freight corridors designated within the state under.	**Chapter 3A** contains a description of the critical rural freight corridors (CRFC) and critical urban freight corridors (CUFC) designated to date and National Multimodal Freight Network (it has yet to be finalized). **Appendix D** contains more information regarding National Highway Freight Network milage.
4	A description of how the plan will improve the ability of the state to meet the national multimodal policy goals described in Section 70101(b) of Title 49, and U.S. Code and the NHFP goals described in Section 167 of Title 23 relating to intermodal goods movement.	**Chapter 1B** explains how CFMP enables the State to meet the national multimodal freight policy goals and NHFP goals.
5	A description of how innovative technologies and operational strategies, including freight intelligent transportation systems (ITS), that improve the safety and efficiency of the freight movement, were considered.	**Chapter 1B** proposes the use of ITS for solving freight issues outlined in the Freight Plan. **Chapter 4A** describes emerging technology trends in the freight sector. **Chapter 6** details operational strategies to resolve congestion, efficiency, and other issues affecting freight. **Appendix K** provides discussion of scenario planning, which considered technological advancements to define the potential future states affecting the State's freight transportation system.
6	In the case of roadways on which travel by heavy vehicles (including mining, agricultural, energy cargo or equipment, and timber vehicles) is projected to substantially deteriorate the condition of the roadways, a description of improvements that may be required to reduce or impede the deterioration.	**Chapter 2** summarizes the share of each industry in overall goods movement flows on California multimodal freight System, specifically freight highway network. **Chapter 3A** summarizes the existing conditions on the freight highway network and maintenance efforts and operational improvements to preserve the infrastructure. **Chapter 3C** describes how the agricultural freight system affects roadways, and strategies to mitigate impacts. **Chapter 6** details strategies to improve freight mobility and efficiency affecting these industries.

7	An inventory of facilities with freight mobility issues, such as bottlenecks within the state, and for those facilities that are state-owned or operated, a description of the strategies the state is employing to address those freight mobility issues.	**Chapter 3A** and **3B** identifies facilities with mobility issues, including bottlenecks. **Chapter 4A** identifies the needs and issues associated with mobility problems. **Chapter 6A** details improvements and strategies.
8	Consideration of any significant congestion or delay caused by freight movements and any strategies to mitigate that congestion or delay.	**Chapter 3B** identifies congestion issues. **Chapter 6A and 6B** details improvements and strategies.
9	A freight investment plan that, subject to 49 U.S.C. 70202(c), includes a list of priority projects and describes how funds made available to carry out 23 U.S.C. 167 would be invested and matched.	**Chapter 6B** is the Implementation Plan including improvement strategies, investment strategies, and short-term lists of projects for each region. **Appendix L** is the California Freight Investment Plan, which was adopted in 2022 through the Trade Corridor Enhancement Program (TCEP). The TCEP is composed of Trade Corridor Enhancement Account and National Highway Freight Program funds.
10	The most recent commercial motor vehicle parking facilities assessment conducted by the State under subsection (f).	**Chapter 3A**: Existing Freight System Assets identifies findings from the most recent commercial vehicle parking facilities assessment conducted by the State.
11	The most recent supply chain cargo flows in the State, expressed by mode of transportation.	**Chapter 4C** Freight Flows Forecast provides the most recent supply chain cargo flow information by mode.
12	An inventory of commercial ports in the State.	**Chapter 3A** Existing Freight System Assets identifies commercial ports in the State.
13	If applicable, consideration of the findings or recommendations made by any multi-State freight compact to which the State is a party under section 70204.	**Appendix F** lists the many Multi State Corridor Efforts the State is a party to, and any findings and recommendations from those efforts.
14	The impacts of e-commerce on freight infrastructure in the State.	**Chapter 4A** Trends Issues and Opportunities discusses the impacts of e-commerce on freight infrastructure in the State.
15	Considerations of military freight.	**Chapter 3A** Existing Freight System Assets contains a section on military freight and miliary freight networks in the State.
16	Strategies and goals to decrease- (A) the severity of impacts of extreme weather and natural disasters on freight mobility. (B) the impacts of freight movement on local air pollution. (C) the impacts of freight movement on flooding and stormwater runoff; and (D) the impacts of freight movement on wildlife habitat loss	These topics are discussed in **Chapter 4B:** Freight Safety, Security, and Resiliency, **Chapter 5A:** Environmental Stewardship, and **Chapter 6A:** Goals, Objectives, and Strategies.

17	Consultation with the state FAC, if applicable	All Freight Plan chapters were informed and reviewed by the CFAC as explained in **Chapter 5:** Partnerships and Outreach
Source: Infrastructure Investment and Jobs Act, 49 USC 70202: State freight plans		

1B. Vision, Goals, and Objectives

The California State Transportation Agency (CalSTA), the California Department of Transportation (Caltrans), regional and local partners, public and private sectors, and the members of the California Freight Advisory Committee (CFAC) began development of the California Freight Mobility Plan 2023 by creating a vision statement (see Executive Summary). Furthering this vision, a set of goals and objectives were developed to guide decision making and ensure consistency throughout the plan.

> *As the largest national gateway for international trade and domestic commerce, California strives to have the world's most innovative, economically competitive, multimodal freight system that is efficient, reliable, modern, integrated, resilient, safe, and sustainable, where the benefits of freight are realized by all while supporting healthy communities and a thriving environment.*

California has a population of nearly 40 million, and it is one of the largest economies in the world. To support this diverse, vibrant, and intricate economy, the State must continue to cultivate and devote resources in a manner that promotes livability, equity, and economic and social prosperity. This includes protecting our natural and built environments, enhancing community livelihoods, and attracting greater investments to the State.

California's transportation system is the most extensive, least polluting, highest capacity, and most technically advanced multimodal freight transportation system in the United States. It handles the highest value of international commerce of any state in the nation and among the highest total freight volumes. This unparalleled system connects California's international gateways to the rest of the country, through several high-speed, high-capacity, multimodal gateways and corridors that provide access to every state in the nation. Not only is California building upon these strengths to create an even more efficient, less-polluting, and higher-capacity freight sector that is competitive in the 21st century and remains a national leader in freight.

The State's evolving freight system is focused on strengthening and preserving the existing system and making strategic improvements to increase mobility and safety with a focus on protecting communities and the environment. The freight industry will need to continue its leadership role by elevating sustainable practices including, reducing vehicle and equipment emissions, and prioritizing environmental restoration and community protection adjacent to high freight volume corridors. The freight industry should also align with state policies that combat climate change, as well as addressing community and health impacts caused by freight. One example where progress is being made in this area is the Community Economic Resilience Fund (CERF). Established by Governor Newsom in 2021, CERF has $600M to support regions-up economic development strategies across California's where inclusion, sustainability, and climate resilience are at the center. The initiative is jointly led by the Labor & Workforce Development Agency, Governor's Office of Business and Economic Development (GO-Biz) and Office of Planning and Research (OPR) and is investing $5M across California's 13 economic regions to support planning efforts, followed by over $450M in project investments.

Looking ahead to the year 2040, zero emission (ZE) or near-zero-emissions (NZE) vehicles and equipment are expected to dominate California's freight system – powered by a modernized energy production and distribution system and a robust mix of renewable and clean energy sources (see **Chapter 6A**). Designated areas will have dedicated freight corridors and hubs – some of them automated – that separate passenger and freight movements and minimize impacts to surrounding communities. Local and regional agencies will be guided by detailed freight transportation plans that integrate land use and economic development. The transition to this mid-twenty-first century freight system will rely on both public and private investments in countless infrastructure projects, vehicle and equipment purchases, technology applications, and system management approaches. It will require incremental change as well as large-scale improvements, implemented by both public and private entities oriented toward achieving a shared freight vision for California.

Scope and Vision

The California Freight Mobility Plan 2023 (CFMP) Vision is consistent with, and built upon, the policies of the adopted California Transportation Plan (CTP) 2050. The CTP itself was developed in coordination with the framework established by the IIJA. The CFMP Vision is also consistent with the Caltrans mission statement. The Vision recognizes that the CFMP must include all modes of freight transportation to achieve a truly integrated, intermodal freight network. The CFMP 2023 vision is also consistent with the Climate Action Plan for Transportation Infrastructure (CAPTI)'s guiding principles, discussed further in **Chapter 5A.**

The Vision provides a common platform for informing and guiding the development of freight transportation policy, programs, and project prioritization across all sectors of State's freight system. The Vision was crafted in collaboration with the CFAC, which was created to inform the development of the CFMP and serve as an ongoing freight advisory body to the State. From this Vision, seven overarching goals and a complementary set of more specific objectives were developed in correspondence with the goals included in federal statute. These goals, as well as additional attributes described later in this chapter, are correlated with strategies and projects identified in **Chapter 6.**

Goals and Objectives

Addressing the listed set of goals and objectives below can only be achieved through coordination, collaboration, and the combined efforts of State, regional, and local agencies, the freight industry, private freight stakeholders, special interest groups, and the public. The public sector plays a crucial role in constructing, operating, and maintaining many freight facilities, such as roadways and seaports. Regulatory activities implemented by the public sector, such as infrastructure investment and land use decisions, heavily influence the business operations of private-sector freight operators who are dependent on these public facilities and are responsible for their own facilities and equipment. **Table 1.2** includes the seven goals and description associated with each goal.

Table 1.2: CFMP 2023 Goals

Goal	Goal Title	Goal Description
1	Multimodal Mobility	Strategic investments to maintain, enhance, and modernize the multimodal freight transportation system to optimize integrated network efficiency, improve travel time reliability, and to achieve congestion reduction.
2	Economic Prosperity	Grow the economic competitiveness of California's freight sector through increased system efficiency, productivity, and workforce preparation.
3	Environmental Stewardship	Support strategies that eliminate, reduce, avoid and/or mitigate adverse environmental and public health impacts of the freight transportation system while promoting and enhancing public health and ecological restoration in the planning process.
4	Healthy Communities	Enhance community health and wellbeing by distributing the benefits of the goods movement system equitably across California's communities while making sure the environmental and public health costs of the system are not disproportionately borne by goods movement communities.
5	Safety and Resiliency	Eliminate freight-related deaths and serious injuries and improve system resilience by addressing infrastructure vulnerabilities associated with security threats, effects of climate change impacts, and natural disasters.
6	Asset Management	Maintain and preserve infrastructure assets using cost-beneficial treatment as indicated in the State Highway System Management Plan (SHSMP), per the federal FAST Act, California Streets and Highway Code §164.6, Caltrans Director's Policy 35 Transportation Asset Management (DP-35), and other applicable state and federal statutes and regulations.
7	Connectivity and Accessibility	Provide transportation choices and improve system connectivity for all freight modes.

Within each goal, a number of objectives are identified and intended to serve as means to move toward these goals. The goals are not prioritized; all are considered essential. The specific strategies for each goal and objective will be discussed in **Chapter 6.**

Individual strategies and projects support more than one goal, and therefore, more than one objective. Projects that most effectively address multiple goals and objectives will likely be the most competitive for future funding opportunities. The goals, objectives, and strategies (described in **Chapter 6**) are consistent with, federal, state, and local funding programs, including but not limited to the National Highway Freight Program administered by FHWA, and the Trade Corridors Enhancement Program administered by the California Transportation Commission.

GOAL 1: MULTIMODAL MOBILITY

Strategic investments to maintain, enhance, and modernize the multimodal freight transportation system to optimize integrated network efficiency, improve travel time reliability, and to achieve congestion reduction.

Objectives:

A. Identify causes and solutions to freight bottlenecks
B. Invest strategically to optimize system performance
C. Develop, manage, and operate an efficient, integrated freight system
D. Identify causes and solutions to freight rail network bottlenecks
E. Identify freight rail network operational improvements and mode shift options

GOAL 2: ECONOMIC PROSPERITY

Grow the economic competitiveness of California's freight sector through increased system efficiency, productivity, and workforce preparation.

Objectives:

A. Promote economic development by investing in freight infrastructure projects and operational movements
B. Promote freight projects that enhance the economic activity, freight mobility, unique capabilities, reliability, system resiliency, and global competitiveness
C. Increase workforce availability and training
D. Promote the State's competitive logistics advantages

GOAL 3: ENVIRONMENTAL STEWARDSHIP

Support strategies that eliminate, reduce, avoid and/or mitigate adverse environmental and public health impacts of the freight transportation system while promoting and enhancing public health and ecological restoration in the planning process.

Objectives:

A. Continue to integrate environmental health considerations into freight planning, development, implementation, and operations of projects as feasible
B. Minimize, and where possible, eliminate toxic air contaminants, criteria pollutants and GHGs emitted from freight vehicles, equipment, and operations
C. Promote land use planning practices that prioritize mitigation of negative freight project impacts upon the environment

GOAL 4: HEALTHY COMMUNITIES

Enhance community health and wellbeing by distributing the benefits of the goods movement system equitably across California's communities while making sure the environmental and public health costs of the system are not disproportionately borne by goods movement communities.

Objectives:

A. Prioritize social equity for all freight-related projects by developing alternative methods that avoid negative impacts on, or near existing communities adjacent to high-volume freight routes and facilities
B. Conduct meaningful continuous engagement and coordination efforts with other agencies focused on environmental justice communities disproportionately burdened by the freight transportation system in urban areas and rural areas by identifying and documenting their needs
C. Promote noise and other pollution abatement strategies associated with the movement of goods alongside residential areas and sensitive habitat near freight corridors

GOAL 5: SAFETY AND RESILIENCY

Eliminate freight-related deaths and serious injuries and improve system resilience by addressing infrastructure vulnerabilities associated with security threats, effects of climate change impacts, and natural disasters.

Objectives:

A. Reduce rates of incidents, collisions, fatalities, and serious injuries associated with freight movements
B. Utilize technology to provide for the resilience and security of the freight transportation system
C. Develop a freight resiliency strategic plan

GOAL 6: ASSET MANAGEMENT

Maintain and preserve infrastructure assets using cost-beneficial treatment as indicated in the State Highway System Management Plan (SHSMP), per the federal FAST Act, California Streets and Highway Code §164.6, Caltrans Director's Policy 35 Transportation Asset Management (DP-35), and other applicable state and federal statutes and regulations.

Objectives:

A. Apply preventative maintenance and rehabilitation strategies using sustainable best practices

GOAL 7: CONNECTIVITY AND ACCESSIBILITY

Provide transportation choices and improve system connectivity for all freight modes.

Objectives:

A. Support research, demonstration, development, and deployment of innovative technologies
B. Promote innovative technologies and practices utilizing real time information to move freight on all modes more efficiently
C. Coordinate with local and regional partners of freight facilities, siting, design, and operations
D. Utilize inland port facility, short-haul rail shuttle, and inland seaports to lessen impacts on nearby communities
E. Improve truck trip planning, coordination, operations, and management

Freight and Vehicle Miles Traveled

The State has passed several laws, issued Executive Orders (EO), and implemented several policies aimed to reduce passenger vehicle miles traveled (VMT). The State does not have an explicit policy to reduce VMT produced from the freight sector. Rather, the State does have statutes, EOs, and policies in place to support the transitioning of freight related VMT to sustainable or "green" freight VMT. See **Appendix B** for more details. The CFMP goals, objectives, and strategies described in **Chapter 6A** are aligned with these statutes, EOs, and policies by encouraging sustainable, transformative, and innovative freight projects that increase freight competitiveness and reduce emissions.

As described in **Chapter 6A,** the State also supports modal shift of freight from trucks to other modes of transportation, if feasible. The State recognizes that until additional freight modal shift occurs from motor vehicles to rail, waterways, cargo bikes, manned or unmanned aircraft systems (UAS), or other forms of transportation, motor vehicles will continue to be the predominant mode for freight deliveries. Efforts to specifically reduce freight related VMT may be counter to California's other goals of increasing freight competitiveness and reducing GHG, as some modal shifts may have additional unintended negative impacts on the supply chain. A shift of cargo away from California may also result in a rise in GHG due to goods traveling greater distances to out-of-state warehousing and distribution centers from California ports.

Freight stakeholders and agencies should encourage increased freight efficiency and a shift from freight moved by motor vehicles to rail, waterways, cargo bikes, and other modes when feasible. When modal shift is not feasible, freight stakeholders and agencies should continue to implement projects that reduce the negative impacts of freight such as Zero Emissions (ZE) or Near Zero Emissions (NZE) vehicles, consolidation of goods, longer trailers, eco routing, fewer empty trailers, alternative fuel corridors, "clean" truck lanes, truck platooning, and other innovative methods. Some of these strategies and project types are identified in **Chapter 4A**, **Chapter 6A** and **6B**.

Relationship to Freight National Goals

The FAST Act established a new National Highway Freight Program (NHFP) to improve the efficiency of goods movement on the National Highway Freight Network (NHFN). The FAST Act also implemented requirements of state freight plans to describe how they advance the National Multimodal Freight Policy (NMFP) and the NHFP goals and strategies intended to improve safety, security, and resiliency of the freight system. These goals and strategies have continued under the IIJA.

The ten NHFP goals (23 U.S.C. §167), in alignment with the seven NMFP goals (49 U.S.C. §70101) directly pertain to the National Multimodal Freight Network (49 U.S.C. §70103) and have been outlined in **Table 1.3** below. This table also shows the CFMP 2023 goals and objectives that align with each NMFP and/or NHFP goal.

Table 1.3: How CFMP Goals Align with NHFP/NMFP Goals

NHFP/NMFP Goals	CFMP Goals & Objectives
NHFP/NMFP Goal 1 **Invest in infrastructure improvements and implement operational improvements on the highways of the U.S. that:** **a. Strengthen the contribution of the NHFN to the economic competitiveness of the United States** **b. Reduce congestion and bottlenecks on the NHFN** **c. Reduce the cost of freight transportation** **d. Improve the year-round reliability of freight transportation** **e. Increase productivity, particularly for domestic industries and business that create high-value jobs**	***CFMP Goal 1 (Multimodal Mobility)*** a. Identify causes and solutions to freight bottlenecks b. Invest strategically to optimize system performance c. Develop, manage, and operate an efficient integrated freight system d. Identify causes and solutions to Freight Rail Network Improvements bottlenecks e. Identify freight rail network operational improvements and mode shift options
NMFP Goal 2 **Improve the safety, security, efficiency, and resiliency of multimodal freight transportation.** ***NHFP Goal 2*** **To improve the safety, security, efficiency, and resiliency of freight transportation in rural and urban areas.**	***CFMP Goal 5 (Safety & Resiliency)*** a. Reduce rates of incidents, collisions, fatalities, and serious injuries associates with freight movements b. Develop a freight resiliency strategic plan
NMFP Goal 3 **Achieve and maintain a state of good repair of the NMFN.** ***NHFP Goal 3*** **to improve the state of good repair of the NHFN.**	***CFMP Goal 6 (Asset Management)*** Apply preventative maintenance and rehabilitation strategies using sustainable best practices. ***CFMP Goal 7 (Connectivity & Accessibility)*** Coordinate with local and regional partners of freight facilities, siting, design, and operations.
NMFP/NHFP Goal 4 **Use innovation and advanced technology to improve the safety, efficiency, and reliability of the NMFN/NHFN.**	***CFMP Goal 5 (Safety & Resiliency)*** Utilize technology to provide for the resilience and security of the freight transportation system. ***CFMP Goal 7 (Connectivity and Accessibility)*** a. Support research, demonstration, development, and deployment of innovative technologies. b. Promote innovative technologies and practices utilizing real-time information to move freight on all modes more efficiently.
NMFP/NHFP Goal 5 **Improve the efficiency and productivity of the NMFN/NHFN.**	***CFMP Goal 2 (Economic Prosperity)*** a. Promote economic development by investing in freight infrastructure projects and operational improvements. b. Promote freight projects that enhance economic activity, freight mobility, unique capabilities, reliability, system resiliency and global competitiveness. c. Increase workforce availability and training. d. Promote the State's competitive logistics advantages.

NMFP Goal 6 **To improve the reliability of freight transportation.** ***NHFP Goal 6*** **To improve the flexibility of States to support multi-State corridor planning and the creation of multi-State organizations to increase the ability of States to address highway freight connectivity.**	***CFMP Goal 7 (Connectivity & Accessibility)*** a. Support research, demonstration, development, and deployment of innovative technologies. b. Promote innovative technologies and practices utilizing real time information to move freight on all modes more efficiently. c. Coordinate with local and regional partners of freight facilities, siting, design, and operations. d. Truck trip planning, coordination, operational and management improvements.
NMFP Goal 7 **To improve the short- and long-distance movement of goods that:** **a. Travel across rural areas between population centers;** **b. Travel between rural areas and population centers; and** **c. Travel from the Nation's ports, airports, and gateways to the NMFN.**	***CFMP Goal 1 (Multimodal Mobility)*** a. Identify causes and solutions to freight bottlenecks. b. Invest strategically to optimize system performance. c. Develop, manage, and operate an efficient integrated freight system. ***CFMP Goal 7 (Connectivity & Accessibility)*** Improve truck trip planning, coordination, operational and management.

2

Chapter 2: California Freight Competitiveness

California Freight Competitiveness

Trade between the United States (U.S.) and other nations is worth approximately $5.9 trillion per year. China, Canada, and Mexico are the country's largest trading partners and account for nearly $1.3 trillion worth of imports and exports.[3] California's economy ranks fifth in the world, and the state is a leading competitor for trade. (See **Chapter 4B** for more information). In 2021, California's total value of exports was approximately $175.12 billion, nearly 10 percent share of the U.S. total.[4]

Increasing statewide competitiveness is a key priority for the State. California can achieve economic growth, environmental sustainability, and community development with a balanced and effective approach. California's competitiveness is vital to both public agencies and private stakeholders. Increasing competitiveness across the state will contribute to local, regional, and state economic development by making California a preferred choice for developers, businesses, and transportation providers. This chapter provides a summary of findings based on information found in **Appendix C**.

The State, its communities, its transportation providers, and its businesses compete in several ways:

- The State of California, and California municipalities, compete for business locations, including production facilities, distribution centers, and offices.
- California producers, manufacturers, distributors, and wholesalers compete for business and market share with their domestic and foreign counterparts elsewhere, and they may also compete for business within their own firms.
- California seaports, airports, and freight transportation providers compete with their counterparts in other states and nations for freight transportation business.

California's economy and the number of jobs continues to grow, especially in the State's well-publicized high-tech, biotechnology, and green technology sectors. However, the growth has not been uniform across the freight transportation and logistics sectors. Other states and regions have had successes in attracting businesses, especially businesses that do not need to locate in California. The freight sector is a complex mix of carriers, service providers, transportation-related industries, cargo owners, reverse logistics and infrastructure.[5] Figure 2.1 below displays each freight sector by enumerated group.

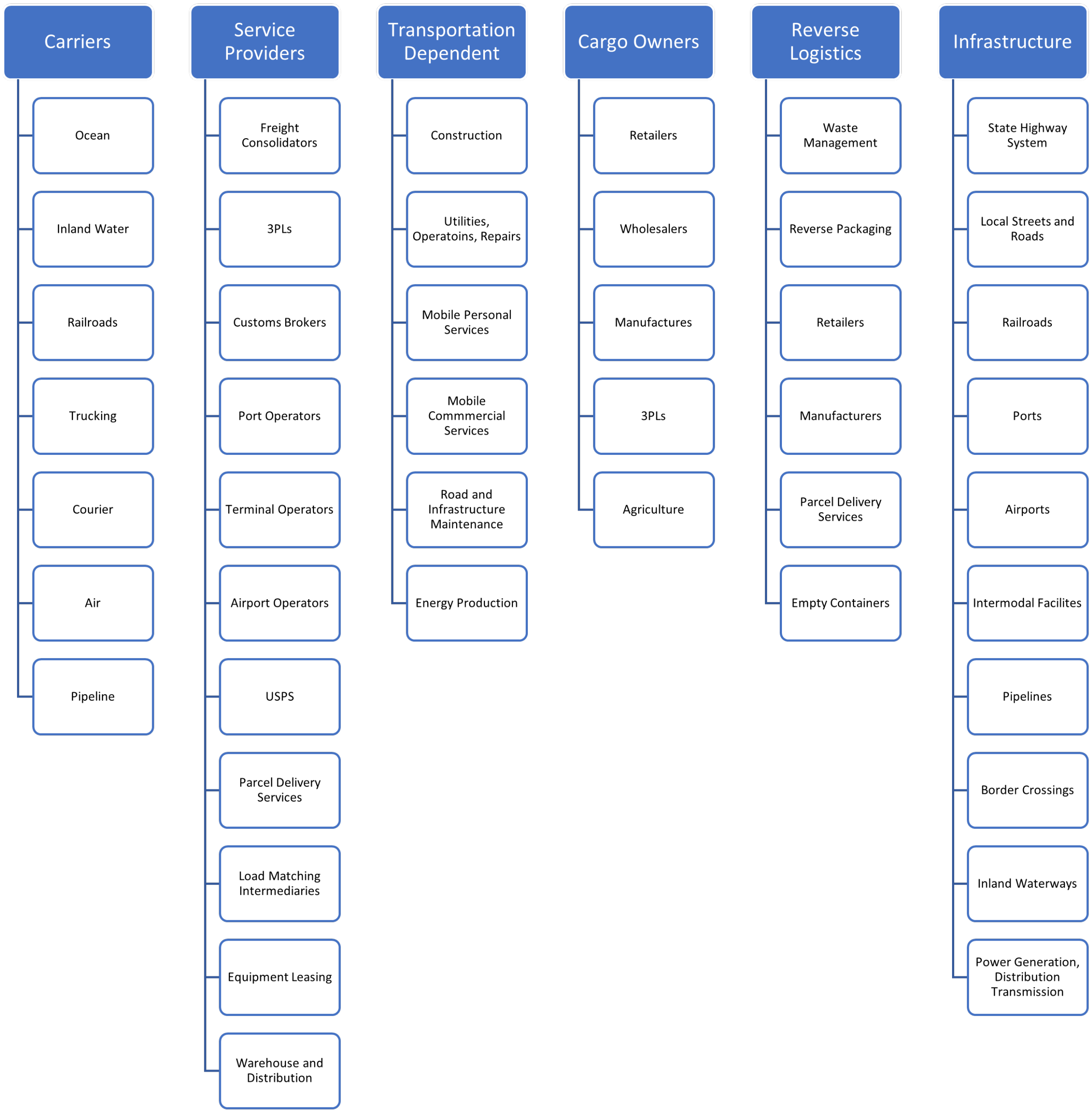


Figure 2.1: Freight Sector by Enumerated Group (Source: Metrans Implementation of Action 6 for CSFAP Phase 3 Tracking Economic Competitiveness)

Job losses in commerce, businesses, and jobs to other states or other nations are acutely felt throughout the state and across sectors. Losses of economic activity due to interstate and international competition vary in scope and effect. Losses are highly visible when businesses move away from California or when businesses that might have located in California choose a competing location instead. Other economic losses are less obvious, such as gradual shifts in business activity away from California. Yet, these less obvious losses can be equally important to California's aggregate economy and affect some communities disproportionately.

The role of freight transportation in economic competitiveness is usually assumed to be a function of freight system capacity, performance, and efficiency. In most discussions of competitiveness, quantitative or qualitative shortfalls in freight capacity, cost, service frequency, transit time, reliability, safety, etc. are presumed to diminish economic competitiveness. The CFMP aims to support long-term competitiveness.

Competition for Business Locations

The focus of most regional and state competitiveness discussions is competition for locations of new production, distribution, or transportation facilities. These facilities generate jobs, tax revenue, and positive economic impacts within communities. Californians are concerned about the potential loss of businesses and facilities that close due to out-of-state competition or relocation to other states. Although there are many possible variations and combinations, most location decisions fall under the following categories:

- Choosing a location for a new production or distribution facility
- Choosing whether to expand, contract, or close an existing location
- Choosing how much production or distribution activity to allocate among locations

LOCATION DECISION FACTORS

Key factors commonly considered when deciding locations include:

- Access to target markets
- Workforce availability
- Proximity to suppliers, intellectual capital, and other inputs
- Availability of suitable sites, buildings, or other facilities, with appropriate zoning
- Fit within existing or planned production, supply chain, and distribution networks
- Development timeline (e.g. permitting, construction, environmental documents)
- Land cost and zoning
- Cost of doing business (other than transportation)
- Cost and availability of electric power
- Local regulations and other restrictions
- Freight transportation access, capacity, and reliability
- Freight transportation service and cost

California's consumer population, nearly 40 million in 2021 and direct access to international markets via ports on the Pacific Rim give the state a competitive edge on the first criterion, access to markets. Few businesses have a major presence in the California market without a physical location in California. California also has an advantage in attracting business in its strongest sectors, notably in the technology industries. Access to a skilled labor pool, technology suppliers, investment capital, and research institutions leads new tech businesses to locate in California and existing tech businesses to expand here. California also has strong rail access to markets in the U.S. Midwest and East Coast, which coupled with direct access to the Pacific Rim, makes it competitive for discretionary cargo. However, California's competitiveness declines when location decisions are more flexible and cost factors rise in importance.

Surface transportation infrastructure capacity, such as those on highways, ports, rail lines, or air cargo can be overlooked when businesses are making location decisions. Businesses ordinarily assume that their incremental shipments can be handled through existing infrastructure. Facilities that require or produce large volumes of marine bulk cargo (e.g. export grain elevators) or specialized cargo (e.g. import autos) need specialized terminals with sufficient capacity. Reliability can usually be achieved, but sometimes at a higher cost. If fleet operators must add drivers and equipment, and/or allow extra time to overcome local problems, then costs can increase significantly. Notably, some parts of rural California have limited Surface Transportation Assistance Act (STAA)[6] truck route access, which can reduce the ability of those areas to compete for new facilities.

Freight transportation congestion and its impacts on productivity, cost, and reliability are serious concerns for industry stakeholders. While transportation cost differences may be relatively easy to quantify, reliability differences are not. Reduced reliability requires higher inventory levels, but in most cases the greater concern is the ability to meet corporate and customer requirements consistently. Recurrent congestion reduces productivity and can affect reliability. Non-recurrent delays and congestion are more serious reliability challenges. As California's transportation facilities – highways, arterials, ports, airports, railroads, pipelines operate closer to their capacity, the frequency and severity of non-recurrent congestion tends to rise. In some parts of California, geography and land uses restrict transportation corridors. Often, there are no practical alternatives to congested routes.

Manufacturing plants have flexibility when making location decisions, either within California, other states, or other countries (e.g., Mexico). For example, manufacturing plants that need access to high-tech suppliers or California agricultural products have strong reasons to locate in California. On the other hand, manufacturing plants that use easy-to- transport inputs (e.g. electrical components) or widely available inputs (e.g., paper or basic metals) may take the full list of location factors above into account and choose locations elsewhere. The ability of the facility to locate in a wide variety of locations implies that either goods movement differences are not likely to be critical, or that there are few significant goods movement differences between locations.

Where more generic inputs such as semi- skilled labor, space, or electrical power and its reliability, are a major part of production expenses, the costs of those inputs will have a greater impact on location decisions. In this case, California's higher labor, land, or power costs – or perceptions of higher costs – place the State at a competitive disadvantage.

LOCAL MARKET FACILITIES

Many goods movement and freight-dependent industry facilities must be located close to the market that they serve or the sources on which they rely. California does not need to compete for these local market facilities, although there may be competition between cities and counties within California. In general, businesses shipping common commodities with high transportation costs relative to their value cannot outcompete nearby competition if they have to ship commodities far distances. Concrete batch plants, for example, are distributed throughout the state to serve local markets, and cannot serve California cities from other states. Food and beverage processors, such as wineries, need to be close to agricultural producers, and many are anchored in California.

Competition for California Products and Producers

California producers and their products compete with producers and products from other states and nations. The extent and nature of that competition depends on commodity type. Some California products are differentiated by source or brand, such as Napa Valley wines or California raisins. Since customers may not see wines or raisins from elsewhere as perfect substitutes, differentiated products can often command a somewhat higher price and have a greater ability to absorb transportation and distribution cost differences without losing market share. Market demand and production volume help some California products dominate their industry and shield them from competition (such as almonds). California products that are not differentiated by source or brand must compete on delivered price and reliability of supply and are more vulnerable to lower-cost production elsewhere. See **Appendix C** for an example case study.

Competition for Distribution Centers

Distribution centers (DCs) can be national (NDCs, serving the entire nation), regional (RDCs, serving a region within the nation), or local in scope. There may also be separate import distribution centers (IDCs) handling imported goods separately from domestic goods. A state or a sub-region may compete as a potential location for a national, regional, or import DC.

RDCs in the state may also "compete" for coverage with RDCs in other states. Due to the large size of California, it is unlikely that a major retail business would serve the state without at least one RDC in the state. However, the activity level of California's DCs may be subject to "competition" within the supply chain of various types:

- Competition for existing territory – how much of California, or the Western states, will be served from California DCs, as opposed to DCs elsewhere?
- Competition for expansion – will the firm choose to expand stores or sales in California, thus increasing volume at the California DC, or expand elsewhere?
- Competition for new territory – as a producer, importer, or retail chain expands into new markets, will California DCs serve those markets?

Competition for California Seaport Business

California has 12 deep water port complexes that each specialize in a different mix of major cargo types, commodities, and service territories. California also has numerous private terminals that handle liquid and dry bulk commodities. California container ports compete with other U.S. and North American ports in two ways:

- California ports compete for discretionary container traffic that moves by rail to inland U.S. destination or truck to other regions through any of its ports. For example, Los Angeles and Long Beach compete with various U.S. and Canadian ports for Asian imports to Midwestern consumer markets.[7]
- California port cities compete with other regions for the location of import DCs and their inbound trade flows. For example, Riverside County might compete with Georgia for a new import DC that would bring in goods through either Los Angeles/Long Beach or Savannah.

If businesses choose to send discretionary cargo to other ports, economic activity and employment at California ports and in the transportation, sector would be at risk. If import DCs locate or expand outside of California, economic activity and employment at California DCs are also at risk, due to competition with other regions.

From 2000 through 2010, California ports combined had a 46.7 to 49.2 percent share of the loaded U.S. import container trade. From 2010 to 2017, the Atlantic, Gulf, and Pacific Northwest port share rose from 52.9 to 57.7 percent. California's market share declined within those seven years despite an increase in loaded containers (TEUs or twenty-foot equivalent units). This apparent loss of market share, shown graphically in **Figure 2.2**, has prompted concerns over the competitiveness of California's container ports.[8]

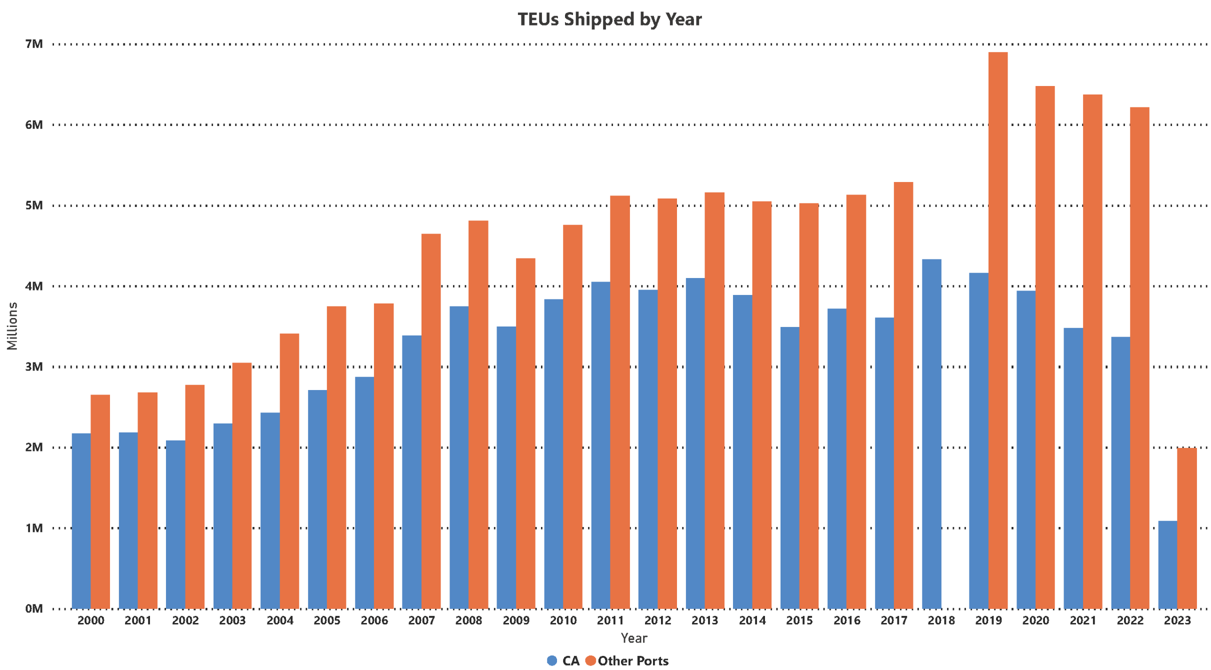


Figure 2.2: Shift in Coastal Import Shares (Source: U.S. Maritime Administration 2000-2017, PMSA West Coast Trade Reports 2018-2023, U.S. Waterborne Container Trade by U.S. Customs Ports (series) **Note: Incomplete data sets for years 2018 and 2023

For more than two years during the period from 2019 to 2022, the worlds global supply chain encountered issues caused by the change in consumer behavior fueled by the COVID-19 pandemic. **Figure 2.3** shows the TEUs handled from 2019 to May 2022 by major ports in California (port of Los Angeles (POLA), port of Long Beach (POLB), port of Oakland) and representatives of ports in the Atlantic/ Pacific Northwest/ Gulf ports (namely Charleston, Houston, Savannah, Seattle, Tacoma, and ports in New York, New Jersey, and Virginia). During the pandemic period, TEUs handle for California ports hit their lowest amount in March 2020 after the first low peak in March 2019. However, the annual TEUs of the three ports combined in 2020 was slightly higher (1.6 percent) than that of 2019. This number increased nearly 13 percent in 2021.

FREIGHT PLAN California Freight Mobility Plan

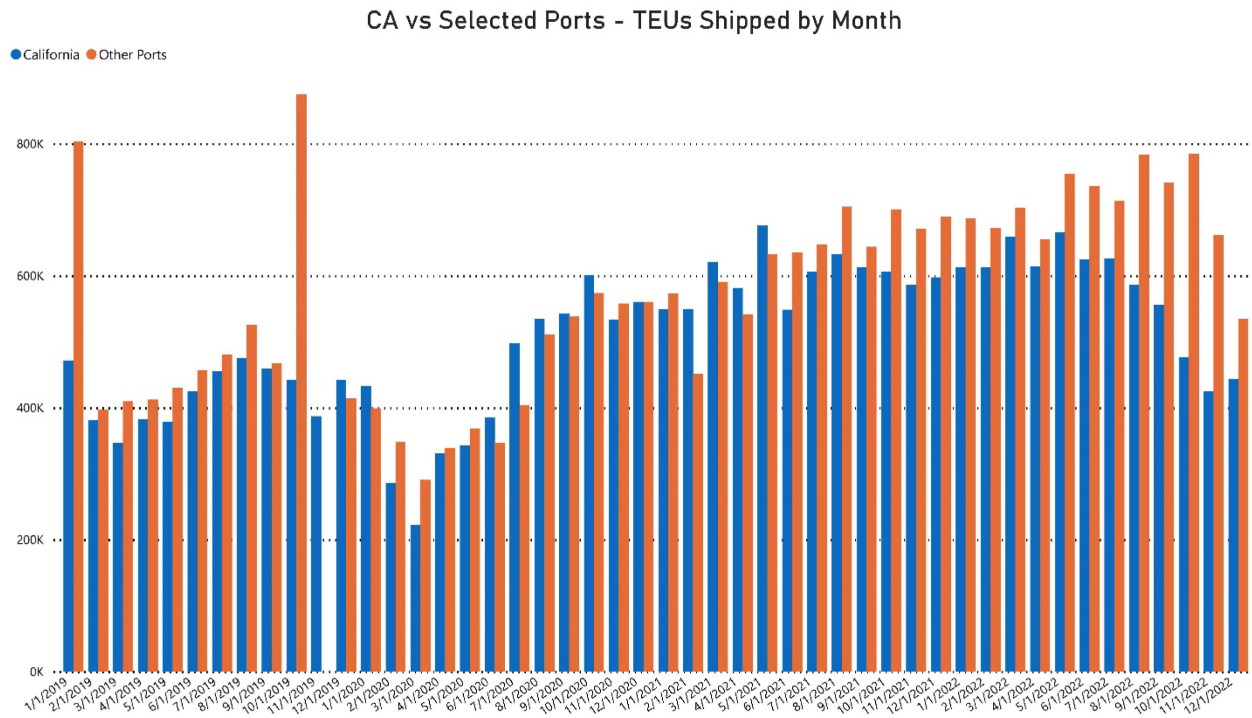


Figure 2.3: Total TEUs Shipped by California and Selected Atlantic/Pacific NW/Gulf Sea Ports from January 2019 to December 2022 (Source: Monthly Container Port TEUs dot.gov)

Since 2006 the total inland point intermodal (*IPI)* (inbound and outbound) containers through the POLA/POLB peaked at 43 percent of total POLA/POLB volume, the IPI share has declined significantly, by 31 percent (to 30 percent in 2018). In absolute terms, although total POLA/POLB volumes have increased from 15.76 million TEU to 17.5 million TEU between 2006 and 2018, the IPI volume have decreased by 1.6 million TEU.

In addition, while the total TEUs and import TEUs handled by these three major ports in California from 2019 to 2020 declined only roughly 0.3 million, which equaled to 1.5 percent and 2.5 percent, respectively; the corresponding tonnages of all California ports went down approximately 11 percent and 14.5 percent.

The faster growth on the Atlantic and Gulf Coasts may be explained by the following:

- Strong growth in the Transatlantic/ European and Caribbean/South American trades
- Increased use of Suez Canal routings from Southeast Asia, driven in part by a shift of manufacturing and sourcing from China to countries in Southeast Asia and the Indian subcontinent (tariff implications)
- Increased adoption of "three corner"[9] and "four corner"[10] logistics strategies by large importers
- A reduction in Southern California imports transloading
- Rate increases on rail intermodal service, leading ocean carriers to replace some rail movements from Southern California with truck or rail movements from other ports
- Rising costs of locating and operating distribution and manufacturing facilities in California versus aggressive economic development efforts from other states

- New Panama Canal locks permitting larger, more efficient vessels on route to the Gulf and Atlantic Coasts
- Increased cost at California ports due to "clean truck" and vessel requirements, Pier Pass/Off-Peak fees, and drayage costs increases from port and highway congestion
- Concerns over West Coast labor relations stability after the lengthy 2014-2015 dispute and accompanying shipping disruption

Of these factors, only the last two are specific to California ports; the other factors are shifts in trade patterns in the economic context in which California ports must compete. There is no publicly available information on relative costs at different container ports. The fees that marine terminal operators charge their ocean carrier customers are negotiated and embodied in confidential contracts. The rents that port authorities charge marine terminal operators are also negotiated and confidential.

Table 2.1 provides a key perspective on the relative growth of California's container port volumes. In the rapid growth era of 1990-2007, Southern California ports outperformed the nation. Much of the cargo and share growth in that period was attributable to the rapid expansion of rail intermodal container movements through San Pedro Bay in response to the introduction of double-stack rail cars. This period also saw an increase in the practice of import transloading: bringing in international containers of imported merchandise and transferring the goods to domestic containers or trailers in Southern California. Finally, this period also saw dramatic growth in U.S. imports from China, with Southern California as the leading gateway. The Port of Oakland did not benefit as much from the expansion of intermodal traffic or transloading, and Northern California TEU totals did not grow as fast.

The U.S. container ports were hit hard by the recession, with Southern California losing 24 percent of its 2007 peak volume by 2009. Following the recession, the Southern California ports rebounded slightly faster than the nation. Oakland's volume dropped by 14 percent during the recession but did not grow as quickly after partial recovery in 2010. The labor-management issues in late 2014 and early 2015 hampered recovery for all U.S. West Coast ports.

Table 2.1: Container Port Cargo Growth Rates by Volume, 1990-2017

Compound Average Growth Rate (CAGR)	1990-2007	2007-2009	2009-2017
United States	6.4%	-6.1%	4.4%
California	7.9%	-8.4%	4.3%
Northern California	8.9%	-8.9%	4.6%
Southern California	3.8%	-5.0%	2.1%
Pacific Northwest	3.6%	-8.1%	1.4%
British Columbia	11.7%	-1.3%	7.1%
Source: American Association of Port Authorities			

Tables 2.2 and 2.3 below provide some perspective about the relative growth of California's container port volume during the 2018-2020 period. The total tonnage handled in all California

ports declined 11 percent, dropping from 38,483,803,160 tons in 2018 to 34,265,551,950 tons in 2020 while the whole U.S. water ports' tonnage declined 13 percent in the same period (**Table 2.2**). The loaded imports in all California ports declined almost15 percent while the whole U.S. import tonnage declined nearly 21 percent (**Table 2.3**).

Table 2.2: Percent Change of Total Shipment by Ports, 2018-2020

Percent Change of Total Shipment within the period	Total		
	2018-2019	2019-2020	2018-2020
United States*	-5.0%	-8.4%	-13.0%
California	-1.9%	-9.2%	-11.0%
Oakland** – Northern California	-1.8%	-1.6%	-3.3%
Los Angeles/Long Beach** – Southern California	-3.3%	2.1%	-1.3%
Sea/Tac** – Pacific Northwest	-0.6%	-12.0%	-12.6%
Vancouver** – British Columbia	0.1%	2.0%	2.1%
Savannah** - East Coast	5.7%	1.8%	7.6%
Virginia** – East Coast	2.9%	-4.3%	-1.5%
*Source: *FAF 5.4 includes all water ports, volume in tons; ** Port websites, include only seaports, volume in TEUs.*			

Table 2.3: Percent Change of Imports by Ports, 2018-2020

Percent Change of Total Shipment within the period	Total		
	2018-2019	2019-2020	2018-2020
United States*	-7.2%	-14.8%	-20.9%
California	-2.0%	-12.7%	-14.5%
Oakland** – Northern California	-1.5%	1.9%	0.3%
Los Angeles/Long Beach** – Southern California	-5.7%	3.7%	-2.2%
Sea/Tac** – Pacific Northwest	-5.7%	-8.4%	-13.7%
Vancouver** – British Columbia	-2.2%	6.5%	4.1%
Savannah** - East Coast	5.2%	4.4%	9.8%
Virginia** – East Coast	2.9%	-3.6%	-0.9%
*Source: *FAF 5.4 includes all water ports, volume in tons; ** Port websites, include only seaports, volume in TEUs.*			

Comparing between Northern and Southern California major ports, the Port of Oakland decreased 3.3 percent in the total TEUs handled (from 2,546,399 TEUs in 2018 to 2,461,262 in 2020) and increased 0.3 percent in the loaded imports (from 1,184,568 TEUs to 1,118,226 TEUs), while the POLA/POLB dropped 1.3percent in total (from 17,549,771.50 TEUs to 17,326,715.95) and 2.2 percent in the loaded imports (from 9,224,034.85 TEUs to 9,021,061.25 TEUs).

The impacts of COVID 19 to large ports of California seem to be more severe than that to ports located in East Coast. As shown in **Table 2.2,** the Virginia port's volume dropped only 1.5 percent for total TEUs and 0.9 percent for total imports. The Savannah port's volume even increased by 7.6 percent and 9.8 percent, respectively.

During the recovering time in 2021, the POLA/POLB ports in Southern California soared and handled a total of 20,061,977 TEUs, including more than 10 million TEUs in imports. These numbers counted for more than 15 percent and 13.9 percent increases in California total volume and import volume towards the previous year. When compared with the growth experienced by Savannah and Virginia with 18.6 percent and 27.8 percent respectively, those experienced by California ports were significantly lower. According to the John McCown Container Reports[11], the shift from California ports to other ports was due to avoid congestion in West Coast ports.

CALIFORNIA'S EFFORTS TO GREEN PORTS

California Ports have taken significant measures to reduce emissions related to port operations by utilizing Zero Emissions technologies and implemented comprehensive environmental mitigation plans. These technologies and plans have led to cleaner air and reductions in health risks posed by air pollution on portside communities. This commitment to being outstanding environmental stewards has enabled California ports to be the most environmentally friendly in the world[12]. California and Japan signed a letter of intent in March 2023 to support port decarbonization and the development of green shipping corridors. This letter was signed by dignitaries from both the Ministry of Land, Infrastructure, Transport and Tourism of Japan (MLIT), and "calls for deepening cooperation, information-sharing, and discussion of best practices between the governments of California and Japan to support the development of green shipping corridors, expand offshore wind, and cut planet-warming pollution at ports in Japan and California."13. CalSTA will support the development of green shipping corridors, port decarbonization, and the deployment of zero emission transportation through the $1.2 billion Port and Freight Infrastructure Program. In addition, the partnership will provide an opportunity for all parties to share best practices on critical efforts to cut port related pollution, including strategies for offshore wind development and zero-emission fuels and infrastructure.

Competition for California Air Cargo Business

As with the State's seaports, the competitive position of California's cargo airports is largely determined by their geographic position relative to major markets. Because both domestic and international air cargo tend to be time-sensitive, shippers commonly choose airports based on the combination of ground and air transit time. Direct competition for air cargo business is largely regional:

- Oakland (OAK) and San Francisco (SFO) compete for Bay Area air cargo, with OAK prevalent in domestic and SFO in international. FedEx has major capacity at OAK. San Jose (SJC) has a smaller air cargo business.
- Sacramento (SMF) and Mather (MHR) compete for air cargo business in the Sacramento area. UPS and FedEx serve SMF while DHL and UPS serve MHR. Amazon has a fulfillment center near SMF.

- LAX and Ontario (ONT) compete for air cargo in Southern California with LAX having the dominant share. UPS has a major facility at ONT. San Diego (SAN) competes for the southern portion of the market.
- The numerous other California airports (Stockton, Merced, Fresno, etc.) are served by feeder connections to the major airports. Stockton (SCK) has recently added service by Amazon.

California airports compete with other states for hub status and for transfer/interchange freight. Hub airports host a larger number of feeder flights to and from regional airports, as well as a full schedule of flights serving other major airports and markets. The competition for West Coast hub status is primarily within California; the nearest alternatives are Portland and Las Vegas. The size of the Northern and Southern California markets, however, will keep major air cargo hub locations within the state. Major hubs may also compete for air cargo transfer/transshipment business between foreign and domestic carriers.

Air cargo is increasingly dominated by the integrated carriers such as FedEx, UPS, and DHL. To use these carriers, the customer tenders the shipment locally, and the carrier chooses the routing and the airports. California airports therefore compete mostly for the business of the integrated carriers rather than for the underlying customer choices.

Except for the air cargo transloading segment, which stays on the airport footprint, California's airports are not in close competition with those in other states. Goods movement mobility within the state is unlikely to affect the competitive position of California airports either nationally or internationally.

California's Cost Difference

TRUCKING COSTS

U.S. marginal trucking costs per mile are computed by the American Transportation Research Institute (ATRI).[14] As of 2021, ATRI estimates that the average U.S. marginal trucking cost per mile is $1.855. The average marginal cost percentage data in **Table 2.4** indicates that fuel accounts for 22 percent of motor carrier costs, while driver wages and benefits are 43 percent. The average semi-truck's fuel economy is about 6.8 mpg. California has relatively high diesel fuel prices, and the recent State diesel fuel tax increase of $0.12 per gallon adds approximately $0.02 per mile to trucking costs.

Table 2.4: Cost Comparison Chart

Motor Carrier Costs	2011	2012	2013	2014	2015	2016	2017	2018	2019
Vehicle-Based (Percentages)									
Fuel Costs	35	39	38	34	26	21	22	24	24
Truck/Trailer Lease or Purchase	11	11	10	13	15	16	16	15	16
Repair & Maintenance	9	8	9	9	10	10	10	9	9
Truck Insurance Premiums	4	4	4	4	5	5	4	5	4
Permits and Licenses	2	1	2	1	1	1	1	1	1

Tires	2	3	2	3	3	2	2	2	2
Tolls	1	1	1	1	1	2	2	2	2
Driver-Based (Percentages)									
Driver Wages	27	26	26	27	32	33	33	33	32
Driver Benefits	9	7	8	8	8	10	10	10	10
TOTAL	100	100	100	100	100	100	100	100	100
Source: ATRI, 2020									

Motor carriers within California are concerned about highway and facility congestion that reduces driver productivity, vehicle productivity, and effective capacity. This issue has received the most attention in connection with port container drayage, where longer times spent at terminals and on congested highways to-and-from terminals reduce the number and length of the trips a driver can make within Hours of Service (HOS) limits. These issues are not unique to California or to port drayage. Busy Pacific Northwest and East Coast ports have similar problems, and urban congestion affects all trucks. When in competition with less congested regions and ports such as Savannah or Charleston, however, these higher costs place California at a disadvantage. The higher cost of port drayage in California is likely to be a significant factor when choosing the location for import distribution facilities or export- oriented businesses, partially offsetting the State's advantage with close access to Asian markets.

Reducing freight and supply chain congestion and increasing reliability is a long-term effort. The State is investing in freight transportation improvements through implementation of the Road Repair and Accountability Act of 2017, also known as Senate Bill (SB) 1. SB 1 provides stable, long-term funding for both state and local transportation infrastructure. In 2017, SB 1 was projected to average of $5.4 billion per year from 2017 to 2027 for a strategic mix of state and local transportation projects, depending on tax and fee revenue. It was also estimated in 2017 that it would add $300 million per year to improve trade corridors, and $250 million per year is available to increase throughput on congested corridors. So far SB 1 has funded over $16 billion for transportation projects throughout California[15]. The current State Budget (2022-2023) invests almost $15 billion over the next four-year period in transportation infrastructure, in which, $7.7 billion is to improve transit and rail, $4.2 billion to complete high-speed rail construction in the Central Valley, $1.2 billion to support goods movement and port. The Federal Infrastructure Investment and Jobs Act (IIJA) will increase California's federal road and transit funding by $2.2 billion annually over the next five years bringing California's total federal funding to $38 billion over that period.[16]

RAILROAD COSTS

California is served by two Class 1 railroads: BNSF and UPRR. The two railroads have extensive networks across Western states, with connection to other railroads at Midwestern gateways and Canada and Mexico. Their rates and services would not ordinarily effect competitiveness with other states For California's short line railroads, these predominately operate within the state. Similar to Class 1 railroads, short line rates are under confidential, negotiated contracts rather than under published tariffs. It is important for the State to continue to support short line rail operations, as their operations reduces the number of trucks on the roadway. Caltrans efforts to support multi-modal freight mobility include the development of the California Sustainable Action Plan, the State Rail Plan, and Short Line Rail Plan.

Railroad operating costs may be slightly higher in California than in other states. There has been a series of CARB actions designed to reduce emissions from both line-haul and yard operations driven by federal requirements. These include increased use of low-sulphur fuel; low-emission, high-efficiency road locomotives; and hybrid and other low-emission switching locomotives. Some of these costs have been offset by grants, such as those under the Carl Moyer program. Recently, the railroads have been acquiring low-emission locomotives for use across their systems. Over time, higher capital costs will likely be offset by lower operating costs.

OCEAN SHIPPING COSTS

The ocean shipping rates paid by customers include the cost of vessel operations, the cost of terminal operations, fees assessed by ports, canal tolls, and ocean carrier overhead. All West Coast port terminals in North America are covered by the same basic labor contract, and many are operated by the same firms. The ports' own charges tend to be highly competitive. Vessels calling North American ports do incur higher costs for low-sulphur fuel and cold-ironing. Almost all relevant rates and fees are contained in confidential, negotiated contracts. Assembling a quantitative comparison from available data is currently not possible.

AIR CARGO COSTS

The air cargo industry is dominated by the integrated carriers, FedEx, DHL, and UPS, and trailed by smaller air freight forwarders and airlines offering belly cargo space on passenger flights. Air cargo operations in California have similar costs as in other states, and California customers likely face similar rates for air cargo service.

LAND COSTS

California ranks first in a national study[17] of total land valuation according to the U.S. Bureau of Economic Analysis. The study estimated the combined value of all land in the country and found that California accounts for 17 percent of the total value of the land in the 48 contiguous states. High land values can be attractive for investors but can discourage development of facilities which could locate less expensively elsewhere. Commercial and industrial land prices are driven up by the value of land in residential development. In California, residential land values as a percentage of total property values have increased substantially over the last 40 years.

ENERGY AND UTILITY COSTS

The price of petroleum gas, water, diesel, natural gas, and electricity affect California's competitiveness for business locations and freight movement. Energy and utility costs including electricity and water, can be prominent factors in facility operating costs and impacts the decision-making processes for facility locations. These factors become more important for facilities that use electric power for lighting, climate control, and production equipment, and water for processing. These costs also affect the cost of living for employees.

California's average commercial, industrial, and residential electric power rates are high compared with most other states. According to the U.S. Energy Information Agency (EIA), in 2020, California had the third highest average commercial electricity rates, the fifth highest average industrial electricity rates, and the sixth highest average residential electricity rates. California's average commercial electricity rates over the course of a year study were 60 percent higher, average industrial electricity rates were 85 percent higher, and average residential electricity rates were 50 percent higher than the average of all other states in the nation for this period.[18]

The higher industrial electric power rates combined with near-zero emissions equipment mandates at port terminals may lead to higher costs for terminal operators. Diesel fuel prices are an especially important factor in freight transportation, as the freight industry still heavily depends on diesel-powered trucks and rail locomotives. Compared with other states, California's average diesel fuel prices are usually among the two highest states including Hawaii. In September 2022, for example, the average diesel fuel price in California was $0.96 higher than the average for the rest of the West Coast area and $1.15 higher than the average for all U.S. It was 18.6 percent and 23 percent differences, respectively[19]. As of the end of October 2022, diesel price in California exceeded that in Hawaii and was the highest in the nation.

Average natural gas prices for transportation, building heating, and industrial process use are also higher in California than in other states. The U.S. EIA reports that for the 12 months ending in July 2022, California's average residential natural gas rates were 48 percent higher than the average for other states. In the same period, California's average natural gas rates for commercial customers were 19.8 percent higher than the average for the rest of the U.S., while industrial natural gas customers in California paid an average natural gas rate 37.9 percent higher than the average for the rest of the country.

COMPARATIVE DISTRIBUTION CENTER COSTS

The combined impact of these various cost factors is evident in total operating costs for distribution centers or other industrial facilities. **Table 2.5** compares the cost factors for potential distribution center locations. Warehouse operating costs were scaled to a hypothetical 750,000 sq. ft. facility employing 200 nonexempt workers and shipping over-the-road to the nearest intermodal and port city.[20] As **Table 2.5** indicates, California locations had the highest annual combined costs. The estimate for Los Angeles, for example, was 37 percent higher than in Houston, Texas and 86 percent higher than Savannah, Georgia, and a company would save $7.85 million or $13.4 million annually by choosing Houston or Savannah, respectively, over Los Angeles.

Table 2.5: California Distribution Centers & Operation Costs

Rank	Distribution Warehouse Location	Total Annual Operation Costs
1	Inland Empire, CA	$29,386,566
2	Los Angeles, CA	$28,902,383
3	Houston, TX	$21,043,771
4	Chicago, IL	$21,038,260
5	Northern NJ	$19,937,350
6	Southern NJ	$18,557,013
7	Columbus, OH	$18,408,177
8	Memphis, TN	$18,066,690

9	Atlanta, GA	$17,595,703
10	Mobile, AL	$17,510,626
11	Lehigh Valley, PA	$17,351,260
12	Louisville, KY	$17,166,370
13	Nashville, TN	$17,142,284
14	Jacksonville, FL	$16,448,396
15	Charlotte, NC	$16,299,580
16	Charleston, SC	$16,290,374
17	Norfolk, VA	$16,049,615
18	Greenville/ Spartanburg, SC	$15,739,906
19	Savannah, GA	$15,492,178
20	Dillon, SC	$15,357,480
Source: Comparative Distribution Warehousing Costs in Port and Intermodal-Proximate Cities, 2021 Boyd Company, Inc. Data of 2017 was used in the study.		

Perceptions of California's Business Climate

As a part of the CFMP 2023 outreach and engagement efforts (**Appendix H**), many of the freight industry stakeholders contacted perceive an "anti- business" attitude in California, and see that attitude manifest in environmental regulations, high taxes and fees, and opposition to facility development. Opinions and concerns over California's friendliness to business are evident in state rankings on the ease of doing business, or as places to start a business. Examples include the following:

- WalletHub, a personal finance company, used a variety of statistics to rank states as places to start a business. Although California ranked 8th overall, it lagged behind states such as Texas and Georgia, which are making strong efforts to attract firms. California ranked 46th in business costs.[21]
- USA Today placed California 13th among the best states in which to do business.[22]
- A 2022 CNBC poll placed California 29th among "America's Top States for Business."[23] California was ranked: 16th on workforce, 25th on infrastructure, 48th on cost of doing business, 17th on the economy, 26th on quality of life, and 1st on technology.
- A 2018 ranking by Area Development did not list California among the Top 20 States for Doing Business.[24]
- A 2009 study by the Public Policy Institute of California[25] found that California typically ranks highly on productivity, but poorly in terms of taxes and costs.

California may be viewed as a magnet for high-tech research and product development, with superlative access to venture capital and expertise, however, for wholesaler seeking to build distribution center and warehousing developments, access to markets, cost, and reliability are key factors for these types of investments.

COMPETITIVE ECONOMIC DEVELOPMENT

Industry outreach efforts have revealed opportunities for California's economic development efforts and the linkage of those efforts to goods movement, logistics, and freight transportation infrastructure. In In fiscal year 2016, California ranked 48th out 50 states for state spending on economic development and related functions, as compiled by the Council for Community and Economic Research. Higher spending by the Southeast states is noteworthy and paralleled with strong economic development in that region.

Examples of aggressive economic development initiatives are described in **Appendix C** and include such examples as Georgia's economic development efforts with the Port of Savannah and Canada's Asia Pacific Gateway initiative. These initiatives attract cargo flows, manufacturing plants, distribution centers, and jobs away from California.

IMPLICATIONS FOR COMPETITIVENESS AND POTENTIAL IMPROVEMENTS

Competitiveness is a matter of degree rather than a dichotomy. California's competitiveness varies depending on the type of decision being made, the industry sector and products involved, and the location within California.

- California is highly competitive in sectors where its resources, products, markets, and capabilities are difficult to match elsewhere. Examples include unique agricultural products and high-technology research and development. While freight mobility is a minor factor in some of these sectors, mobility needs must also be considered due to the time-sensitivity or high-volume movement of these goods.
- California is much less competitive for businesses or functions that can be readily located elsewhere and that are vulnerable to high transportation, labor, land, or utility costs. Distribution is one such sector, and distribution centers that do not need to be near California markets or ports are increasingly likely to locate elsewhere. Freight mobility can be a significant factor in such sectors.

California is currently attracting and will continue to attract business activity tied to specific state industry clusters, such as the high-tech or green energy sectors. California is in a unique or advantageous competitive position in those cases. The State is also experiencing and will continue to experience "organic" growth in businesses and establishments serving the population. For the most part, businesses seeking to serve California customers will continue to have a physical presence in the State.

Some of the perceived losses of economic activity and market share are resultant of exogenous logistics developments and strategies. Wider Panama Canal locks have reduced the cost of shipping from Asia to the East Coast compared to the West Coast, and port market shares have shifted in response. As import volumes grow and import supply chains mature, importers have established multiple import routes and facilities, again reducing California's market share.

The measures and initiatives that can improve California's competitiveness through increased capacity efficiency, reliability, and efficiency are the same as those that can improve performance for California's own needs. For example, public agencies might improve the state's competitiveness on trucking costs by:

- Increasing capacity efficiency on state highways and local roads to reduce congestion

- Deploying ITS technologies to reduce congestion and trucking costs
- Providing greater financial assistance to ease emissions limits, clean truck requirements, and clean fuel taxes (alignment to State objectives)
- Reducing truck driver time spent at marine terminals and other freight facilities
- Improving truck driver training to increase the supply of drivers
- Increasing the supply of truck parking in public locations

The State's competitiveness is affected by several non-transportation factors identified through the CFMP industry focus groups. These factors include the following:

- Workforce availability and cost of living
- Land and development costs and uncertainty
- Environmental regulations
- Lack of linkage between goods movement and economic development efforts

Increased competitiveness in these areas will require policy initiatives and actions outside of the freight transportation sphere.

Freight Carrier Industry Workforce

WORKFORCE

America's workforce is experiencing significant changes as "baby boomers", people born between 1944 and 1964, continue to retire, and with many retiring early. Seventy million people are estimated to retire in the U.S. within the next decade, which will have massive impacts on industries and economy throughout the country. As companies address the issue of an aging workforce, some companies are implementing retention and succession planning, as well as additional incentive strategies, such as job-sharing, flextime, telecommuting, and part-time work. All levels of employment are undergoing constant change and face great challenges and opportunities as new technologies are developed and are applied throughout the freight industry. Freight modal, supply chain, and logistics industries will need to implement more transitional training to reskill displaced workers.

TRUCKING

Truck driver employment falls into following categories: Delivery Driver, Driver, Line Haul Driver, Log Truck Driver, Over the Road Driver (OTR Driver), Production Truck Driver, Road Driver, Semi Truck Driver, and Tractor Trailer Operator. In 2021, the California workforce consisted of 179,450 Heavy and Tractor-Trailer truck drivers. Most of those drivers work in the Los Angeles-Long Beach-Glendale Metropolitan Division and the Riverside-San Bernardino-Ontario Metropolitan Statistical Area (MSA), with 49,540 and 38,240 employed respectively. Between the years of 2016 and 2026, the U.S. Department of Labor projects 18,200 annual job openings for Heavy and Tractor-Trailer truck drivers. With stricter enforcement of HOS regulation, the industry will need more drivers and trucks to do the same amount of work due to the need for breaks and limited HOS flexibility.

Drivers are either paid a salary, paid hourly, or paid by the mile. Drivers specializing in heavy hauling or hauling low boys (low deck semi-trailers with a drop-in deck height), household moving services, cattle, hazardous materials, or refrigerated units are often paid more. For trucking companies that are unionized, employees are typically represented by the International Brotherhood of Teamsters Union. As of May 2021, California's median yearly wage for a Heavy and Tractor-Trailer truck driver was $49,030.[26] Variability and differences in local minimum wage laws creates monitoring and compliance challenges since drivers may be subjected to multiple minimum wages during a single trip.

According to the Heavy-Duty Trucking (HDT) Fact Book[27] 2022 the average driver turnover rate at large truckload carriers (those with more than $30 million in annual revenue) was slowing: it fell from 90 percent in 2020 to 89 percent in 2021 then to 78 percent at current. A carrier with 100 drivers and an 87 percent turnover rate could spend nearly $500,000 on recruitment and replacement annually. Carriers are focusing on truck driver development, not just recruitment, to gain greater control over the stability and quality of their workforce and capacity, while reducing driver turnover rates.

At the same time, trucking firms are raising driver pay – sometimes multiple times in a year. In the U.S., the average age of a commercial truck driver is 55. Currently, there are roughly 78,000 unfilled truck driving jobs, four percent decrease from a record 81,258 in 2021. However, this improvement is expected to be temporary, and these numbers will continue to climb. The current long-haul driver shortage is due to an 18-year low U.S. employment rate of 3.9 percent (as of September 2022), as well as higher-paying employment alternatives to truck driving form a barrier to recruitment. According to the U.S. Bureau of Labor and Statistics (BLS), the economy added on average 216,000 non-farm jobs a month in 2022. However, employment in transportation and warehousing only increased by 8,200. Driver shortage and turnover is a function of California's high cost of living, insurance costs, regulations, lack of experienced drivers, and interested but unqualified persons. Many trucking companies are actively recruiting military veterans, and many truck driving schools are also actively recruiting veterans to get training for their commercial driver's license using the Servicemen's Readjustment Act of 1944 (also known informally as the GI Bill) or other veteran's educational benefits. Formal education is not a requirement for seeking and obtaining a truck driver position. However, important skills and knowledge are necessary.

Lastly, truck parking availability also contribute to truck driver demand. Due to state and federal HOS regulations, truck drivers spend a significant amount of time searching for authorized parking, thereby reducing the productivity of the trip. By increased truck parking, there will be greater truck driver efficiency that may reduce the demand for truck drivers.

RAIL

The railroad industry's response to the aging workforce is to actively recruit military veterans for both Class I and short line railroads. Veterans transition favorably to rail positions because they respond well to a chain of command, have experience working in teams, can either bring a unique skill set or modify their skill sets to meet rail industry needs, and importantly, have been well-trained for safety. According to the American Association of Railroads (AAR), nearly 20 percent of current U.S. railroad employees are veterans.[28] Sacramento City College and San Diego City College (SDCC) offer Railroad Operations associate degrees and certificate programs, SDCC offers an apprenticeship program in Railroad and Light Rail Operations, and apprenticeship programs and web-based training are offered by various organizations, such as the International Union of Operating Engineers and the Teamsters Apprenticeship Fund for Southern California.

The Class I and short line railroads provide railroad careers that tend to be relatively stable. Railroad employees are also among the best-paid workers in American industry. However, some short line railroads find it difficult to recruit employees due to the requirement for multiple skills and lower wages than Class I railroads. America's major freight railroads supports 1.5 million jobs, nearly $274 billion in output, and $88 billion in wages across the U.S. economy.[29]

Currently, California is home to 8,270 freight railroad employees, with an average wage and benefits package of $123,680 per employee.[30] According to AAR, in 2020, there were approximately 165,000 freight railroad employees in the U.S., and the average U.S. Class I freight railroad employee earned $135,700 (including fringe benefits). Approximately 82 percent of Class I rail employees and more than half of non-Class I rail employees are unionized under one of more than a dozen labor unions. Labor relations in the rail industry are subject to the Railway Labor Act (RLA). Under the RLA, labor contracts do not expire. Rather, they remain in effect until modified by the parties involved through a complex negotiation process which can take years to conclude.

MARITIME

Maritime careers include shipping and transportation, navigation, engineers, offshore operations, technology, shipbuilding and repair, port and marine terminal operations, clerical, and others. In the ocean shipping industry, two primary organizations represent labor and cargo carriers on the West Coast ports. Labor is represented by the International Longshore and Warehouse Union (ILWU). Domestic carriers, international carriers, and stevedores that operate in California, Oregon, and Washington are represented by the Pacific Maritime Association (PMA). Members of the PMA hire workers represented by the ILWU. PMA members employ longshore, clerk, and foreman workers along with thousands of "casual" workers, who typically work part-time.

The terms of employment are governed by labor contracts that are periodically negotiated between the two organizations, and the results are applied to all U.S. West Coast ports. Similar processes and organizations are found in the country's other maritime regions. When agreements cannot be reached, as happened in 2002 on the West Coast, strikes or lockouts can occur, which may severely disrupt the entire freight movement system and sometimes have lasting impacts as shippers permanently redirect their products to ports in other regions or countries. Tens of thousands of trucking, railroad, warehouse, and support workers may be temporarily out of work because strikes and lockouts stop the flow of goods that other sectors handle. The 2002 dispute was estimated to cost the U.S. economy $1 billion per day.

As of November 2022, PMA members employed 15,656 registered union workers at 29 West Coast ports in California, Oregon, and Washington, and thousands more workers who typically worked part-time. Since the signing of the 2002 agreement that brought the widespread use of technology to the West Coast, the registered workforce has increased by 36 percent[31].

The Maritime Administration nationally provides limited funding to six state maritime academies. One such academy, the California Maritime Academy (Academy), is part of the California State University System and is the only Maritime Academy on the West Coast. The Academy prepares students for careers in international business and logistics, marine engineering technology, global studies and maritime affairs, marine transportation, mechanical engineering, and facilities engineering technology. The nation's maritime academies educate young men and women for service in the American merchant marine, the U.S. Armed Forces, and in the nation's intermodal transportation system. Located in Vallejo, the Academy's enrollment is currently at approximately 925 students (as of June 2022).

AIR CARGO

In the aeronautics industry, the Federal Aviation Administration (FAA) increased the retirement age from the previous mandatory retirement at 55 years old to 65 years old for scheduled pilots. The FAA also instituted a new rule requiring scheduled pilots to get a minimum amount of uninterrupted rest – at least 10 hours between shifts. This will impact the movement of belly cargo, but the rule does not apply to cargo pilots. Many cargo pilots are pushing to be included in this regulation; however, the FAA has not yet applied this to the cargo industry and is still considering the matter. Consensus across the industry (pilots, air traffic controllers, airport managers, etc.) appears to be that the rate of retirement may hinder the development and operations of aviation activity. The FAA uses the Veterans Recruitment Appointment (VRA) program, which acts as a hiring authority to expedite the hires of veterans.

The air cargo pilot employment falls into at least three different categories: Airline Pilots, Copilots, and Flight Engineers. The definition includes, "Pilot and navigate the flight of fixed-wing, multi-engine aircraft, usually on scheduled air carrier routes, for the transport of passengers and cargo. Requires Federal Air Transport Pilot certificate and rating for specific aircraft type used. Includes regional, national, and international airline pilots and flight instructors of airline pilots." In 2021, the annual mean wage for California airline pilots, copilots, and flight engineers was $227,870. The mean wage across the U.S. was $220,180.[32] The projected annual job openings between 2021 and 2031 is 1,800 jobs within California, and 7,700 jobs across the U.S. As of 2021, there were 8,070 airline pilots in California and 87,600 in the U.S.

California's freight industry needs to increase efficiency to remain economically competitive, and to improve environmental sustainability while retaining high paying jobs and educating/increasing training for the freight industry workforce so that the industry can successfully transition for continued success going forward.

Freight Dependent and Support Industry Workforce

Freight plays a significant role in supporting California's $3.4 trillion economy. Technology and the use of artificial intelligence (AI) can increase productivity, cut operation costs, and increase a customer's experience and satisfaction. All industries rely on safe and efficient movement of goods, whether by road, sea, rail, or air. There are some industries, however, where this movement is essential to the sector's competitiveness and ability to operate. According to the Southern California Association of Governments (SCAG), "goods movement-dependent industries are defined as industries that operate frequent inbound and outbound freight vehicle trips and costs associated with goods movement, and the also have sizable impact on their business expenses. Key industries include construction, manufacturing, wholesale trade, retail trade, and transportation and warehousing."[33] Altogether, these industries employed roughly 5.3 million Californians in 2022, which grew compared to 2018 employment figures. The California agriculture industry is also heavily reliant on efficient and dependable freight transportation. These industries rely upon agriculture products, raw materials, semi-finished and finished products to warehouse, and processing distribution centers before they are moved to final locations to be consumed.

CONSTRUCTION

The construction industry was hardest hit during the Great Recession. The industry has rebounded in recent years as the economy continues to grow. As of September 2022, the California construction industry employed 930,100 people and its GDP was valued at roughly $92 billion.[34]

The passage of SB 1 in 2018 helped secure additional funding for local and regional transportation projects, which in turn helps the construction industry. The State will need to ensure that funding continues to keep pace with the level of maintenance required and that the freight transportation system continues to operate.

TRANSPORTATION AND WAREHOUSING

The transportation and warehousing sectors currently employ 783,000 Californians[35]. The warehousing jobs that make up this sector rely on freight movement to receive and ship goods to and from the warehouses and storage facilities. Warehousing is meant to act as a storage facility and intermediary between the various links in a supply chain. Warehousing incorporates diverse purposes, such as storage, bulk storage, and transloading. Warehouses can also be distribution centers, where functions such as sorting, palletizing, pick and packing, labelling, assembly, and wrapping of goods occur before shipment to retailers or consumers directly. Warehousing relies on efficient, reliable, and resilient transportation to ensure prompt delivery and pick-up of goods. Efficient goods movement ensures that warehouse capacity is neither over-filled nor empty, otherwise it will result in monetary losses by the warehouse operators, and it will negatively disrupt downstream operations.

3

Chapter 3: Existing Freight System Conditions & Performance-Based Needs Assessment

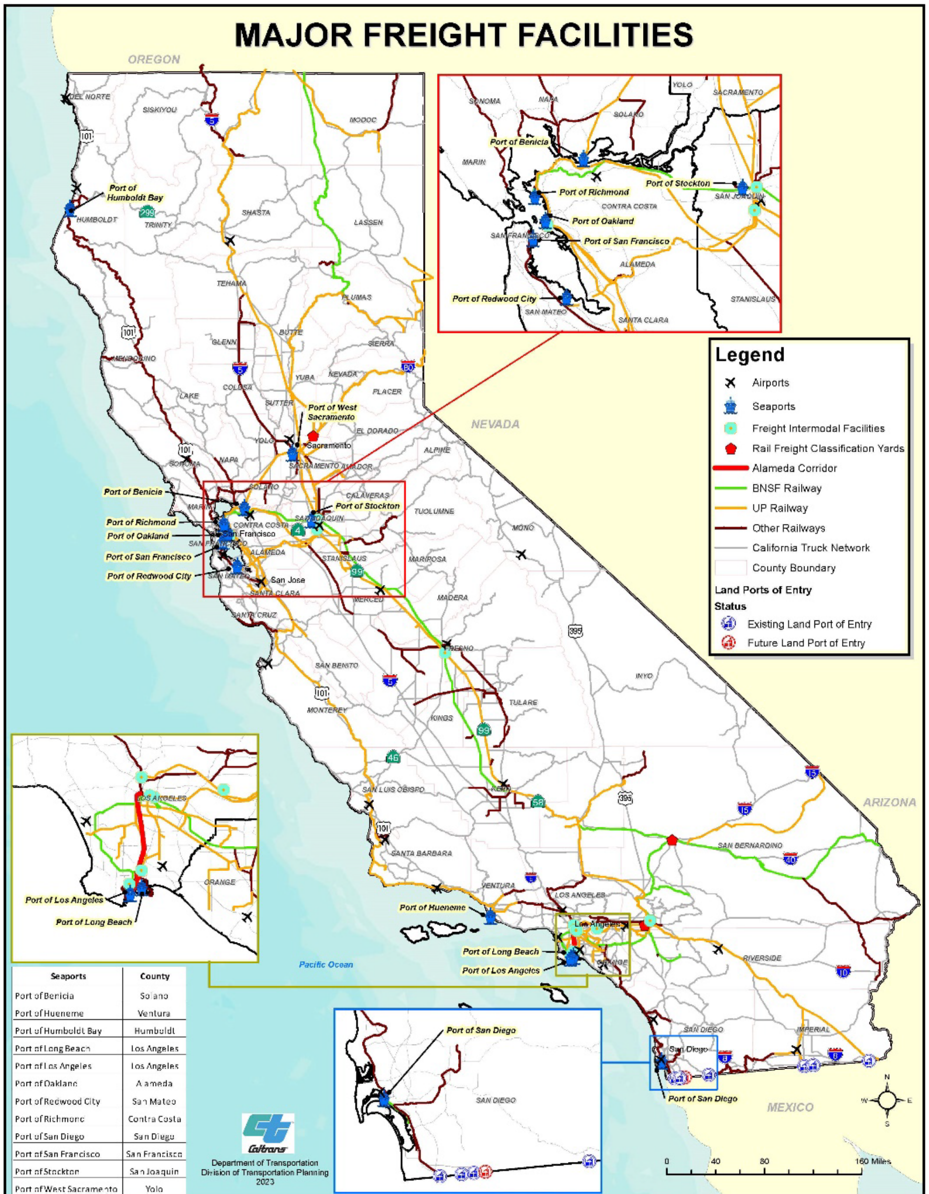
FREIGHT PLAN
California Freight Mobility Plan

3A. Existing Freight System Assets

California has one of the most extensive, complex, and interconnected freight systems in the nation. With a rich history of freight infrastructure development dating to the opening of the first transcontinental railroad in 1869, California's freight network has become a vital economic force that connects the state to the rest of the country and the world. According to the California Chamber of Commerce, California's economy is the 5th largest in the world, poised to become the 4th, and the State's freight network plays a major role in securing its global economic position.[36]

In 2021, California exported to 226 foreign markets, valued at approximately $175.12 billion,[37] up from $155.9 billion in 2020 and $173.8 billion in 2019.[38] The freight system also facilitates commerce internally. The State's current core freight system is comprised of 1 private and 11 public deep-water seaports, numerous private port and terminal facilities, 12 airports with major cargo operations, 2 Class I railroads and 27 short line railroads operating over approximately 6,500 miles of railroad track, approximately 5,800 miles of high traffic volume Interstate and State highways, seven existing and one future commercial land border ports of entry (POE) with Mexico, intermodal transfer facilities, approximately 19,390 miles of hazardous liquid (includes crude oil, refined petroleum products, and other highly volatile liquids) and natural gas pipelines, a vast warehousing and distribution sector, and numerous local connector roads that complete the "last mile."

Maintaining and modernizing this extensive freight system requires continuous investment. Ports and their navigation channels must be dredged for ever larger ships; railroad track must be upgraded to handle heavier loads and faster trains; highway pavement must be strengthened to handle more trucks with more cargo; airports must balance passenger and air-freight demands; and innovative technologies must be developed and applied across the entire industry to improve efficiency and reduce costs. California must meet these daunting needs while also ensuring community and environmental impacts are avoided, minimized, or mitigated. At the same time, California must also meet the challenge of maintaining international competitiveness and retaining millions of freight related jobs.



Seaports	County
Port of Benicia	Solano
Port of Hueneme	Ventura
Port of Humboldt Bay	Humboldt
Port of Long Beach	Los Angeles
Port of Los Angeles	Los Angeles
Port of Oakland	Alameda
Port of Redwood City	San Mateo
Port of Richmond	Contra Costa
Port of San Diego	San Diego
Port of San Francisco	San Francisco
Port of Stockton	San Joaquin
Port of West Sacramento	Yolo

Freight Intermodal Facilities	City	County
City of Industry Intermodal Facility (UP)	City of Industry	Los Angeles
Fresno Intermodal Facility	Fresno	Fresno
ICTF Long Beach (UP)	Long Beach	Los Angeles
Los Angeles Intermodal Facility (UP)	City of Commerce	Los Angeles
Los Angeles Transportation Center (UP)	Los Angeles	Los Angeles
Lathrop Intermodal Facility	French Camp	San Joaquin
Oakland International Gateway Intermodal Facility (BNSF)	Oakland	Alameda
On-Dock Intermodal Facility (PHL)	Wilmington	Los Angeles
Railport Intermodal Yard (UP)	Oakland	Alameda
San Bernardino Intermodal Facility	San Bernardino	San Bernardino
Santa Fe Hobart Yard (BNSF)	Los Angeles	Los Angeles
Stockton Intermodal Facility	Stockton	San Joaquin

Airports with Major Cargo Operations
Bob Hope (Burbank) Airport (BUR)
Fresno Yosemite International Airport (FAT)
John Wayne Airport, Orange County Airport (SNA)
Long Beach Airport Daugherty Field (LGB)
Los Angeles International Airport (LAX)
Metropolitan Oakland International Airport (OAK)
Ontario International Airport (ONT)
Sacramento International Airport (SMF)
San Diego International Airport (SAN)
San Francisco International Airport (SFO)
San Jose International Airport, Norman Y. Mineta (SJC)

Ports of Entry	Route	County	Status
Andrade	186	Imperial	Existing
Calexico East	7	Imperial	Existing
Calexico West	111	Imperial	Existing
Cross Border Xpress	0	San Diego	Existing
Otay Mesa	905	San Diego	Existing
Otay Mesa East	11	San Diego	Future
San Ysidro	5	San Diego	Existing
Tecate	188	San Diego	Existing

Figure 3.1: Major Freight Facilities in California. (Source: Caltrans, 2023)

California's freight assets include an extensive inventory of infrastructure that is essential for supporting the multitude and diversity of freight dependent industries within the state. The smooth functioning of California's complex freight system depends on a series of interconnected facilities working in concert with one another. Each system component is typically owned and operated by a different public or private organization, often in competition with other organizations that have similar facilities. Seaports compete against each other for domestic and international business. The Class I railroads that serve California are the nation's two largest railroads and are competitors, yet they also often coordinate their operations to safely share the same track. And like the railroads, each trucking company is in competition with many other trucking and logistics firms and owner/operators. **Figure 3.1** highlights California's major freight facilities.

Freight Highway Assets

NATIONAL HIGHWAY SYSTEM (NHS)

According to the FHWA, the National Highway System[39] consists of roadways important to the nation's economy, defense, and mobility. The NHS includes the following subsystems of roadways (note, a specific highway route may be designated on more than one subsystem):

- Interstate: The Eisenhower Interstate System of highways retains its separate identity within the NHS.
- Other Principal Arterials: These are highways in rural and urban areas which provide access between an arterial and a major port, airport, public transportation facility, or other intermodal transportation facility.
- Strategic Highway Network (STRAHNET): This is a network of highways which are important to the United States' strategic defense policy and which provide defense access, continuity and emergency capabilities for defense purposes.
- Major Strategic Highway Network Connectors: These are highways which provide access between major military installations and highways which are part of the Strategic Highway Network.
- Intermodal Connectors: These highways provide access between major intermodal facilities and the other four subsystems making up the National Highway System. Within California, there are currently 122 miles.[40]

NATIONAL HIGHWAY FREIGHT NETWORK IN CALIFORNIA

The National Highway Freight Network (NHFN) consists of the following subcategories: The Primary Highway Freight System (PHFS) including routes and connectors, portions of the Interstate System not part of the PHFS (non-PHFS), Critical Rural Freight Corridors (CRFC), and Critical Urban Freight Corridors (CUFC). The CRFCs and CUFCs are important freight corridors that provide critical connectivity to the NHFN. **Table 3.1** shows the four California freight systems and their respective total lengths in miles. The full list of routes and facilities that comprise the various systems is presented in **Appendix D**.

One of the more dynamic components advised through Federal statue is the process of designating the critical corridors initiated by Metropolitan Planning Organizations (MPO) for CUFCs and initiated by Caltrans for CRFCs. Designating CUFCs and CRFCs is a collaborative effort and all miles must be certified by the FHWA. For the CUFC/CRFC Designation Process, refer to **Appendix E**.

Table 3.1: National Highway Freight Network in California

Freight System	Total Length (Miles)
California Primary Highway Freight System (PHFS)	3126.28
California Non-PHFS Interstate Highway	352.12
Critical Urban Freight Corridors	192.3
Critical Rural Freight Corridors	101.2

As stated above, California has a vast inventory of freight assets, allowing the State to support various freight dependent industries and making it a top competitor with neighboring states such as, Oregon, Nevada, and Arizona. **Table 3.2** compares California's PHFS miles, Truck VMT, and Rail Miles with its neighboring states.

Table 3.2: California's Freight Movement Compared to Neighboring States

State	PHFS (Miles)[41]	Truck VMT* (% of State's total VMT)[42]	Rail Miles[43]
California	3126.28	20.9%	4,828
Oregon	775.32	32.1%	2,382
Nevada	572.79	21.4%	1,193
Arizona	1025.62	24.9%	1,820
****Truck VMT are listed as a percentage of the respective State's total VMT.***			

Intermodal connections are an essential consideration in the discussion of freight movement within California. These connections provide access to intermodal facilities where transloading of freight occurs between multiple modes, allowing for the least amount of handling and overall delay. Intermodal connectors are generally associated with airports, seaports, rail yards, and warehousing facilities where the transfer of freight is completed on-site. The access to and from these intermodal facilities is typically located along local roadways which connect to Interstate and State Highway freight corridors and serve as the "last mile" for freight movement.

Often these local arterials and roadways have not been designed to accommodate the largest combination vehicles and are not designated Surface Transportation Assistance Act (STAA) routes. The STAA directs US DOT to create the National Network (NN) where States would be required to allow the operation of tractors with single and double trailers; it covers about 150,000 miles.[44] Additionally, they are not engineered to accommodate the amount of Average Annual Daily Truck Traffic (AADTT) that exists on the roadway either. Despite this, some of the roadways have among the highest AADTTs in the state. Many of the environmental and community impacts from freight can be most prevalent along these local intermodal connectors shown in **Table D.2** in **Appendix D**. In addition, **Table D.4** in **Appendix D** lists California's freight intermodal connectors organized by type (truck/rail, truck/pipeline, port terminal, and airport) designated on the NHS.

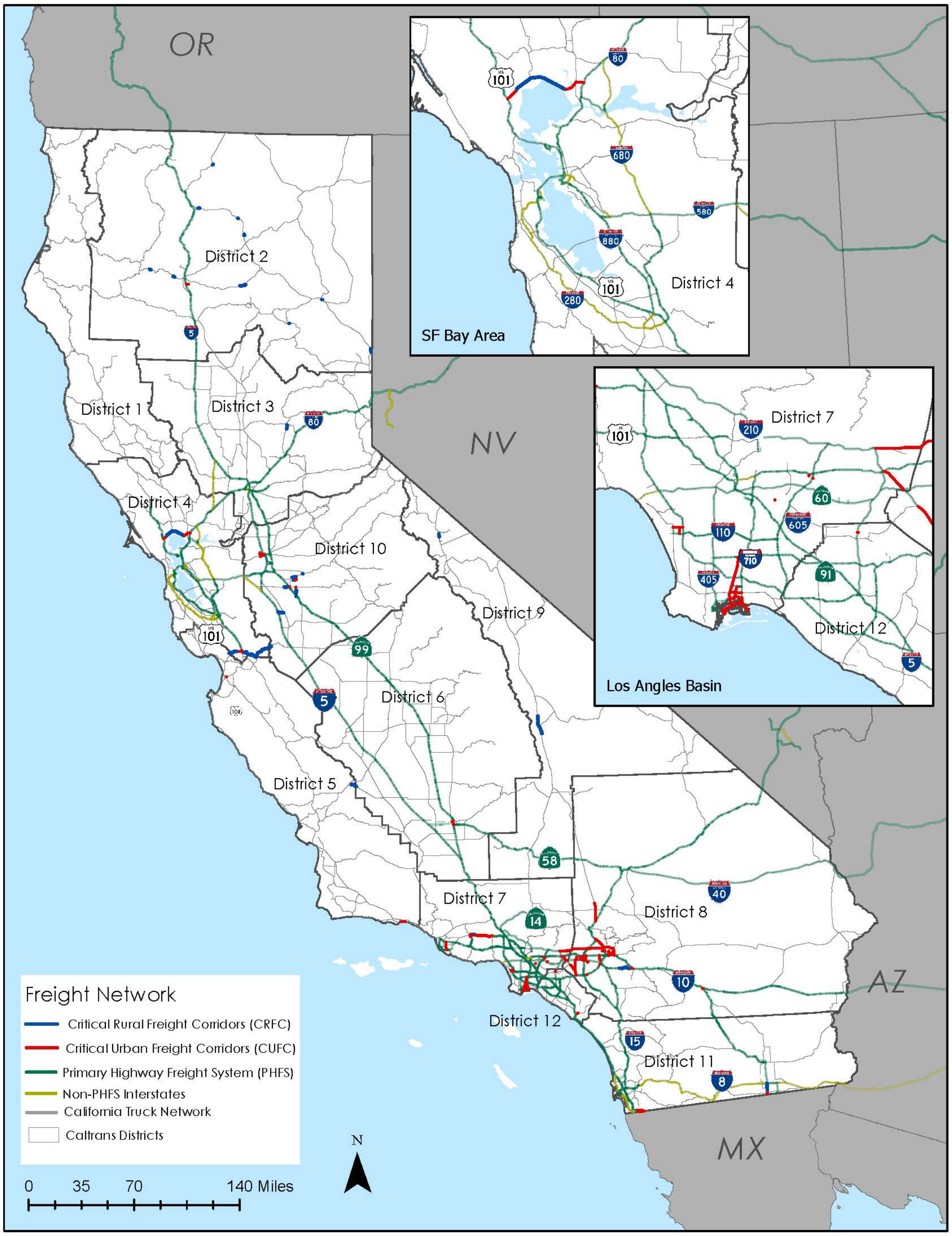


Figure 3.2: National Highway Freight Network and CA Freight Network in California. (Source: Map produced using data from FHWA Freight Management and Caltrans, 2022)

Interregional Transportation Strategic Plan (ITSP) 2021

The ITSP provides guidance for the identification and prioritization of interregional transportation improvements. Projects identified are eligible for Interregional Transportation Improvement

Program (ITIP) funding. The 2021 ITSP expanded the analysis from focusing on ITIP investment in interregional highways and intercity rail to analyzing the entire interregional transportation system regardless of funding source. The purpose of the ITSP is to be a guiding document for all investments in the interregional transportation system. The 11 ITSP Strategic Interregional Corridors comprise a subset of legislatively designated interregional routes, known as the Interregional Road System (IRRS). California's IRRS includes key corridors for the movement of freight and people within the state and is currently considered Caltrans' priority for the allocation of interregional funds. **Figure 3.3** shows all Strategic Interregional Corridor areas identified on California's Highway Freight Network. [45]

Although Caltrans has designated the Strategic Interregional Corridors for funding priority, funding has not kept pace with the costs of meeting growth demands and improving system performance and safety; the estimated cost to improve selected locations on this highway system in most of the 11 Strategic Interregional Corridors is in excess of $10 billion.[46] The 2021 ITSP identifies I-5, SR 99, and I-10 as having some of the highest truck volumes in the nation outside of urbanized areas. These routes have higher than average volumes of large, long-haul trucks using all lanes for travel and passing, which creates potential safety and capacity problems for interregional travelers who also use those routes.

Trucking is the most commonly used mode for California's freight transportation and trucks transport almost all freight and services during some point within the supply chain. For this reason, the trucking industry is one of California's most valuable freight assets, particularly for the "first and last mile" of a trip. California must continue to develop, maintain, and operate a safe, efficient, and reliable freight transportation network to accommodate the truck volumes necessary to move freight within the state.

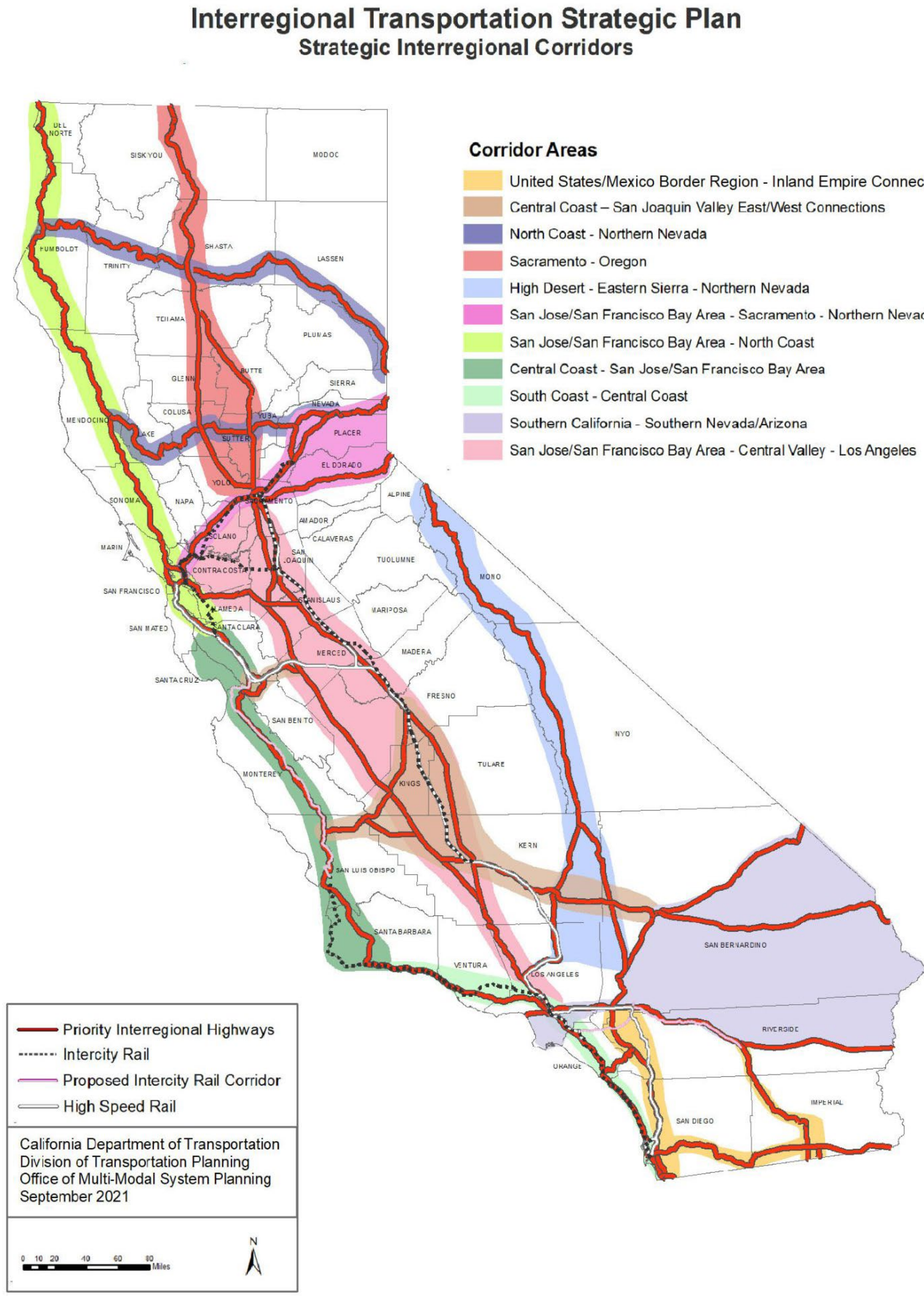


Figure 3.3: Strategic Interregional Corridors. (Source: Caltrans, Interregional Transportation Strategic Plan 2021)

INTERNATIONAL BORDER CROSSINGS

In 2019, US Congress approved the United States-Mexico-Canada Agreement (USMCA) signed by President Trump in 2020. The agreement updates the North American Free Trade Agreement (NAFTA), which governed more than $1.2 trillion worth of trade among the three nations. The USMCA will create more balanced, reciprocal trade that supports high-paying jobs for Americans and grows the North American economy. Some highlights of the agreement include:

- Creating a more level playing field for American workers, including improved rules of origin for automobiles, trucks, other products, and disciplines on currency manipulation.
- Benefiting American farmers, ranchers, and agribusinesses by modernizing and strengthening food and agriculture trade in North America.
- Supporting a 21st Century economy through new protections for U.S. intellectual property and ensuring opportunities for trade in U.S. services.

California and Mexico share over 130 miles of international border, consisting of the southernmost portions of San Diego and Imperial Counties. This California-Baja California region represents the largest integrated economic zone along the U.S. Mexico Border.[47] According to the California Chamber of Commerce in 2019, Mexico became the United States' top trading partner. Since NAFTA was signed in 1994, trade between the two countries has increased by more than 225%. Following the signing of USCMA, cross-border trade flows have increased to more than $68 billion in the California-Baja California region alone – a figure amounting to more than $1 million of goods and services traded per minute.[48,49] The commercial land border ports of entry (POEs) are the main arteries for freight movements between the two nations. California's multimodal state freight system includes all of the existing and future commercial land border POEs between California and Mexico, which include Otay Mesa (SR 905), Otay Mesa East (SR 11) - a future commercial land border POE currently under construction, Tecate (SR 188 and SR 94) in San Diego County, and Calexico East (SR 7) in Imperial County. **Figure 3.4** provides information for California-Mexico land border POEs.

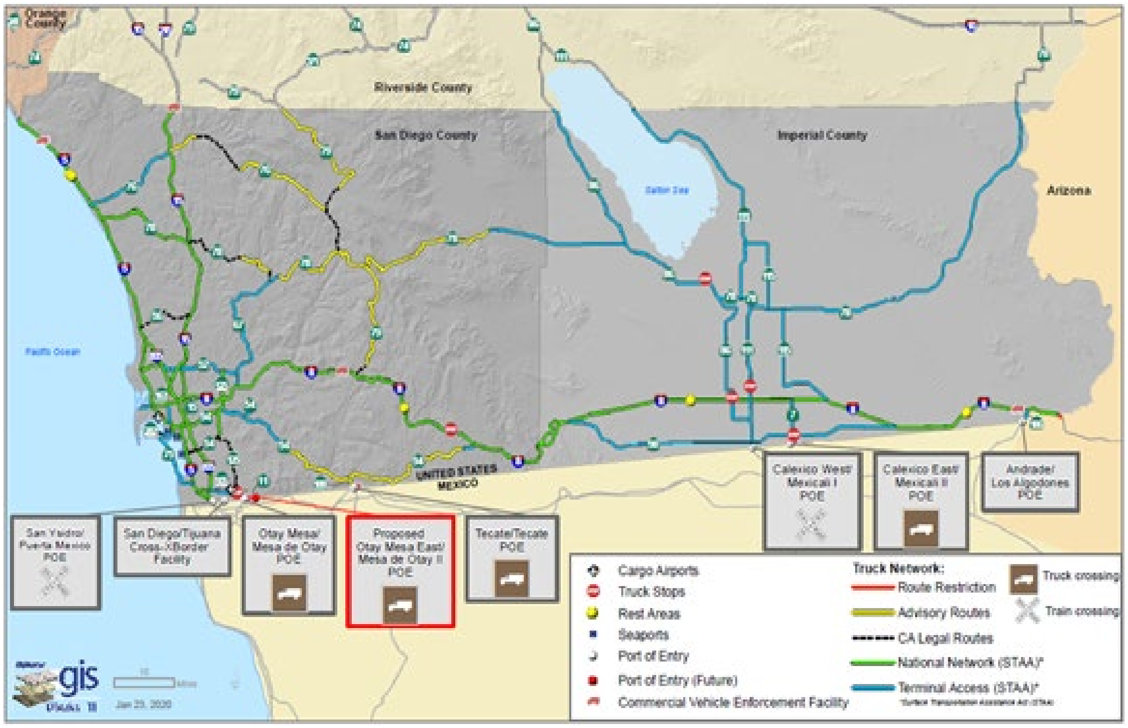


Figure 3.4: Major Freight Facilities along the California-Baja California Border (Source: Caltrans 2023)

Otay Mesa POE in San Diego County and the Calexico East POE in Imperial County are the two main California-Mexico freight gateways. The Otay Mesa POE is the third busiest commercial land border POE on the U.S.-Mexico border by trade value and the busiest commercial land port in California. Major commodities transported between California and Mexico through the POE include plastic; rubber; pulp; paper; allied products; electronics; electrical machinery, equipment, and supplies; automobiles and light duty trucks; food; grain products; and farm products. Projections for northbound commercial vehicle volumes in the California-Baja California region estimate 178% overall growth from 1.2 million in 2015 to nearly 3.4 million in 2040. About 27% of the future total (about 900,000) is expected to be processed at the future Otay Mesa East facility, while Otay Mesa, Calexico East, and Tecate are anticipated to process the remaining 50%, 20%, and 3% of the 2040 annual total, respectively.[50]

The future Otay Mesa East POE represents two decades of work that has brought together state, federal, regional, and local stakeholders. A tolled highway (SR 11) will provide access to the future Otay Mesa East POE on the California side with construction of the final segment breaking ground Summer 2022 and expected completion in 2024. The POE is expected to generate a benefit-cost ratio of 10 to1, meaning for every dollar spent on the project there would be $10 in benefits to California realized. This new POE will help reduce freight and passenger traffic congestion at the San Ysidro, Otay Mesa, and Tecate POEs, as well as provide additional capacity for future growth by providing a new alternative for freight operators traversing the California-Mexico border. The POE will be the nation's first transformative land POE to integrate a suite of innovative technologies designed to improve regional security and safety, bolster binational economic productivity and goods movement, provide resiliency to the border transportation network, reduce greenhouse gas emissions, and enhance health in surrounding environmental justice communities.

ROADWAY BRIDGES

According to the Caltrans 2021 State Highway System Management Plan, California's SHS includes approximately 13,246 lane miles of bridges and tunnels[51]. These highway bridges have an average age of 48 years. New bridges are designed with an expected design life of 75 years. Bridge health is critical to freight movement because bridge closures can redirect trips – lengthening travel time, wasting fuel, reducing efficiency, and delaying emergency deliveries and services. Detailed information about bridge performance and vertical clearance restrictions is presented in **Chapter 3B**.

TRUCK PARKING

According to the FWHA report 'Jason's Law Truck Parking Survey Results and Comparative Analysis,' California is one of three states in the nation with the lowest rates of commercial vehicle truck parking spaces per 100,000 miles of daily combination truck VMT. The lack of available truck parking is a national safety concern, observed most notably in the number of crashes involving a parked truck. **Figure 3.5** shows the number of crashes involving a parked truck between 2014 and 2018 and **Figure 3.6** shows where those crashes occurred statewide. Demand for truck parking continues to increase as industries pivot from brick-and-mortar stores to online shopping and home delivery-- straining an already over-burdened goods movement system.

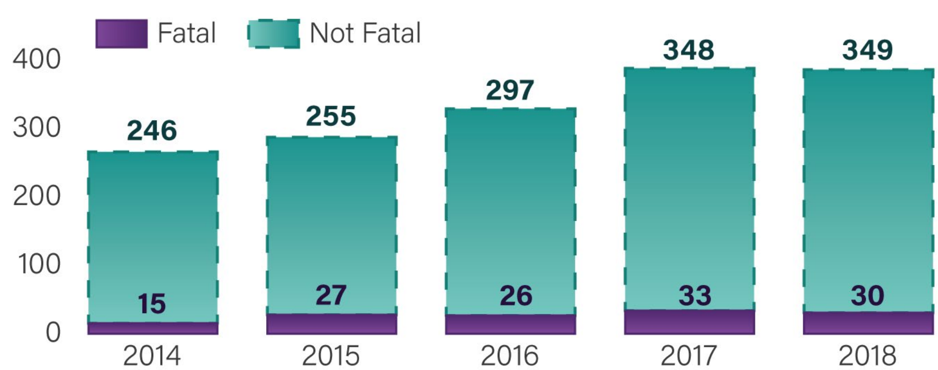


Figure 3.5: Statewide Crashes Involving a Parked Truck, 2014-2018. (Source: California Statewide Truck Parking Study, 2022)

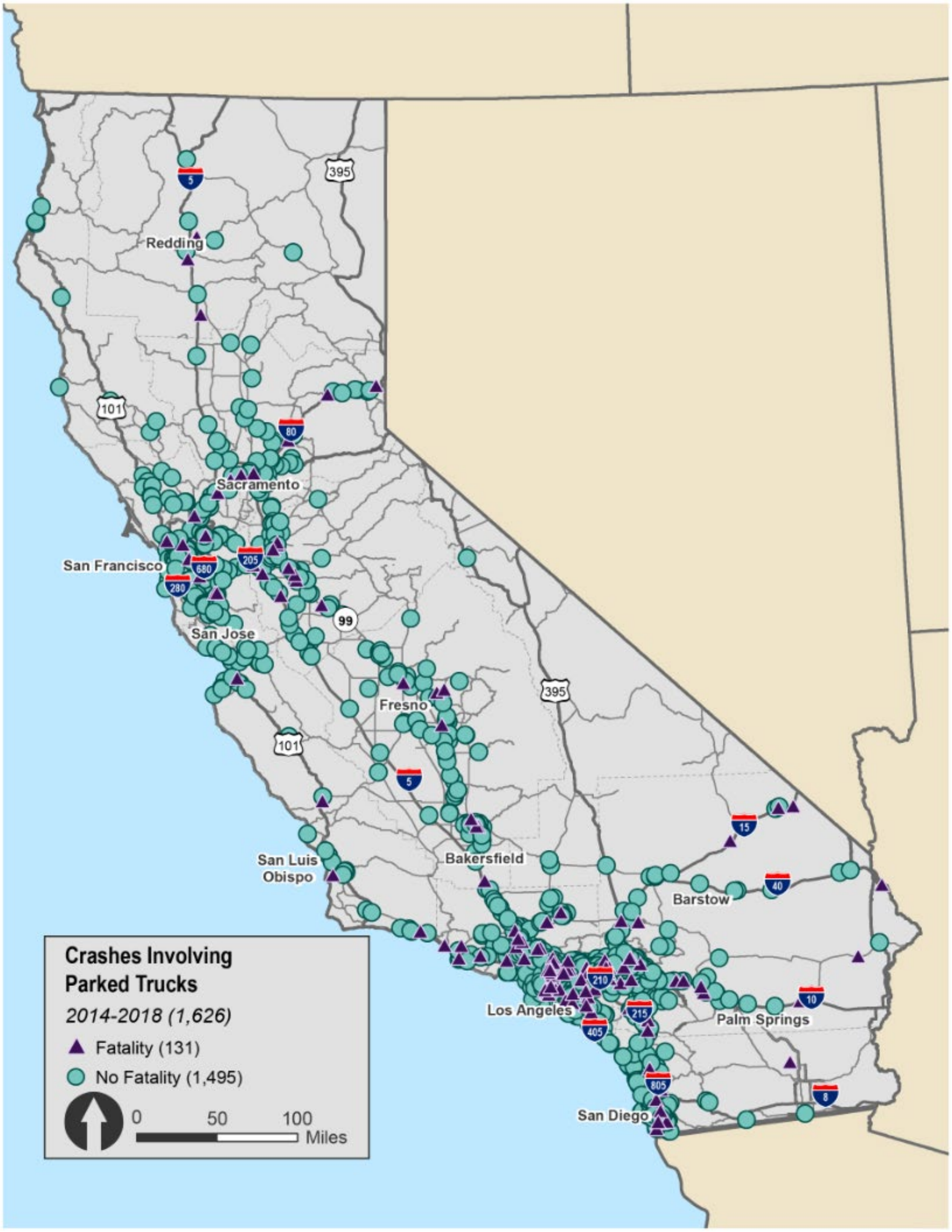


Figure 3.6: Statewide Crashes Involving a Parked Truck, 2014-2018. (Source: California Statewide Truck Parking Study, 2022)

In addition to safety concerns, truck drivers searching for parking leads to unnecessary fuel consumption and contributes to air and noise pollution and greenhouse gas (GHG) emissions. These effects are exacerbated in neighborhoods and cities that experience frequent truck parking in undesignated areas, many of which are equity priority communities (EPCs).

Demand for truck parking continues to increase as industries pivot from brick-and-mortar stores to online shopping and home delivery, straining an already over-burdened goods movement system. California has high levels of truck parking in absolute terms but has low levels relative to truck VMT, NHS miles, and GDP; and also has notable shortages at private truck stops.[52]

According to the MAP-21 Section 1401, more popularly known as Jason's Law, DOTs are required to address the national truck parking shortage at public and private facilities along U.S. highways. FHWA conducted the first round of the Jason's Law Truck Parking survey in 2015.[53] The survey identified several parking indicator metrics to evaluate the supply and demand for truck parking in each state. However, California has very high demand for truck parking, and about 40 percent of truck drivers indicated that they perceive a shortage of truck parking in the state. California ranked in the lower quartile among all states for five metrics:

- Public Spaces per 100K Daily Truck VMT
- Private Spaces per 100K Daily Truck VMT
- All Spaces per 100K Daily Truck VMT
- Public Spaces per 100 miles of NHS
- Spaces per Million GDP

According to the California Statewide Truck Parking Study, 264 of the 274 public and private truck parking sites in California have parking data available. Of those, about half are nearing, at, or over capacity meaning that at least 70% of the available spaces are full during peak demand (see **Figure 3.7**). Truck parking demand is typically highest overnight, and facilities often are at or over capacity during these hours. Statewide, the peak hour for truck parking is from 12:00 a.m. to 1:00 a.m., although the peak hour varies by specific locations. **Table 3.3** shows the peak hour truck parking space shortage or surplus by Caltrans district.

Figure 3.7: Demand at Designated California Truck Parking Locations. (Source: California Statewide Truck Parking Study, 2022)

Table 3.3: Peak Hour Truck Parking Space Shortage or Surplus by District

District	Parking Supply	Total Parking Demand (Designated and Undesignated)	Peak Hour Shortage or Surplus	Shortage or Surplus as a Percentage of Supply
1- North Coast	87	20	67	77%
2- Redding	1,220	1,096	124	10%
3- Sacramento	1,032	1,601	-569	-55%
4- Bay Area	983	1,491	508	-52%
5- Central Coast	334	371	-37	-11%
6- Central Valley	3,249	2,797	452	14%
7- Los Angeles	661	1,532	-871	-132%
8- Inland Empire	3671	5,538	-1,867	-51%
9- Eastern Sierra	448	476	-28	-6%
10- Stockton	2,020	2,310	-290	-14%
11- San Diego	1,185	938	247	21%
12- Orange County	35	157	-122	-350%
Total	**14,925**	**18,329**	**-3,404**	**-**
Source: California Statewide Truck Parking Study (2022)				

The analysis corridors for the California Statewide Truck Parking study, for which ATRI GPS data were collected, are the primary corridors traveled by trucks, nevertheless they represent a small portion of all roadways in the State. Stakeholder input and anecdotal evidence indicates that a large amount of undesignated parking occurs on many other roadways, private land, vacant lots, or other non-roadway locations but that was not quantified as part of this study. While ATRI provides an accurate and a rich dataset, they do not represent all trucks traveling through California. **Table 3.4** shows a sample of truck counts taken at weigh-in-motion (WIM) count sites in the State and the ATRI GPS truck counts at those same locations and during the same time periods. The ATRI data capture between eight and 38 percent of all trucks on the road at the selected locations. The average percent capture is 25 percent, which is an expansion factor of four. For example, if ATRI data indicate 20 trucks in their database parked at a particular location, it is estimated that approximately 80 trucks, or four times the number of trucks in ATRI's database, likely parked there. An expansion factor of four was used for all locations except those in District 11 (San Diego) where the Study used an expansion factor of five. Based on validation of the data in that district, the ATRI data appeared to capture less of the trucks in that region. In a similar study in Texas, a slightly lower percent capture also was found along the border region.

Table 3.4: American Transportation Research Institute Data Capture

WIM Location	WIM Count	ATRI Count	Total % ATRI Capture
Devore NB (I-215)	244,194	92,755	38%
Hayward NB (I-880)	310,815	91,543	29%
Bowman EB (I-80)	228,166	64,874	28%
Indio EB (I-10)	352,959	88,986	25%
Redding NB (I-5)	304,797	75,763	25%
Cholame EB (CA-46)	141,267	34,971	25%
Artesia EB (91)	384,628	94,277	25%
Vacaville EB (I-80)	349,638	81,540	23%
Tulloch EB (120)	21,659	4,657	22%
Balboa NB (I-15)	206,150	40,387	20%
Fresno NB (99)	636,659	116,243	18%
Elmira NB (I-505)	81,879	12,495	15%
Poggi NB (I-805)	169,603	14,934	9%
Leucadia NB (I-5)	461,996	35,808	8%
Source: Caltrans WIM data and ATRI data. Analysis by Cambridge Systematics (2021).			

The Federal Hours of Service (HOS) and Electronic Logging Devices (ELDs) requirements have further exacerbated the need for parking that is consistently available, safe, and provides basic amenities. **Chapter 4A** discusses HOS and ELD requirements in more detail.

In response to this critical need for additional truck parking, Caltrans initiated a truck parking advisory committee (TAC) in 2017 to identify needs and priority areas. The TAC consists of drivers, small and large fleets, beneficial cargo owners, and several CFAC members. Caltrans led a survey of TAC members, Caltrans Districts, and regional agencies. The survey results lacked detail on where the most critical truck parking needs are in the state. The survey highlighted the need for Global Positioning Systems (GPS) data or similar types of data to be able to determine exactly where drivers are experiencing shortages, where unauthorized and/or unsafe parking is occurring, and where demand for parking exists. Given this need for data, Caltrans initiated a comprehensive California Statewide Truck Parking Study to identify existing truck parking shortages and new potential locations, and to develop public and private partnerships for enhanced truck parking supply and dissemination of truck parking availability information. **Table 3.5** shows the distribution and demand of truck parking locations by each Caltrans district, and **Table 3.6** provides additional details regarding these locations. The plan was completed in February 2022.

In addition to gathering crucial truck parking data, the study also developed a prioritized demand factor to analyze it. In this analysis, major freight corridors across the state were divided into segments that could be more easily assessed. For each segment, the total number of trucks parked at designated and undesignated locations within the segment at the statewide peak hour was subtracted from the total number of designated truck parking spaces. The shortage or surplus was then normalized by dividing it by the segment length. For example, a 10-mile segment with 20 designated truck parking spaces, 23 trucks parking at designated locations, and 7 trucks parking in the ROW (undesignated parking) would have a shortage of 10 spaces, or one space per mile. **Figure 3.8** shows the results of this analysis. Note that all segments shown in color (green, yellow, or red) have a truck parking supply gap. The colors indicate how severe the need is compared to all segments in the state. While urbanized areas like Los Angeles, Sacramento, and the Bay Area have some of the highest clusters of need, every Caltrans District includes corridors with high unmet parking demand.

Table 3.5: Demand at Designated Locations by District

District	Number of Locations	Number of Spaces	24-Hour Demand	Percent of 24-Hour Demand	Peak Utilization (Peak Demand/Supply)
1—North Coast	7	87	9	3%	3%
2—Redding	28	1,220	1,806	11%	72%
3—Sacramento	24	1,032	1,970	10%	91%
4—Bay Area	23	1,033	229	5%	57%
5—Central Coast	11	334	545	3%	82%
6—Central Valley	51	3,307	5,508	19%	76%
7—LA	10	661	861	4%	49%
8—Inland Empire	50	3,671	8,105	19%	103%
9—Eastern Sierra	11	448	1,183	4%	100%
10—Stockton	33	2,020	4,117	13%	90%
11—San Diego	25	1,185	1,098	10%	44%
12—Orange County	1	35	2	0.4%	4%
Total	274	15,033	25,407	100%	81%
Source: ATRI. Analysis by Cambridge Systematics (2021).					

Figure 3.8: Truck Parking Prioritized Demand Factor. (Source: California Statewide Truck Parking Study, 2022)

Table 3.6: Public and Private Trucking Related Units

Ownership	Number of Locations	Percent of Locations	Number of Spaces	Percent of Spaces
Public	86	31%	1,209	8%
Commercially Owned: National Chain Truck Stops	60	22%	8,496	57%
Commercially Owned: All Other	128	47%	5,328	35%
Total	**274**	**100%**	**15,033**	**100%**
Source: California Statewide Truck Parking Study (2022)				

ALTERNATIVE FUELING LOCATIONS

At the national level, the FHWA has designated alternative fuel corridors to establish a national network of alternative fueling infrastructure along the National Highway System. As of 2021, FHWA has nominated portions or segments of 134 Interstates and 100 US highways and state roads, covering more than 166,000 miles of the NHS throughout 49 states and the District of Columbia.[54]

At FHWA's behest and owing in part to a statewide commitment to renewable energy and the reduction of greenhouse gas emissions, alternative fueling locations have proliferated throughout California, and many are available for use by trucks on California's Highway Freight Network. **Figure 3.9** shows the locations of alternative fueling locations by fuel type.

At the time of this plan being written, the California Transportation Commission (CTC) was preparing a Clean Freight Corridor Assessment, required by SB 671. This assessment will identify six corridors in California and the infrastructure needed to support zero emission freight vehicles. More information about this assessment is provided in **Chapter 4A: Trends, Issues, and Opportunities**.

WEIGH-IN-MOTION SCALES AND TRUCK ACTIVITY MONITORING SYSTEM

As of 2022, California has 144 weigh-in-motion (WIM) scales in operation throughout the state. WIM devices are designed to capture and record axle weights and gross vehicle weights as vehicles drive over a measurement site as opposed to requiring vehicles to come to a complete stop to measure their weight. California's WIM locations provide 24-hour traffic information, including axle weights and gross weights, axle spacing, vehicle classification, speed, and overall length. This data is subsequently used to inform pavement studies, highway monitoring and capacity studies, accident rate calculations, and load factor calculations for structures. **Figure 3.10** shows the location of California's WIM locations.[55]

Figure 3.9: California Alternate Fuel Corridors and Fueling Stations. (Source: Data from FHWA HEPGIS and U.S. Department of Energy Alternative Fuels Data Center 2018)

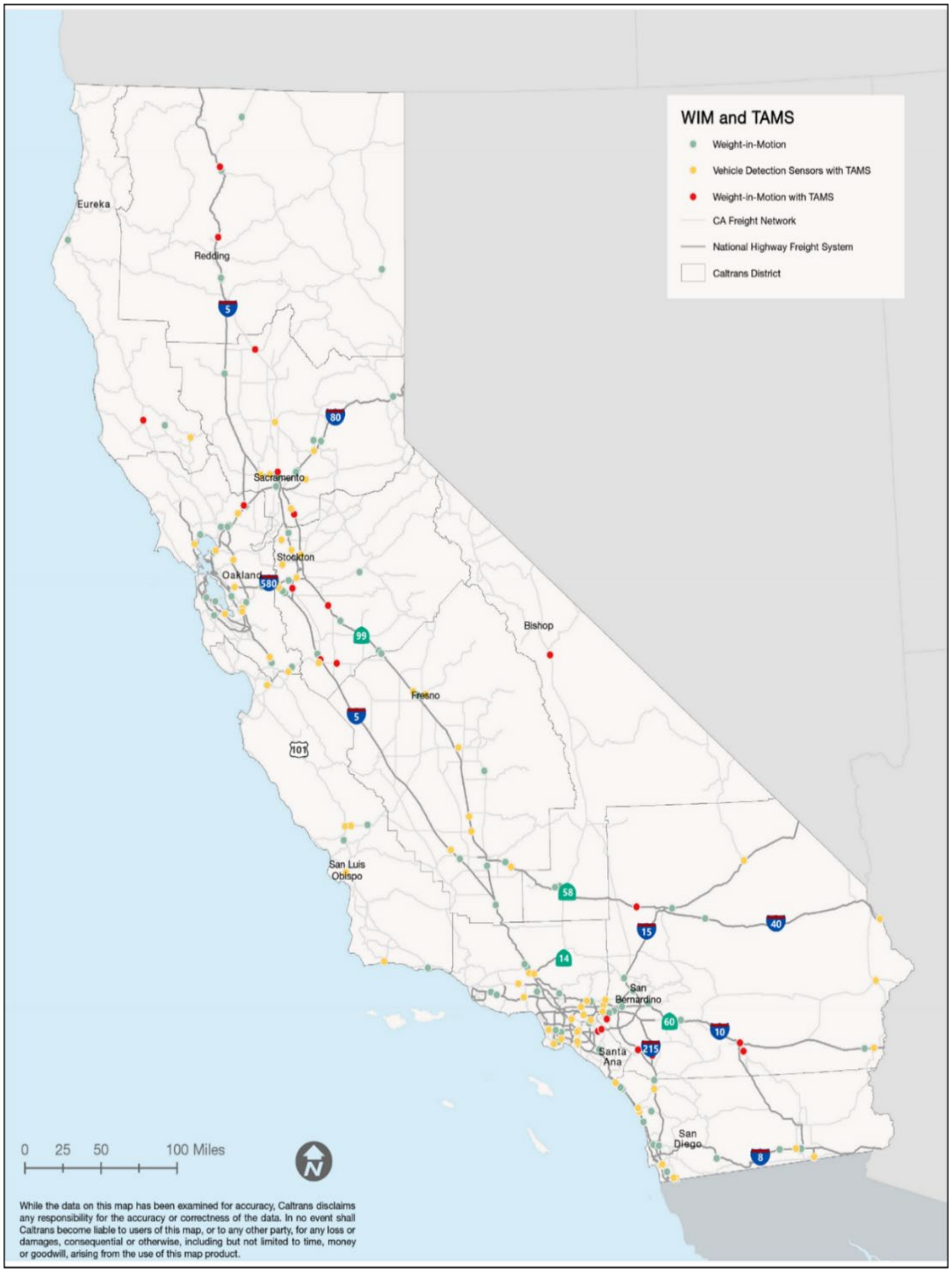


Figure 3.10: California Weigh-In-Motion Stations and Truck Activity Monitoring Stations. (Source: Data from Caltrans Division of Traffic Operations 2018)

Figure 3.11: Freight Locomotives, BNSF & UPPR

Freight Rail Network

The freight railroad system in California is comprised of two Class I railroads and 27 Class III railroads, commonly referred to as "short line" railroads. This freight rail network supports the operations of industries throughout the state and links California with domestic, interregional, and international markets. Railroads are grouped into three classes, based on their annual operating revenue[56]:

- Class I - $943.9 Million or more
- Class II - Less than $943.9 Million but more than $42.4 Million
- Class III – Less than $42.4 Million

In 2019, total operating revenue nationally for Class I railroads was approximately $74.3 billion[57]. In 2019, railroads in California handled 158.9[58] million tons of commodities. There are no Class II railroads operations in California currently. **Figure 3.12** shows California's Class I and Class III freight railroads.

Figure 3.12: Railroad Ownership in California. (Source: Caltrans, State Rail Plan 2023)

The two Class I railroads operating in California are the Union Pacific Railroad (UPRR) and the BNSF Railway Company (BNSF). UPRR is the largest railroad in California by number of employees, payroll, and track-miles in operation. UPRR operates an expansive network of rail lines that serves diverse regions of California, including the agriculturally rich San Joaquin Valley, the Port of Oakland, the San Francisco Bay Area, and the Los Angeles metropolitan area. UPRR also provides strategic freight rail movement to California's Central Coast as it parallels the US 101 corridor. For its carload services, UPRR operates two system classification yards at West Colton in Southern California and Roseville in Northern California, three regional yards in Lathrop (San Joaquin County), Commerce (Los Angeles County), and Yermo (San Bernardino County), and a rail port in Oakland (Alameda County). UPRR also has shared use of the on-dock rail terminals at the Port of Los Angeles (POLA) and Port of Long Beach (POLB) with BNSF. UPPR operates nearly 3,292 miles of track within California and handled over three million carloads in California in 2017.[59] **Table 3.7** includes the key operating characteristics for UPRR.

The BNSF Railway Company is the largest intermodal carrier in the U.S. and is the product of mergers and acquisitions of nearly 400 different railroad lines, including two major railroads (Burlington Northern Railroad and the Atchison, Topeka and Santa Fe Railway). Within California, BNSF operates on more than 2,000 track miles. In 2017, there were nearly 2 million BNSF carloads originating and terminating in the state. Major BNSF freight hubs include 11 carload yards, five dedicated intermodal terminals, and the shared on-dock rail facilities at the POLA and POLB. Along with the on-dock terminals at the POLA and POLB, significant BNSF's intermodal facilities in California include off-dock terminals at the Hobart Yard near downtown Los Angeles, the San Bernardino Intermodal Yard, and the OIG near-dock terminal in Oakland. California serves as a gateway to BNSF's Transcontinental Corridor, which links the POLA and POLB with Chicago.[60] **Table 3.7** includes the key operating characteristics for BNSF.

Table 3.7: Class I Railroad Operating Characteristics in California

Name	Employees	Payroll (Millions of Dollars)	Tracks Miles Owned	Track Miles with Tracking Rights	Total Miles Operated	Originating Carloads	Terminating Carloads
BNSF	3,655	$283.8	1,149	965	2,114	1,948,082	1,982,279
UPRR	4,783	$462.8	2,773	515	3,292	1,537,094	1,594,670
Source: Caltrans California State Rail Plan 2018							

SHORT LINE RAIL

To shippers, the ability to use short line railroads means lower transportation costs, more flexible local service options, and a greatly expanded market reach for local products through their Class I railroad partners. Without short line railroads, businesses would be forced into more expensive truck transloads (freight transfer between modes or from smaller to larger trailers) that typically take place in large cities adding more trucks on an already congested metropolitan highway system. Short line railroads' direct access to industrial, mining, commercial, and agricultural processing facilities enables the shipment of loads that are too heavy for trucks to transport over the roadway. For many companies, access to short line railroads is essential to their business viability.

California has 27 active short line railroads (two of which are primarily operating passenger trains). This includes 20 short lines and seven switching and terminal railroads which collectively operate over 1,600 route-miles. **Table 3.8** lists California's short line and switching and terminal railroads.

Table 3.8: Short Line Railroads in California

Local Railroads	Standard Carrier Alpha Code	Total Miles Operated
Arizona & California Railroad	ARZC	297 (83 in CA)
California Northern Railroad Company	CFNR	250
Central California Traction Company	CCT	16
Central Oregon & Pacific Railroad	CORP	362 (65 in CA)
Goose Lake Railway	GOOS	105 (90in CA)
Los Angeles Junction Railway Company	LAJ	64
Modesto and Empire Traction Company	M&ET	50
Napa Valley Railroad Company	NVRR	21
Northwestern Pacific Railroad Company	NWP	61
Oakland Global Rail Enterprise	OGRE	15
Pacific Harbor Line	PHL	59
Quincy Railroad Company	QPR	3
Richmond Pacific Railroad Corporation	RPRC	12
Sacramento Valley Railroad	SAV	7
St. Paul and Pacific Railroad Company	SPP	31
San Diego & Imperial Valley Railroad	SDIY	33
San Francisco Bay Railroad	SFB	5
San Joaquin Valley Railroad Company	SJVR	371
Santa Cruz, Big Trees & Pacific Railway	SCBG	9
Saint Paul & Pacific Railroad	SP&P	32
Santa Maria Valley Railway	SMVRR	14
Sierra Northern Railway	SERA	68
Stockton Terminal and Eastern Railroad	STE	25
Trona Railway Company	TRC	31
Ventura County Railroad Company	VCRR	9
West Isle Line, Inc.	WFS	5
Oakland Terminal Railway	OTR	10

TOTAL		**1615**
Source: Caltrans, Short Line Rail Improvement Plan, 2021		

PASSENGER RAIL OPERATING ON FREIGHT RAIL LINES

In addition to freight trains, the freight rail network also accommodates the operation of passenger trains throughout the state. In the past, the main freight rail lines had excess capacity to allow the use of passenger trains with little impact to the freight service. Passenger service volumes along these shared-use rail corridors have expanded, along with expansion of freight volumes, resulting in a primary railroad network that is more congested. Many current shared-track operations involve passenger services operation over tracks owned by BNSF and UPRR. These operations include all three State-supported routes (portions of the Pacific Surfliner, San Joaquin and Capitol Corridor) and the four Amtrak long-distance trains operating in the state, as well as several commuter services such as Metrolink, Caltrain, and the Altamont Corridor Express.

ON-DOCK AND NEAR-DOCK RAIL

On-dock and near-dock rail facilities play an integral role in the movement of cargo from the dock to rail yards. On-dock facilities are located within a marine port terminal, allowing containers to be moved directly from the dock to the railcar. On-dock terminals handle a significant number of containers (1.84 million lifts in 2010) with volumes projected to reach 6.3 million lifts by 2035. Through its elimination of truck drayage, on-dock rail intermodal transfer is perhaps the most efficient way to handle trainloads of international intermodal containers. Near-dock terminals (facilities that are within a five-mile radius of the port terminal) are essential for providing additional container handling capacity that minimizes long-distance drayage trips. Off-dock intermodal facilities are rail yards located more than five miles from port terminals. Off-dock intermodal facilities provide substantial capacity for handling port-related (international) containers as well as domestic containers (both transloaded international cargo and pure domestic cargo) and trailers. Containers that are transferred from ships to train via truck drayage are almost all routed to out-of-state locations. There is a concerted effort in California to reduce drayage trips to rail yards and to move the activity as close to the ports as possible.

INTERMODAL RAIL TERMINALS

The freight rail network in California includes a number of significant intermodal rail terminals. Intermodal rail terminals are established to facilitate transfer of containers and trailers between modes (ship to rail, truck to rail, and vice versa). In California, the majority of intermodal rail traffic is associated with the Port of Oakland, POLA, and POLB; a sizeable but smaller volume is related to wholly USMCA traffic. Intermodal service is typically described as either container on flat car (COFC) or trailer on flat car (TOFC). In California, all primary intermodal corridors have sufficient vertical clearances for double-stack service. Double stacking is not possible with TOFC. This inability to double-stack is due to the lack of structural strength of truck trailers. **Table 3.9** identifies the facility characteristics for the intermodal terminals within California. **Chapter 6B** discusses planned intermodal rail facilities throughout the state.

SHORT-LINE RAILROAD INFRASTRUCTURE

In 2021, sixteen short line railroads operating in California were surveyed, and they identified over $130 million in infrastructure, over $15 million in equipment, and over $23 million in facility needs. Top issues impacting the industry include track conditions and the state-of-good repair, lack of funding to maintain rail lines properly, and new business opportunities for each railroad.[61]

Table 3.9: Existing Intermodal Rail Facility Characteristics

Name	Facility Type	Railroad	Existing Yard Capacity (Lifts)
City of Industry	Off-Dock	UPRR	232,000
East Los Angeles	Inland	UPRR	650,000
Hobart	Off-Dock	BNSF	1,700,000
Intermodal Container Transfer Facility (ICTF)	Near-Dock	UPRR	760,000
Los Angeles Transportation Center (LATC)	Off-Dock	UPRR	340,000
POLA-POLB On-Dock Intermodal Facilities	On-Dock	BNSF/UPRR	2,257,775
San Bernardino	Inland	BNSF	660,000
Lathrop	Inland	UPRR	270,000
Oakland International Gateway (OIG) – Joint Intermodal Terminal (JIT)	Near-Dock	BNSF	300,000
Rail port-Oakland	Near-Dock	UPRR	450,000
Stockton/Mariposa	Inland	BNSF	300,000
Total			**7,619,775**
Source: Caltrans California State Rail Plan, 2018			

Seaports

Seaports are the lynchpin of California's international trade. They are California's freight gateways to the world. California has 12 deep-water seaports that can accommodate transoceanic vessels, of which 11 are publicly owned and one, the Port of Benicia, is privately owned. This includes two inland water ports that have access to the ocean via the Sacramento/San Joaquin Delta. Each port has different navigable channel and berth depths so the sizes of ships and ship draft that can be accommodated vary by port. All of the ports, with the exception of the Port of Humboldt, utilize on-dock or near-dock rail infrastructure in conjunction with their terminal operations.

The four largest deep-water seaports in California are Los Angeles, Long Beach, Oakland, and San Diego. All four seaports are included within the top 50 U.S. Containership Ports in 2018 (see **Table 3.10**). In addition to containerized freight, these seaports handle a variety of cargo, including petroleum coke, crude oil, break bulk, bulk, heavy equipment, machinery, roll-on/roll-off cargos, and many others. Please refer to the Pacific Merchant Shipping Association West Coast Trade report for the most current data.

Table 3.10: California's Four Top Ranking Containership Ports in North America, 2020

Port	Rank	Domestic	Export	Import	Total
Los Angeles	1	46,633	1,376,075	5,027,888	6,450,596
Long Beach	2	347,066	1,155,381	4,228,028	5,691,810
Oakland	7	165,691	795,769	1,014,879	1,916,005
San Diego	32	0	3,051	73,504	76,555
TOTAL		**559,390**	**3,330,276**	**10,344,299**	**14,134,966**
Source: U.S. Army Corps of Engineers – U.S. Waterborne Container Traffic by Port/Waterway in 2020					

The POLA, number one in national container volume, and the POLB, number two in national container volume, together make up the largest container port complex in the U.S. They are often referred to as the San Pedro Bay Ports. The San Pedro Bay Ports and the Port of Oakland—California's third largest seaport and the nation's seventh largest container port—have sufficient depths to accommodate the largest vessels currently in operation and even larger vessels that are being developed. The remaining seven deep-water seaports are smaller in size and scale, specializing in the transport of specific types of cargo such as dry bulk, break bulk, liquid bulk, construction materials, fresh fruit and produce, automobiles, or other commodities. **Table 3.11** contains some key characteristics of each seaport.

Table 3.11: Public and Private Deepwater Seaports

Seaport	Channel Depth	Acres	Rail Access	Highest Value Exports	Highest Value Imports
San Diego	42 feet	6,000*	On-Dock	Machinery, Metals, Autos/ Parts, Heavy Equipment, Food Products	Vehicles, Perishables, Construction Materials, Heavy Equipment
Long Beach (POLB)	76 feet	3,520	On-Dock	Petroleum Coke and Bulk, Waste Paper, Chemicals, Scrap Metal	Crude Oil, Electronics, Plastics, Furniture, Clothing
Los Angeles (POLA)	53 feet	4,300	On-Dock	Wastepaper, Animal Feeds, Scrap Metal, Fabric, Soybeans	Furniture, Apparel, Automobile Parts, Electronic Products
Hueneme	35 feet	375	Near-Dock	Autos, Produce, General Cargo	Autos, Produce, Liquid Fertilizer, Bulk Liquid
Redwood City	30 feet	120	On-Dock	Iron Scrap	Aggregates, Sand, Gypsum
San Francisco	38-40 feet	1,000+	Near-Dock	Tallow, Vegetable Oil	Steel Products, Boats/ Yachts, Wind Turbines,

					Project Cargo, Aggregate, Sand
Oakland	50 feet	1,300	Near-Dock	Fruits and Nuts, Meats, Machinery, Wine and Spirits	Machinery, Electronics, Furniture, Plastic Ware, Tiles
Richmond	38 feet	200	Near-Dock	Vegetable Oils, Scrap Metal, Coke, Coal, Aggregate, Zinc, Lead	Autos, Petroleum (crude/ refined), Bauxite, Magnetite, Vegetable Oils
Stockton	35 feet	2,000	On-Dock	Iron Ore, Sulfur, Coal, Wheat, Rice, Machinery, Petroleum Coke, Safflower Seed	Liquid Fertilizer, Molasses, Bulk Fertilizer, Cement, Steel Products, Ammonia, Lumber
Benicia	38 feet	645	On-Dock	Petroleum Coke	Automobiles
West Sacramento	30 feet	480	On-Dock	Agricultural and Industrial Products	Agricultural and Industrial Products
Humboldt Bay	38 feet	-----	N/A	Logs, Wood Chips	Logs, Petroleum, Wood Chips
Source: Southern California Association of Governments – Comprehensive Regional Goods Movement Plan and Implementation Strategy, 2013 *Acreage includes land and water					

California's seaports are extraordinary multimodal places that have a tremendous mix of public and private entities, each with its own set of industry responsibilities. This requires efficient interaction between the public and private sectors to meet the needs of the ports. Additionally, the seaports and their intermodal connectors heavily support the movement of military and freight cargo. The Ports of Long Beach, San Diego, Oakland and Hueneme. are designated as Strategic Commercial Seaports. Ports of Los Angeles and Richmond are designated as Alternate Strategic Commercial Seaports These Strategic Seaports are integral part of the National Port Readiness Network (NPRN)[62].

The strength of California's seaports depends on a complex public private partnership approach for investment in both capital and operational improvements within the seaport complex, including compliance with environmental and safety regulations. Generally, California's seaports are owned by public port authorities who develop port facilities which are then leased to private marine terminal operators and stevedoring companies who load and unload cargo from ships. Marine terminals load and unload cargo from ships at-berth and then receive or discharge that cargo to and from landside trucking and rail operations. This requires a tremendous amount of coordination among all of the parties involved. All parties must work together toward improvements in efficiency and productivity to minimize delays in the supply chain, stay competitive in both the national and global economies, and to reduce and eliminate the environmental and community impacts of freight from these critical freight facilities. However,

Figure 3.13: Port of Long Beach, Vincent Thomas Bridge

not all ports operate this way. The Port of Hueneme, for example, is not a landlord port and controls its own terminals.

In addition to the 11 publicly owned deep-water seaports, California has one private deep-water seaport, the Port of Benicia, and a multitude of privately owned and operated, both large and small scale, port and terminal facilities which help to facilitate maritime freight movement along California's coast, and to and from interstate and international markets. These private freight facilities handle a variety of cargo that include dry bulk materials, metals, bulk liquids, construction materials, vehicles, electronics, crude oil, petroleum products, and many others.

Airports

There are more than 200 airports that participate in the movement of airfreight in the state of California. Air cargo is shipped both domestically within the U.S. and internationally to global markets. Air cargo is usually high-value and particularly time sensitive. The amount and value of freight transported through each airport differs dramatically. The California Multimodal State Freight system includes the 13 busiest airports with major cargo operations by volume as detailed in **Table 3.12**. [63] All but two of California's largest airports with major cargo operations saw growth from 2013 to 2018. The total cargo operation by the top cargo airports increased by over 36 percent overall. The key challenges facing California's air cargo include modal shifts to trucking, competition with airports at other states, the shifting of manufacturing from Asia back to North America (and Europe), and the alternative maritime shipping routes that influences supply chains for air cargo-related goods.

Table 3.12: Major Cargo Operations Enplaned and Deplaned (Tons)

California's Top Air Cargo Airports	Rank	2013	2018	2021	% Change from 2018
Los Angeles International Airport (LAX)	4	1,917	2,444	2,972	122%
Ontario International Airport (ONT)	9	461	826	956	116%
Oakland International Airport (OAK)	12	556	670	698	104%
San Francisco International Airport (SFO)	20	400	628	582	93%
Sacramento International Airport (SMF)	38	74	127	167	131%
San Diego International Airport (SAN)	45	162	192	146	76%
Sacramento Mather Airport (MHR)	63	55	77	836	1086%
Stockton Metropolitan (SCK)	86	N/A	45	64	142%
Hollywood Burbank Bob Hope Airport (BUR)	-	55	55	54	98%

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San Jose International Airport (SJC)	101	47	61	36	59%
Fresno-Yosemite International (FYI)	108	12	11	17	155%
Long Beach Airport (LGB)	122	26	24	16	67%
Santa Ana (John Wayne) Airport (SNA)	118	18	20	16	80%
Total		**3,783**	**5,180**	**6,560**	**179%**
Source: National airport ranks from Federal Aviation Administration, 2021. https://www.faa.gov/sites/faa.gov/files/2022-08/cy21-cargo-airports_0.pdf					

According to the California Air Cargo Groundside Needs Study, "The numbers indicate that the top airports at which cargo activities are currently focused should have the individual capacity to address their own future cargo growth.[64] Although some new development or redevelopment will eventually be needed, there are no specific projects currently identified by the airports as critical to accommodating long-term cargo growth." While the capacity of California's largest cargo airports appears to be able to handle modest increases in freight movement in the near-term, the importance of ground transport of freight to and from the cargo airports is a key consideration. Local roads provide access to airport cargo facilities and transportation to nearby cargo handling and transloading facilities is accomplished. Many of these roads were not designed to accommodate 53-foot trailers and are located in dense, high traffic areas that are dominated by passenger vehicles.[65]

Pipeline Network

The U.S. EIA reports that California ranks fifth in the nation in crude oil production and ranks third (January 2017) in petroleum refining capacity, accounting for approximately five percent of production capacity and 10 percent of U.S. refining capacity.[66] California's crude oil and refined petroleum network consists of crude oil and petroleum product pipelines, refineries, terminals, and petroleum ports. The crude oil pipelines connect California's production areas to the refining centers in Los Angeles, the Central Valley, and the San Francisco Bay Area. These refineries are then connected through petroleum product pipelines to refineries and terminals throughout the U.S. Most gasoline imports into California enter by ship via the San Pedro Bay Ports and the San Francisco Bay Area Ports.
According to the U.S. EIA, California is second in the nation in the use of natural gas.[67] California's natural gas is largely delivered through the Western Region Natural Gas Pipeline Network.

The main conduits of natural gas to California are the El Paso Natural Gas Company system and the Transwestern Pipeline Company system in the southern regions of the state, and the Gas Transmission Northwest Company's interstate system in the northern regions of the state. The southern region systems originate in Texas and parallel each other as they traverse New Mexico and Arizona to deliver large portions of their capacity to California's largest natural gas companies at the California eastern border. The northern region system delivers Canadian natural gas through Washington and Oregon to California's northern border. California's natural gas network consists of pipelines, along with the processing plants, terminals, and storage facilities that support the transportation of this important energy resource. The intrastate transportation and distribution of natural gas in California is dominated by three main providers, the California Gas Transmission Company (CGT) (3,477 miles), the Southern California Gas Company (SoCal) (1,887 miles), and the San Diego Gas and Electric Company.

Future study is needed to determine which elements of the pipeline network should be included in the California Multimodal State Freight System. **Figure 3.14** and **Figure 3.15** depict California's crude oil and petroleum pipelines and facilities, and the natural gas pipelines and facilities.[68]

Figure 3.14: California Petroleum Pipelines and Facilities. (Source: U.S. Energy Information Administration, 2018)]

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California Freight Mobility Plan

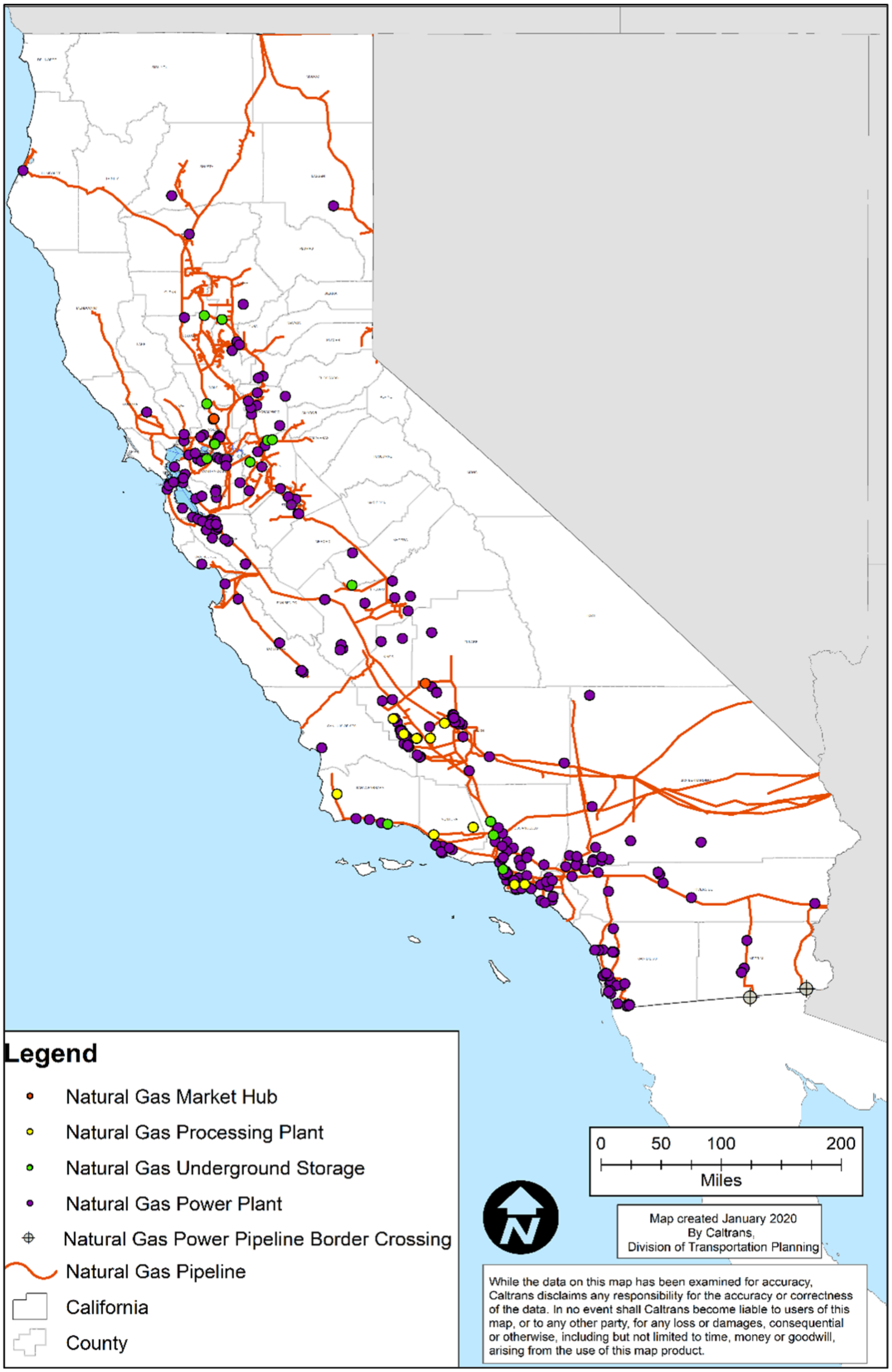

Figure 3.15: California Natural Gas Pipelines and Facilities. (Source: U.S. Energy Information Administration, 2019)

Military Freight

California's transportation network plays a major role in national security. California's numerous highways, railroads and ports are used for researching, designing, developing, and applying a variety of technologies to be used for national defense. **Figure 3.16** illustrates the location of California's Military Installations, ports and roadway network used to transport military equipment across the state. The State continues to work with Highways for National Defense (HND), Railroads for National Deference (RND), and Ports for National Defense (PND). HND has a mission to ensure that national defense is served by adequate safe and efficient public highway systems. They are also responsible for identifying and integrating the defense needs of the public highway systems. HND establishes policy and provides guidance on the safe use of public highway systems by Department of Defense (DOD) assets. The DOD develops and updates the Strategic Highway Network (STRAHNET) and STRAHNET connectors. Additional activities coordinated by HND relating to military freight include defense regulation on permitting and maintaining a directory partner organization contacts from military services/installations, Federal Highway Administration, State Departments of Transportation, American Association of state highway and Transportation Officials (ASHTO), and Transportation Research Board (TRB).

The STRAHNET is a system of about 62,400 miles of highways that is spread through the entire United States, including the interstate system. An additional 1,800 miles of STRAHNET connectors link over 200 military installations, seaports, and airports through the U.S. All together STRAHNET and all the connectors define the total minimum public highway network necessary to support defense deployment needs. The STRAHNET's Power, Projection, Platform (PPP) routes include about 5,000 miles of public roadways that are the most critical to support the deployment of DOD equipment. 18 designated PPP installations are spread through the U.S. designed to deploy military forces to seaports of embarkation (SPOE'S) during a national emergency. California has one PPP Installation located at Camp Pendleton and one PPP SPOE designation at the Port of San Diego.

The DOD regularly coordinates with Federal Highway Administration (FHWA) and Caltrans to address identified issues that affect the efficient movement of military goods traversing STRAHNET and PPP routes. Issues that have been identified in coordination with the DOD include permitting for the movement of oversized and overweight military equipment, traffic bottlenecks, system reliability, and bridge vertical clearance. All of which can negatively affect military mission performance and efficiency, but also disrupt convoy integrity. It is critical that the STRAHNET and PPP routes are adequately designed to accommodate the intended defense need and that the conditions of these roadways are safe and efficient to allow for rapid deployment of military equipment when needed.

The military also utilizes Strategic Rail Corridor Network (STRACNET). STRACNET is the minimal network of key commercial rail lines (33,000 route miles of high-density commercial lines) supplemented by defense connector lines (4,700 miles) serving installations throughout the United States.

STRAHNET and STRACNET are part of a national defense system that also includes strategic and alternative seaports that are designated within the National Port Readiness Network (NPRN). The Ports for National Defense (PND) mission is to provide information necessary to identify and use U.S. strategic seaports, minimize military impact on U.S. commercial seaports, facilitate DOD focus on maintaining readiness of ports required to enable the military to effectively deploy.

Partner organizations include MARAD, Coast Guard, Port Authorities, and rail operators. California has seven strategic and alternative seaports.

These strategic networks and facilities are in place to serve the DOD's potential need for large scale rapid deployment of military equipment by road and rail from major military installations to strategic seaports. Ensuring constant collaboration between DOD, Caltrans and local governments is critical in supporting effective and efficient military deployments of goods and equipment.

Figure 3.16: California Military Installations and Ports. (Source: US Surface Deployment and Distribution Command 2022)

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California Freight Mobility Plan

Warehousing and Distribution Facilities

The warehousing and distribution sectors are essential to supporting the efficient movement of freight within and through the state, and the success of these sectors directly impacts the economic competitiveness of the State and the nation. **Figure 3.18** shows the concentration of warehouses and major wholesale distributions across the state. Southern California has by far the highest concentration of high cube and multi-purpose warehouses.

In the Southern California Association of Governments (SCAG), 'Industrial Warehousing in the SCAG Region' report, SCAG identifies itself as the 16th largest economy in the world with a regional gross product of approximately $820 billion, and "goods movement-dependent industries make up about 35 percent of this total."[69] With one of the largest clusters of logistics centers in North America, the warehousing and distribution sector is particularly important to freight movement in Southern California, occupying approximately 1.17 billion square feet of existing warehousing land.[70] As of April 2018, there were approximately 34,000 warehouses in the SCAG region and 338 million square feet of undeveloped land that could be used to develop new warehouses and distribution centers.[71]

While the majority share of California's warehousing and distribution activities occur in Southern California, specifically in the areas near the POLA and POLB, further east in the Inland Empire (San Bernardino and Riverside Counties), and near the POE by the California-Mexico Border, significant facilities in other parts of the state as well, particularly the northern San Joaquin Valley. More information on warehousing can be found in **Chapter 2 and Appendix C**.

Figure 3.17: Amazon Fulfillment Center

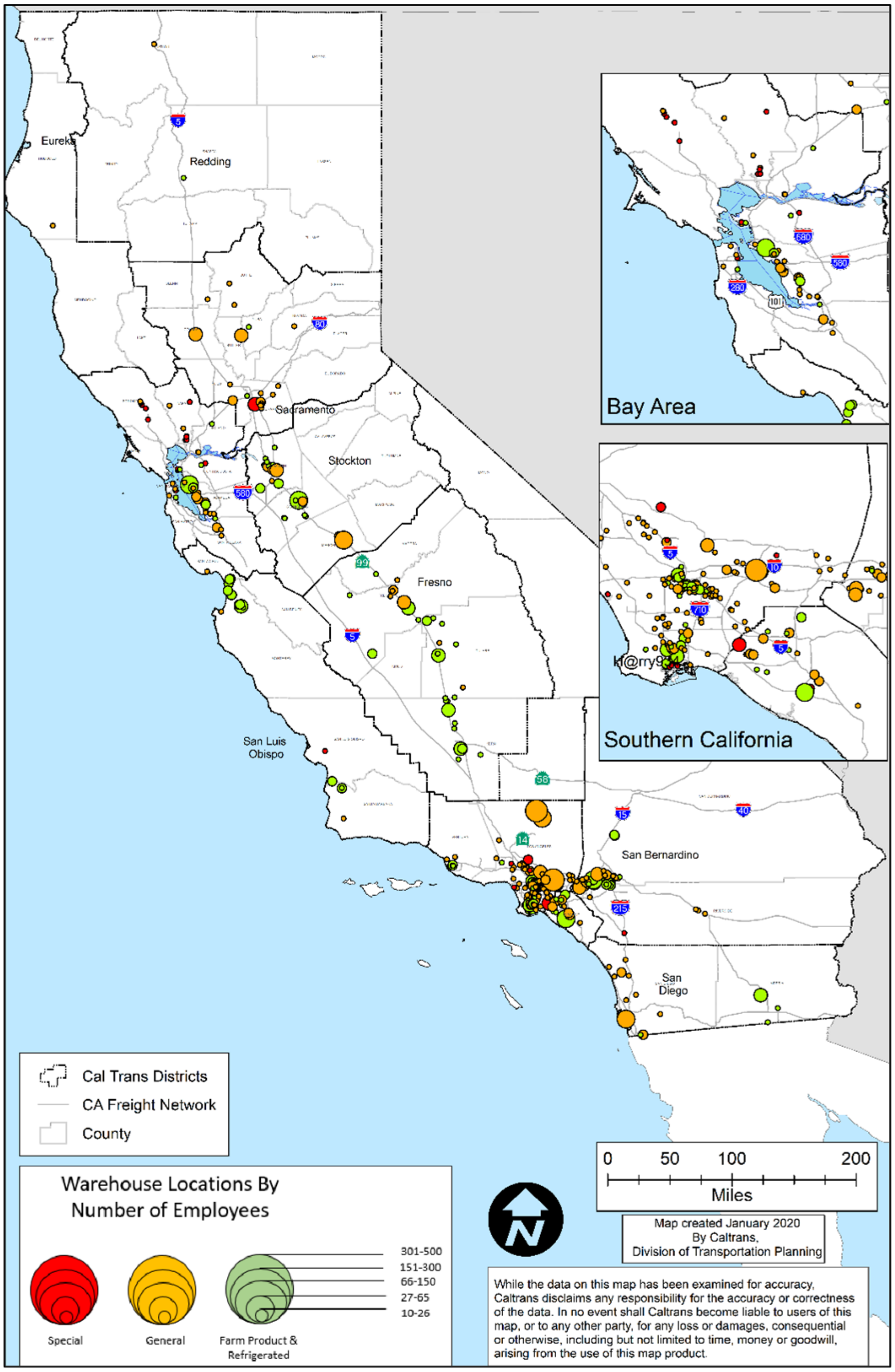

Figure 3.18: Major Warehouse and Distribution Centers in California. (Source: Census Data, California Statewide Freight Forecasting Model database)

3B. Multimodal Freight System Performance Assessment

Performance assessment is key to improving the transportation system. Tracking and analyzing the condition and performance of the freight system ensures that management, operations, and capital improvements are based on sound data and analysis. Assessment of the freight system's condition and performance includes a combination of quantitative and qualitative performance measures to inform and prioritize freight investments for decision makers. As required by the MAP-21, FAST, and IIJA Acts, U.S. DOT has established a set of performance measures for use by state Departments of Transportation and MPOs to assess freight movement on the U.S. Interstate System.[72] These measures are highlighted to:

- Be inclusive of Federal required measures and tied directly to the goals and objectives of the CFMP;
- Measure, update, and track on a rolling basis based on available data sources; and
- Provide insights about the performance of the freight system as needed by its users e.g., shippers, carriers).

Highway Assessment

CONGESTION AND BOTTLENECK ASSESSMENT

American Trucking Research Institute (ATRI) publishes an annual list of the Top 100 Freight Bottlenecks in the nation. This information helps California better understand the severity of congestion and provides some criteria for comparison with other analytical methods. California's highest congested bottlenecks are listed in **Table 3.13**.

Table 3.13: Bottlenecks in California – National Ranking by Congestion Level (2022)

Congestion Ranking	Location Description	Average Speed	Peak Average Speed	Non-Peak Average Speed	Peak Average Speed Percent Change 2020-2021
7	Los Angeles, CA: SR 60 at SR 57	43.3	36.9	46.0	-12.1%
9	San Bernardino, CA: I-10 at I-15	42.2	35.7	44.8	-12.1%
35	Corona, CA: I-15 at SR 91	45.0	40.0	46.8	-8.7%
47	Oakland, CA: I-880 at I-238	43.9	38.1	46.9	-13.1%
59	Los Angeles, CA: I-110 at I-105	41.7	34.5	44.8	-13.1%
63	Oakland, CA: I-80 at I-580/I-880	34.8	29.7	37.0	-16.1%

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90	Anaheim, CA: SR 91 at SR 55	48.4	42.7	50.3	-8.3%
91	Los Angeles, CA: I-710 at I-105	49.3	42.3	52.4	8.1%
Source: American Transportation Research Institute [73]					

Table 3.14 lists examples of planned and programmed projects across the state and regional strategies listed in **Chapter 6B. Freight Investments** to address the identified freight bottleneck locations. This table is intended to highlight major innovative project examples and regional strategies that align with State and Federal freight goals and policies.

Table 3.14: Planned and Programmed Projects and Strategies to address Bottleneck locations in California (2023)

Location Description	Planned/Programmed Projects*	Chapter 6B. Regional Strategy
Los Angeles, CA: SR 60 at SR 57	• SR 57/60 Confluence Chokepoint Relief Program	• Maintaining the long-term economic competitiveness of the region • Increasing freight and passenger mobility • Improving safety of goods movement activities
San Bernardino, CA: I-10 at I-15	• I-10 Corridor Freight and Managed Lane Project • I-15 Express Lanes	• Maintaining the long-term economic competitiveness of the region • Increasing freight and passenger mobility • Improving safety of goods movement activities
Corona, CA: I-15 at SR 91	• I-15 Express Lanes • SR-91 Capital Improvement Project (Express lanes and striping) • Upgrade CCTV detection	• Maintaining the long-term economic competitiveness of the region • Increasing freight and passenger mobility • Improving safety of goods movement activities
Oakland, CA: I-880 at I-238	• Per-Mile Tolling | Regional • Express Lanes | Regional • Express Bus | Service • Expansion | ReX (Basic) | Red Line (Oakland to Redwood City)	• Reduce environmental and community impacts and improve the quality of life in communities most affected by goods movement. • Provide safe, reliable, efficient, and well-maintained freight movement facilities. • Promote innovative technology strategies to improve efficiency. • Preserve and strengthen a multi-modal system that supports freight movement and coordinates with passenger transportation systems and local land use decisions. • Increase economic growth and prosperity.
Los Angeles, CA: I-110 at I-105	• N/A	• Maintaining the long-term economic competitiveness of the region • Increasing freight and passenger mobility • Improving safety of goods movement activities

Oakland, CA: I-80 at I-580/I-880	• Per-Mile Tolling | Regional • Corridor & Interchange Improvements | I-580 | Alameda County • Bay Area Forward Program | Regional • Express Lanes | Regional • Express Bus | Service Expansion | AC Transit | Transbay Corridor • Express Bus | Modernization | I-80 • Express Bus | Service Expansion | ReX (Premium) | Green Line (Vallejo to SFO Airport)	• Reduce environmental and community impacts and improve the quality of life in communities most affected by goods movement. • Provide safe, reliable, efficient, and well-maintained freight movement facilities. • Promote innovative technology strategies to improve efficiency. • Preserve and strengthen a multi-modal system that supports freight movement and coordinates with passenger transportation systems and local land use decisions. • Increase economic growth and prosperity.
Anaheim, CA: SR 91 at SR 55	• State Route 91 Operational and Multimodal Improvement Project	• Maintaining the long-term economic competitiveness of the region • Increasing freight and passenger mobility • Improving safety of goods movement activities
Los Angeles, CA: I-710 at I-105	• N/A	• Maintaining the long-term economic competitiveness of the region • Increasing freight and passenger mobility • Improving safety of goods movement activities
Source: Rebuilding CA Project Map 2023, Trade Corridor Enhance Program Project list, Southern California Association of Governments Regional Transportation Plan (2020), Metropolitan Transportation Commission Regional Transportation Plan (2021), State Highway Operations Protection Program, State Transportation Improvement Program (2022). ***This** is a non-exhaustive list of projects and strategies and is not prioritized*		

In addition to the planned and programmed projects listed and regional strategies in **table 3.14**, there are several listed in **Chapter 6A. Strategies and Objectives** that the state is committed to employing to address the freight mobility issues at these locations. The following 17 strategies can be used to address freight bottlenecks:

- Strategy MM-1-A: Create a multimodal freight bottleneck list for priority corridors
- Strategy MM-1-B: Conduct alternatives analysis – Determine if the highway build-out is the best solution
- Strategy MM-2-A: Identify the most congested freight corridors and facilities; prioritize for improvement
- Strategy MM-2-B: Conduct a dedicated truck lane feasibility study
- Strategy MM-2-C: Explore variable tolling for passenger vehicles and trucks to maximize peak capacity
- Strategy MM-3-A: Implement detection on priority corridors to identify problem areas across modes, particularly targeted to truck data
- Strategy MM-3-B: Construct railroad grade separations at high-volume roadway crossings where feasible; prioritize crossings that facilitate the movement of trucks
- Strategy MM-3-C: Implement systems management approach and active traffic management (ATM) technologies to support efficient and safe freight operations

- Strategy MM-3-D: Expand freight travel information availability
- Strategy MM-3-F: Coordinate with other states and regions to improve multi-jurisdictional freight corridors to reduce delay, increase speed, improve reliability, and improve safety
- Strategy EP-1-A: Reduce transportation costs by eliminating bottlenecks and recurrent delays, making operational improvements, and accelerating rapid incident response on priority freight corridors
- Strategy EP-1-C: Measure the throughput of pass-through freight and identify friction points
- Strategy EP-2-A: Encourage the creation of regional freight advisory committees at regional/county transportation agencies
- Strategy SR-1-D: Prioritize projects that address high-crash and truck-involved locations
- Strategy SR-2-C: Identify alternate freight routes to maintain freight movement at times of disruption by disaster
- Strategy SR-3-B: Identification of high-priority safety concerns, critical and vulnerable infrastructure, and aspects of the State's key supply chains that have resiliency concerns
- Strategy AM-1-D: Fortified bridges and pavement design standards to accommodate heavy freight travel

Infrastructure Assessment

Poor pavement and bridge conditions negatively affect truck operations. Infrastructure deterioration results in potential safety concerns, increased truck operating costs due to slower speeds, increased wear and tear on trucks, and damage to fragile goods. Poor condition of pavement and bridges also may result in weight restrictions that limit access for trucks. Trucks contribute to pavement and bridge structural deficiencies, which affect the ability of those bridges to carry heavy loads. High volume truck corridors have a higher potential for rapid infrastructure deterioration, and therefore higher preservation costs. The National Highway System (NHS) in California consists of 57,699 lane miles of pavement and 10,936 bridges totaling 243,347,047 square feet of bridge deck area in California. The California SHS includes all assets within the boundaries of the highway system including 49,672 lane miles of pavement and 13,189 bridges as identified in Transportation Management System (TMS) assets.[74]

According to the Caltrans 2020 State of the Pavement Report, distressed pavement is considered in poor condition when it has extensive cracks, is considered a "poor ride", or both. Pavement in this category would trigger the need for Capital Preventive Maintenance (CAPM) rehabilitation or reconstruction projects.[75] **Table 3.15** provides an inventory and detailed breakdown of the condition of pavements on the NHS and SHS in California by lane mile.[76]

Table 3.15: Inventory and Conditions of NHS Pavements (State and Local) in CA, by Lane Mile

	Lanes Miles	Good	Fair	Poor
State-Owned NHS	36,896	45.0%	52.8%	2.3%
Interstate	14,419	47.9%	50.2%	1.9%
Non-interstate NHS	22,477	43.1%	54.4%	2.5%
Off the SHS (Locally-Owned NHS)				
Non-interstate NHS	20,803	3.0%	79.0%	17.9%

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Total (State and Local NHS Pavements)				
ALL NHS	57,699	29.8%	62.2%	7.9%
Interstate	14,419	47.9%	50.2%	1.9%
Non-interstate NHS	43,281	23.8%	66.2%	9.9%
Source: California Transportation Asset Management Plan, 2022				

Distressed pavement is one of Caltrans' 2022 California Transportation Asset Management Plan (TAMP) performance measures and Caltrans has set goals to bring 94 percent of the California's NHS pavement and 99.5 percent of California's SHS pavement to a good or fair condition in 10 years.[77] According to the 2022 TAMP, 92 percent of highway lane miles on the California NHS and 99 percent of highway lane miles on the California SHS are in fair or good condition, meaning Caltrans has almost surpassed its goals. Proactive maintenance is now paramount to ensuring that pavement conditions do not deteriorate. The remaining highway lane miles on the California NHS and SHS are in poor condition and will require more substantial maintenance and rehabilitation to improve pavement conditions.[78]

Locally owned pavements on the NHS are those that are not on the California SHS but are owned and maintained by local and/or regional governments. There is a greater percentage of miles on the NHS in fair condition than in good condition on the portions of the NHS owned and maintained by local jurisdictions, suggesting that greater investment is needed to improve pavement conditions for these facilities. Detailed information about pavement conditions is available at 2022 California Transportation Asset Management Plan.[79]

Bridge asset data are reported by Caltrans annually to FHWA to support National Bridge Inventory (NBI), an FHWA database that includes data on all bridges 20 feet or longer. Any culvert with a width that spans 20 feet, or more is also classified as a bridge and recorded on the NBI. Bridges and culverts with a span shorter than 20 feet are excluded. Caltrans also records an inventory of bridges in the State Highway System Management Plan (SHSMP). This inventory has minor differences from NBI data. Notably, SHSMP inventory includes shorter bridges and pedestrian bridges that don't meet NBI requirements. The California TAMP uses NBI data as the source of NHS bridge inventory and condition and uses SHSMP data as the source of SHS bridge inventory and condition. Bridge health is critical to freight movement because bridge closures can redirect trips: lengthening travel time, wasting fuel, reducing efficiency, and delaying emergency deliveries and services.

According to the Caltrans 2022 TAMP, California's NHS includes 10,936 bridges. **Table 3.16** presents the inventory and condition of bridges on the NHS in California. It includes overall ratings for bridge decks, superstructures, and substructures on a scale from 0 (worst condition) to 9 (best condition). Overall, 5.4 percent of the bridges on the NHS are in poor condition.[80]

Table 3.16: Inventory and Conditions of NBI Bridges on the NHS, Weighted by Deck Area

System	Count	Deck Area (sq. ft.)	Good	Fair	Poor
State-owned NHS	9,263	218,564,095	49.9%	45.7%	4.4%
Locally-owned NHS	1,673	24,782,952	35.8%	50.5%	13.7%

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Total NHS	10,936	243,347,047	48.5%	46.1%	5.4%
Source: California Transportation Asset Management Plan, 2022					

According to the Caltrans 2022 TAMP, California's SHS includes 13,189 bridges. **Table 3.17** presents the inventory and condition of bridges on the SHS in California. It includes overall ratings for bridge decks, superstructures, and substructures on a scale from 0 (worst condition) to 9 (best condition). Overall, 3.5 percent of the bridges on the SHS are in poor condition.[81]

Table 3.17: Inventory and Conditions of NBI Bridges on the NHS, Weighted by Deck Area

Bridges on the SHS (State)					
	Count	**Deck Area (sq. ft.)**	**Good**	**Fair**	**Poor**
Total	13,246	251,703,052	54.1%	42.4%	3.5%
Source: California Transportation Asset Management Plan, 2022					

An alternative measure for bridge performance is to track the number of structurally deficient or functionally obsolete bridges. A structurally deficient bridge is one with routine maintenance concerns that do not pose a safety risk or one that is frequently flooded. A bridge is classified by the FHWA as functionally obsolete if it fails to meet design criteria either by its deck geometry, its load-carrying capacity, its vertical or horizontal clearances, or the approach roadway alignment to the bridge.

Further, another aspect of bridge performance for goods movement is the capacity for handling oversized loads, either by weight or dimension. When bridges cannot handle these permitted loads, freight routing is less efficient. The California Vehicle Code stipulates that no load is to exceed a height of 14 feet measured from the surface upon which the vehicle stands, except that a double-deck bus may not exceed a height of 14 feet, 3 inches. Despite this stipulation, there are several State routes that have vertical clearances of 14 feet or less, which means trucks with loads more than the vertical clearance must find alternate routes. **Table 3.18** provides examples of vertical clearances on State routes that are 14 feet or less.[82]

For these oversized and/or overweight loads, Caltrans has a special permitting system that identifies appropriate routes for a load, which might be significantly longer than another route. One such effort to reduce the number of these detours is Caltrans' Accelerated Bridge Program, which focuses on improving freight movement (extralegal trucks). The program aims to clear pinch points due to truck load and vertical clearance restrictions along primary highway freight corridors. These improvements will reduce unnecessary detours, which reduce impacts to neighborhoods and local streets, vehicles miles traveled, increase safety, and provide greater travel time reliability.

Table 3.18: Vertical Clearances on the State Highway System of 14'-0" or less

Route	County	Postmile	Direction	Name	Vertical Clearance
I-5	San Diego	15.420	NB	Pershing Drive	13'-10''
SR-33	Ventura	18.231	NB	South Matilija Tunnel	13'-4''
SR-33	Ventura	18.811	NB	Middle Matilija Tunnel	13'-4''
SR-33	Ventura	18.846	NB	North Matilija Tunnel	13'-4''
SR-33	Ventura	18.846	SB	North Matilija Tunnel	13'-4''
SR-33	Ventura	18.811	SB	Middle Matilija Tunnel	13'-4''
SR-33	Ventura	18.231	SB	South Matilija Tunnel	13'-4''
I-110	Los Angeles	24.160	NB	College Street	13'-6''
I-110	Los Angeles	24.548	NB	Hill Street	13'-5''
SR-151	Shasta	5.508	EB	Coram Railroad Crossing	13'-9''
SR-151	Shasta	5.508	WB	Coram Railroad Crossing	13'-9''
I-238	Alameda	2.190	SB	Edenvale Railroad Crossing	14'-0''
Source: Caltrans, "Height & Low Clearances."					

Safety Assessment

Safety is Caltrans' top priority. By identifying incident trends, Caltrans and other infrastructure owners/operators can make the necessary infrastructure and operational improvements to enhance safety on the SHS. Additionally, improved technology can eliminate or reduce the severity of certain collisions.

The California Strategic Highway Safety Plan (SHSP) is a statewide, coordinated traffic safety plan that provides a comprehensive framework for reducing roadway fatalities and serious injuries on California's public roads. According to the 2020-2024 SHSP which used California Highway Patrol (CHP) Statewide Integrated Traffic Records System (SWITRS) data, between 2008 and 2017, 8,266 fatal or serious injury crashes involved a commercial vehicle in California.[83] These crashes resulted in 3,310 fatalities and 6,651 serious injuries. Crashes related to commercial vehicles represent 6% of fatal or serious injury crashes, 10% of all traffic fatalities, and 6% of all serious injuries over the same period.

California has a significant number of commercial vehicles that transport goods from marine ports and Mexico. Many crashes involving commercial vehicles are caused by passenger vehicles not accounting for the time and ability that a commercial vehicle has to slow down or speed up. Due to the size of trucks and buses, the severity of a commercial vehicle crash is often substantial.

The two most frequent primary crash factors in the 2020-2024 SHSP Commercial Vehicle Challenge Area are improper turning (18%) and unsafe speed (26%). Given that commercial vehicles were a factor in approximately 6% of all fatal and serious injury crashes, three primary crash factors were over-represented:

- 23% of all crashes where the primary crash factor was Other Equipment
- 15% of crashes where the primary crash factor was Brakes
- 15% of crashes where the primary crash factor was Hazardous Parking

Two crash types were also over-represented:

- 17% of rear end crashes involved commercial vehicles
- 13% of sideswipe crashes involved commercial vehicles

In 2019, the CHP SWITRS reported that out of the 347 total fatal traffic collisions for trucks or trucks pulling a trailer, the truck driver was at fault in 82 incidents. This data indicates that passenger

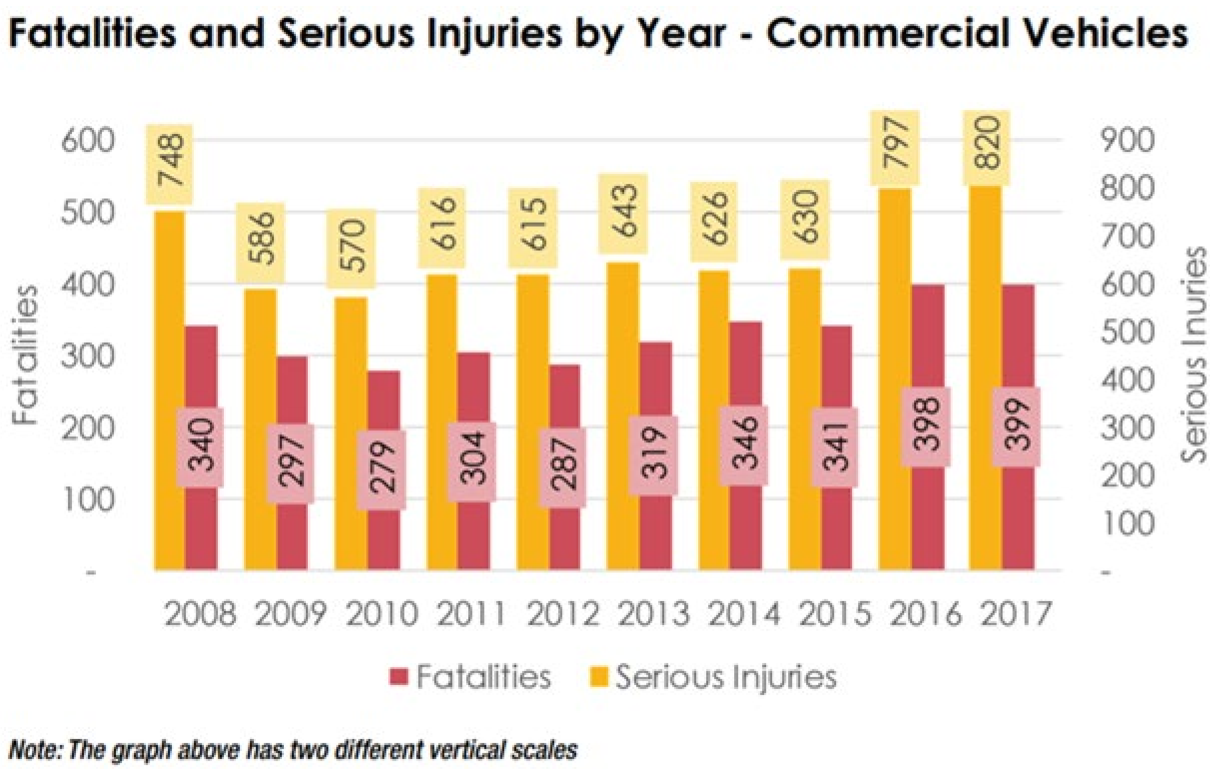

Figure 3.19: 2008-2017 Fatalities and Serious Injuries per Year – Commercial Vehicles. (Source: California Safe Roads: 2020-2024 Strategic Highway Plan)

vehicle drivers involved in fatal collisions with trucks were far more likely to be at fault than the truck driver.[84]

Of the total 7,089 injury collisions for trucks or trucks pulling a trailer, the truck driver was at fault in 3,034 incidents. The above statistics are represented in **Table 3.19.**

Table 3.19: Collision Statistics (Fatal and Injury)

Collision Statistics, Trucks or Trucks Pulling a Trailer (2019)			
	Total Collisions	Involved	At Fault
Fatal	347	265	82
Injury	7,089	4,055	3,034
Source: California Highway Patrol (CHP) Statewide Integrated Traffic Records System (SWITRS) 2019			

RAIL CONGESTION AND BOTTLENECKS/CHOKEPOINT ASSESSMENT

Similar to roadway congestion, reduced track speed may be caused by bottlenecks and chokepoints are mainly caused by track capacity limitations, track structural strength, steep grades, track geometry, conflicts with passenger service, rail yard capacity, track class, and double-stack height limitations. The 2018 CSRP identified the following eight main line and intermodal bottlenecks and chokepoints:

1) BNSF San Bernardino – Los Angeles: San Bernardino via Fullerton and Riverside
2) BNSF Cajon: Barstow to Keenbrook
3) UPRR Sunset Route: Yuma Subdivision
4) UPRR Alhambra and Los Angeles:
5) UPRR Martinez: Oakland to Martinez
6) Southern Oakland Route: Oakland to Niles Junction
7) BNSF Main Line Stockton to Bakersfield: San Joaquin Corridor
8) UPRR Roseville to Reno over Donner Pass

Figure 3.20: Heavy Rail Freight Traffic Corridor Bottlenecks in Southern California – Segments 1-4 (Source: Caltrans State Rail Plan, 2018)

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Figure 3.21: Heavy Rail Freight Traffic Corridor Bottlenecks in Southern California – Segment 5-6 (Source: Caltrans State Rail Plan, 2018)

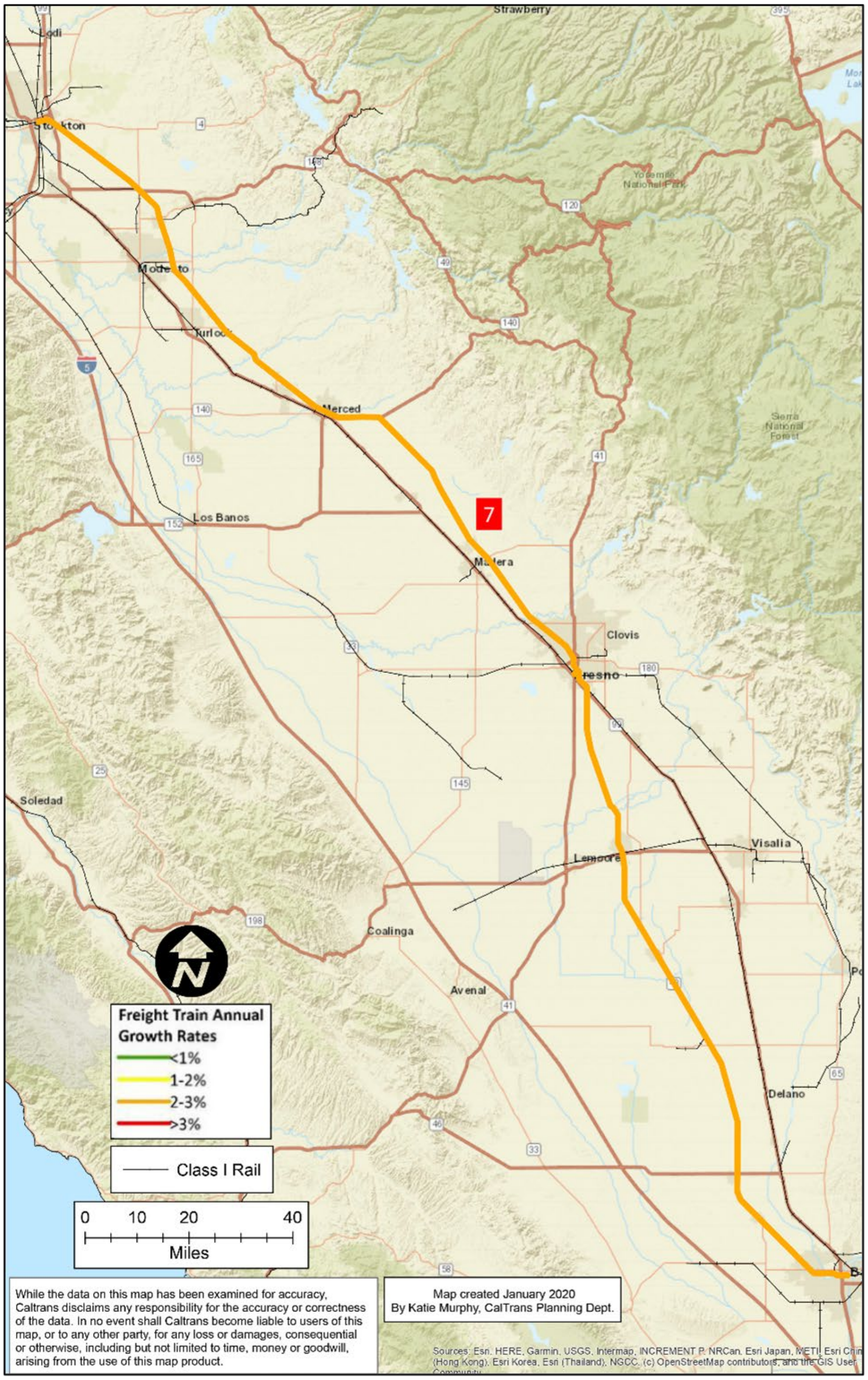


Figure 3.22: Heavy Rail Freight Traffic Corridor Bottlenecks in Southern California – Segment 7 (Source: Caltrans State Rail Plan, 2018)

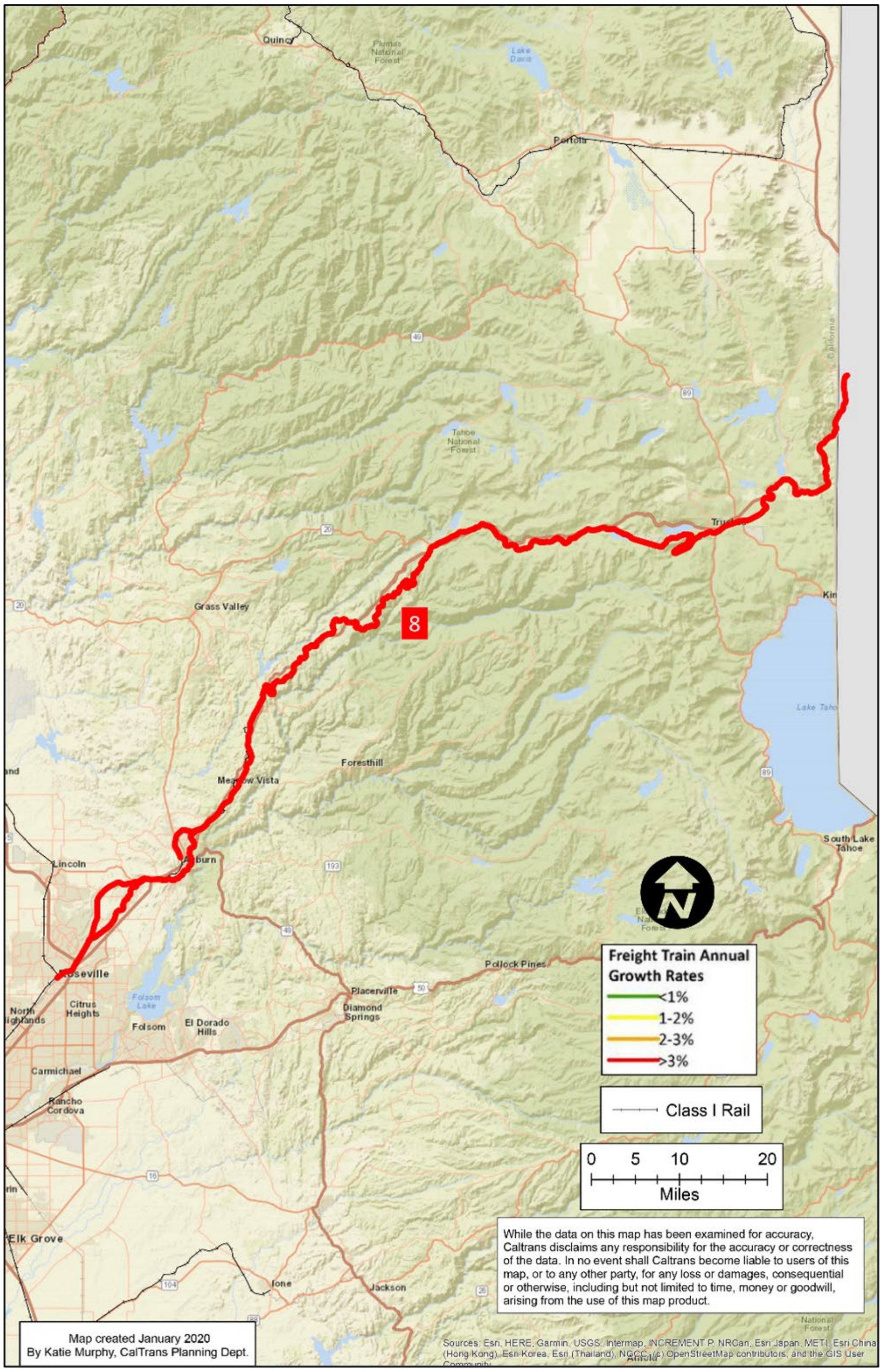


Figure 3.23: Heavy Rail Freight Traffic Corridor Bottlenecks in Southern California – Segment 8 (Source: Caltrans State Rail Plan, 2018)

The Federal Railroad Administration (FRA) categorizes all train tracks into six classes, segregated by maximum speed limits. **Table 3.20** is a list of track miles by each category for California Class I railroads:

Table 3.20: California Class 1 Railroads

Class	Maximum Speed Limit	Track Miles
Class 1	10 mph	38.5
Class 2	25 mph	380.2
Class 3	40 mph	794.8
Class 4	60 mph	10861.1
Class 5	80 mph	1167.2
Class 6	110 mph	none

Higher track speeds correlate to better system conditions and faster delivery times, typically equating to more efficient goods movement. Upgrading track and related facilities to enable higher travel speeds can be a valid infrastructure investment strategy, given a benefit/cost assessment that supports the action. Among the factors contributing to reduced speed are:

- Shared track with passenger train service
- Insufficient sidings
- Classification yard locations
- Heavy freight and/or vehicle traffic
- Steep terrain
- Curved rail geometry
- Tunnels
- Limited number of tracks
- Track gauge and tie/ballast strength

The 2018 CSRP identified the following segments of Class I railroads **(Table 3.21)** that are restricted to speeds of 40 miles per hour or lower.

Table 3.21: Class 1 Railroad Segments Restricted to Speeds 40 mph or Lower

Route	Between	Mile Post	And	Mile Post	Miles	Owner of Track	No. of Tracks	Max. Speed
San Joaquin	Sacramento	89.1	Elvas	91.7	2.6	UPRR	2	35
Capitol Corridor	Rocklin	110.5	Roseville	106.4	4.1	UPRR	2	40
Capitol Corridor	Elvas	91.8	Sacramento	88.9	2.9	UPRR	2	35

Capitol Corridor	Sacramento	88.9	Sacramento River	88.5	0.4	UPRR	2	20
Capitol Corridor	Santa Clara	44.7	San Jose	47.5	2.8	PCJPB	3	40
Pacific Surfliner	Mission Tower	0.7	L.A. Union Station	0.0	1.4	LACMTA	5	25
Pacific Surfliner	Mission Tower	0.7	CP San Diego Jct.	0.9	0.2	LACMTA	2	25
Pacific Surfliner	San Juan Capistrano	197.2	Orange/San Diego County Line	207.4	10.2	OCTA	1	40
Source: California State Rail Plan, 2018								

FREIGHT RAIL INFRASTRUCTURE PRESERVATION

Double-stacking (when freight containers are stacked atop one another on rail cars) increases economic and energy efficiency; the 2018 CSRP states that "a double-stack container-trailer-freight rail car moves freight three to five times more fuel-efficiently than a truck."[85] Sufficient vertical clearance is needed for double-stack service, which is typically 19 feet for international cargo containers and 20 feet, 6 inches for domestic cargo containers. In California, all four of the following primary freight intermodal corridors have sufficient vertical clearances for double-stack service: BNSF Transcontinental, UP Sunset, UP Donner, and Tehachapi. Height limitations that preclude double-stacking along Class I and major Short Line railroad routes are listed in detail in the CSRP.

TRACK WEIGHT ACCOMMODATION

According to the 2013 CSRP, in the mid-1990s, the standard railcar weight was increased from 263,000 to 286,000 pounds and became the applicable weight for all Class I railroads. A rail line's ability to handle this weight is a function of track conditions, rail weight or gauge, and weight bearing structures such as bridges.[86] Over 95 percent of California's Class I network is generally able to handle this standard weight, with only 1.2 percent of total miles (39 miles in Orange County) rated less than the standard. Weight data was not available for 120.5 miles of Class I track along the San Diego, Olive, and San Gabriel subdivisions.

FREIGHT RAIL SAFETY ASSESSMENT

California had 34 fatalities and 36 non-fatal injury collisions occurred at highway-rail grade crossings.[87] **Table 3.22** summarizes highway-rail grade crossing accidents from 2017 to 2021.[88] This information was provided by the Federal Railroad Administration's Office of Safety Analysis, which does not differentiate between the number of freight and passenger train incidents.

Table 3.22: Highway-Rail Grade Crossing Collisions, 2017-2021

Type & Highway User		**2017**	**2018**	**2019**	**2020**	**2021**
Train Struck Highway User	**Car**	56	59	58	39	64
	Trucks	12	20	15	17	18
	Pedestrian	45	52	51	44	34
	Other	31	41	40	32	33
	Subtotal	144	172	164	132	149
Highway User Struck Train	**Car**	11	12	3	11	12
	Trucks	6	1	2	2	2
	Pedestrian	2	2	3	-	1
	Other	4	5	3	5	4
	Subtotal	23	20	11	18	19
Total		167	192	168	166	190
Source: Federal Railroad Administration, Office of Safety Analysis, Total Causalities by State Report						

Short line railroads throughout California serve a critical role in keeping local communities connected to the national freight rail network. These lines tend to be products of Class I railroad spinoffs that faced years of deferred investment due to minimal traffic volume. Because of this, the short line rail industry faces significant challenges in upgrading its rail infrastructure. A short line's ability to haul the modern weighted 286,000-pound rail car can, in some cases, be the deciding factor if a new customer locates on its rail line. In addition, short lines on average operate their trains at much slower speeds because of the condition of the track and bridges. This can lead to increased wait times at crossings, emissions, and reduced utilization of crews and other railroad personnel. Generally, short line rail accommodates less weight than Class I rail. Though some short line railroads have excellent track conditions, the tie and ballast conditions of short line track are typically inferior to Class I track, and short lines often lack an active signaling system. Consequently, short line train speeds are generally lower (typically 40 miles per hour or less for freight trains) and operations are less automated. Approximately one in five, 19 percent of tons and 18 percent of carloads, start their trips on a short line in California. Only 26 percent (270 miles) of reported short line mileage in California can accommodate the 286,000-pound maximum (CRSP 2018).

California short line railroads are facing pressure for investment to remain competitive with trucks, with short lines in other regions, and to maintain vital connectivity to Class 1 railroads.

Seaports

MARINE FREIGHT INFRASTRUCTURE PRESERVATION

Efficient inbound and outbound movement at California seaports is critical for the State's economic health. To preserve maritime transportation infrastructure, channels and harbors for all ports must be dredged and maintained to accommodate the size of ships that California ports are designed to handle. In addition to the California's 12 ports, there are 16 waterways that require minimum vessel depths. **Table 3.23** indicates minimum channel depths as determined by the US Army Corp of Engineers (USACE), and actual channel depths as listed by the American Association of Port Authorities' (AAPA) Seaport Directory.[89]

Table 3.23: Minimum Seaport Channel Depth

Channel	USACE	AAPA
San Diego Harbor	39'	37'-47'
Long Beach Harbor	68'	76'
Los Angeles Harbor	57'	53'
Port of Hueneme	39'	35' MLLW*
Redwood City Harbor	38'	30'
San Francisco Bay Entrance	47'	--**
San Francisco Harbor	45'	55'
Oakland Harbor	45'	50'
Richmond Harbor	47'	35'-38'
San Pablo Bay and Mare Island Strait	42'	--
Carquinez Strait	42'	--
Suisun Bay Channel	42'	--
San Joaquin River	40'	--
Stockton	40'	35'*
Sacramento River	34'	--
Humboldt Harbor and Bay	34'	--

Source: American Association of Port Authorities' (AAPA) Seaport Directory, 2018.
****mean lower low water (Figures are for planning purposes only and not intended for use in navigation decision making.) **These facilities are no longer with AAPA***

The configurations of some California ports require vessels to heed minimum bridge clearances to avoid collisions. Vertical clearance is measured as the distance from the mean high-water level (high tide) to the bottom of the structural span.

Table 3.24 shows minimum vertical bridge height information for major California seaport bridges.[90] Access to the inland ports of Stockton and West Sacramento may require navigation under smaller fixed bridges and draw bridges.

Table 3.24: Major Bridge Vertical Clearances

Bridge	Vertical Clearance
San Diego – Coronado Bay	
West Span	156'
Middle Spans	175'-195'
East Span	214'
Vincent Thomas	
Middle Span	165'
Long Beach International Gateway	
Current	155'
New	205'
San Mateo - Hayward	135'
San Francisco – Oakland Bay	
West	204' -220'
East	112'
Golden Gate	
Center	225'
North Pier	213'
South Pier	211'
Richmond	
West Channel	185'
Carquinez	
North Span	146'
South Span	132'
Martinez UP Rail Bridge	135'
Rio Vista Bridge	146'
Source: NOAA Raster Chart Products	

Airports

AIR CARGO ASSESSMENT

Of California's top 13 air cargo-carrying airports, 12 also have commercial passenger service, with Mather Airport in Sacramento as the exception. Runway pavement is regularly inspected by federal and state officials for conditions and other compliance measures. These assessments ensure California's runways are maintained in "good" condition or better. Airport infrastructure, other than runways, is typically maintained by municipalities or regional airport systems. In the California Aviation System Plan 2020, San Francisco International (SFO) airport was identified as the one California airport having capacity-related constraints—due especially to geography. However, FAA acknowledged SFO's participation in regional planning efforts to address capacity needs.[91]

System Performance Monitoring

The National Highway Performance Program, which was established under MAP-21 and continued under the IIJA, provides support for the condition and performance of the National Highway System (NHS), for the construction of new facilities on the NHS, and for ensuring that investments of Federal-aid funds in highway construction are directed to support progress toward the achievement of performance targets established in a state's asset management plan for the NHS.

Safety Measures

Safety Performance Management (SPM) is part of the overall Transportation Performance Management (TPM) program, which the FHWA defines as a strategic approach that uses system information to make investment and policy decision to achieve national performance goals. The Safety PM Final Rule supports the Highway Safety Improvement Program (HSIP), as it establishes safety performance measure requirements for the purpose of carrying out the HSIP and to assess fatalities and serious injuries on all public roads.

Caltrans, in cooperation with the Office of Traffic Safety (OTS), is required to set five annual Safety Performance Management Targets (SPMTs) for all public roads in California by August 31 of each year. This is pursuant to the MAP-21 Act, P.L. 112-141. The Safety Performance Management Final Rule adds Part 490 to Title 23 of the Code of Federal Regulations to implement the performance management requirements in 23 U.S.C. 150.

Caltrans set SPMTs for the 2023 calendar year by August 31, 2022.[92] Caltrans and OTS have adopted aspirational goals consistent with the California Strategic Highway Safety Plan (SHSP) as follows:

Table 3.25: Safety Measures (Based on a 5-year rolling average)

	Data Source	5-Yr. Rolling Average Target for 2023	Annual Percentage Change for 2023
Number of Fatalities	FARS	3,808.2	-0.3%
Rate of Fatalities (per 100M VMT)	FARS & HPMS	1.216	-1.7%
Number of Serious Injuries	SWITRS	15,156.2	-2.3%
Rate of Serious Injuries (per 100M VMT)	SWITRS & HPMS	4.904	-2.3%
Number of Non-Motorized Fatalities and Non-Motorized Severe Injuries	FARS & SWITRS	4,131.7	-0.3% (Fatalities) -2.3% (Serious Injuries)
Source: California Department of Transportation and the Office of Traffic Safety, 2022			

States must establish statewide targets for each of the safety performance measures. For three performance measures (number of fatalities, rate of fatalities and number of serious injuries), targets must be identical to the targets established for the National Highway Traffic Safety Administration (NHTSA) Highway Safety Grants program that is administered by OTS. The State Departments of Transportation must also coordinate with Metropolitan Planning Organizations (MPOs) in their states on establishment of targets, to the maximum extent practicable. States report targets to the FHWA in the HSIP report that are due in August of each year.

Infrastructure Measures

The Bridge and Pavement Performance Management Final Rule, which is codified in 23 Code of Federal Regulations Part 490, defines the following national performance measures for bridge and pavement:

PAVEMENT MEASURES

- Percentage of Interstate pavements in Good condition
- Percentage of Interstate pavements in Poor condition
- Percentage of non-Interstate NHS pavements in Good condition
- Percentage of non-Interstate NHS pavements in Poor condition

BRIDGE MEASURES

- Percentage of NHS bridges in Good condition
- Percentage of NHS bridges in Poor condition

Table 3.26: National Highway System Pavement and Bridge Performance Measures

	2-Year NHS Targets ***(1/1/2022 to 12/31/2023)***		**4-Year NHS Targets** ***(1/1/2022 to 12/31/2025)***	
NHS Pavement Condition	**Good**	**Poor**	**Good**	**Poor**
Interstate	47.2%	1.9%	49.2%	1.7%
Non-Interstate	21.7%	10.5%	28.2%	9.0%
NHS Bridge Condition	49.1%	5.9%	47.3%	4.4%
Source: Caltrans 2022 TAMP				

System and Freight Performance Monitoring

TRUCK TRAVEL TIME RELIABILITY INDEX

Average travel time for a corridor does not provide travel time reliability information for individual trips along that corridor. Truckers, who may lose a competitive edge if shipments are late or too early, need to consistently predict actual arrival time. Truck Travel Time Reliability (TTTR) Index is the FHWA recommended metric to assess freight movement on NHFN. This TTTR Index comes from the collection of travel time data on the heaviest traffic days and comparing those to average travel time. It is calculated for each segment and each peak period. Based on FHWA methodology, the TTTR index is generated by dividing the 95th percentile time by the normal time (50th percentile) for each segment. The TTTR Index is generated by multiplying each segment's largest ratio of the five periods by its length, then dividing the sum of all length-weighted segments by the total length of roadway. For example, if a trip usually takes 20 minutes, and the TTTR Index is 40 percent, an additional 8 minutes (20 minutes x 0.4 = 8 minutes, or 28 minutes total) should be allowed for that stretch to ensure on-time arrival over 95 percent of the time for that segment.

In February 2017, FHWA finalized the ruling for this performance measure and required state DOTs to report TTTR Index periodically. The average TTTR Index for the Interstate Highway network in California in 2018 was 1.69. In 2018, Caltrans established 2- and 4-year targets to improve TTRR Index to 1.68 by 2020 and to 1.67 by 2022. In the 2022 Full Performance Period Progress Report submitted to FHWA, Caltrans reported that the TTTR Index in 2022 was 1.60.[93]

Table 3.27: System and Freight Performance Measures

	2017 Baseline Data	2-Year Target	2-Year Condition/ Performance	4-Year Target	4-Year Condition/ Performance
% of Reliable Person-Miles Traveled on the Interstate	64.6%	65.1% (+0.5%)	65.2%	65.6% (+1%)	73.8%
% of Interstate System Mileage Providing Reliable Truck Travel Time *(Truck Travel Time Reliability Index)*	1.69	1.68 (-0.01)	1.71	1.67 (-0.02)	1.60
Source: 2022 Full Performance Period Progress Report					

3C. California's Agricultural Freight

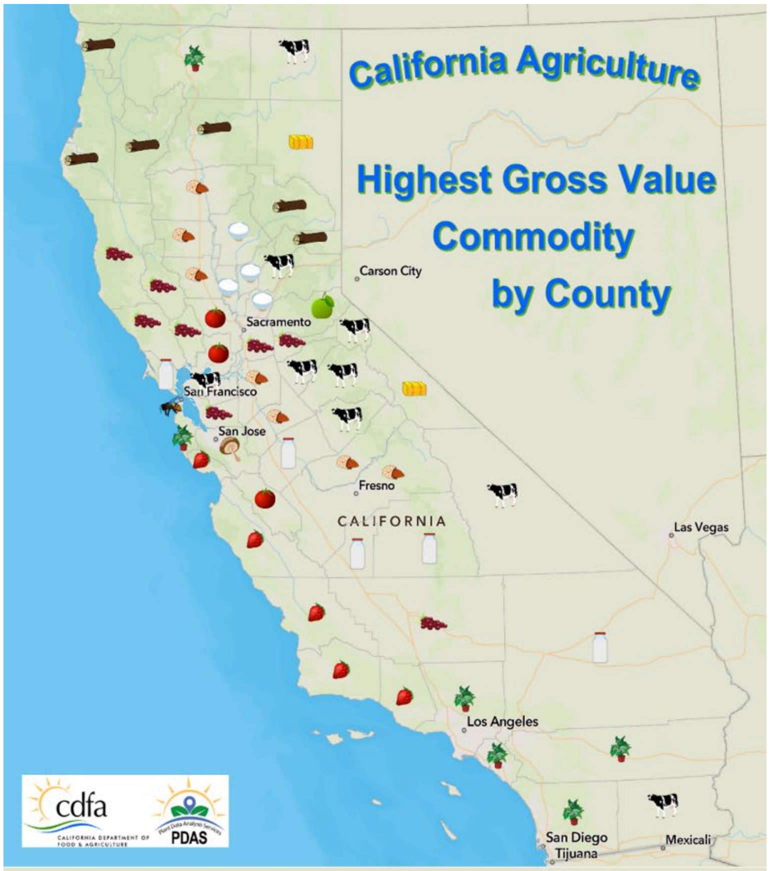
California's climate and diverse regional landscape attracted settlers who planted the first recorded citrus orchard at Monterey in 1782 and possibly the State's first mission orange grove planted at Mission San Gabriel in 1804[94].

California's hot Central Valley and temperate coast region have ideal growing conditions for vegetable, field, nut, and fruit crops. The dense forests of the Northern California Coastal, Klamath, and Cascade Mountain Ranges are national, State, and regional assets that provide the timber needed for global construction. Fertile mountain valleys and basins provide optimal grazing for cattle, dairy, and other agricultural production. The Pacific coastline to the west supports the State's fisheries.

Winter rain and snowpack feed the larger rivers, and water from the Central Valley aquafer allows ranchers and farmers to supply quality food to the world. However, without adequate transportation, farmers and ranchers cannot move their produce to domestic or international markets, and California cannot continue to be a global food producer.

Economy

Over the course of the years, California's diverse agricultural industries and related commodities have exploded. In 2020, the State was home to 69,600 farms on 24.3 million acres of farmland, with an average farm size of 346 acres.[95] In 2020, California generated approximately $49.1 billion in agricultural cash receipts, 13.7 percent of the nation's, with the highest-valued commodities being dairy products, specifically milk, grapes, almonds, and miscellaneous crops.



Highest Gross Value Commodity by County

Alameda	Grapes, Wine	Orange	Nursery, Woody Ornamentals
Alpine	Pasture, Range	Placer	Rice, Milling
Amador	Grapes, Wine	Plumas	Forest Products, Timber
Butte	Rice, Milling	Riverside	Nursery, Woody Ornamentals
Calaveras	Cattle & Calves, Unspecified	Sacramento	Grapes, Wine
Colusa	Almonds, All	San Benito	Vegetables, Unspecified
Contra Costa	Cattle & Calves, Unspecified	San Bernardino	Milk, Market, Fluid
Del Norte	Forest Products, Timber[1]	San Diego	Nursery Products, Misc.
El Dorado	Apples, All	San Francisco	Farm Products, Misc.[2]
Fresno	Almonds, All	San Joaquin	Almonds, All
Glenn	Almonds, All	San Luis Obispo	Berries, Strawberries, Fresh
Humboldt	Forest Products, Timber[2]	San Mateo	Nursery Plants, Potted
Imperial	Cattle, Heifers & Steers, Fed	Santa Barbara	Berries, Strawberries, Fresh
Inyo	Cattle & Calves, Unspecified	Santa Clara	Mushrooms
Kern	Grapes, Table	Santa Cruz	Berries, Strawberries, Fresh
Kings	Milk, Cow's, Unspecified	Shasta	Forest Products, Timber
Lake	Grapes, Wine	Sierra	Forest Products, Timber
Lassen	Hay, Alfalfa[3]	Siskiyou	Nursery Plants, Strawberry
Los Angeles	Nursery Products, Misc.	Solano	Vegetables, Unspecified
Madera	Almonds, All	Sonoma	Grapes, Wine
Marin	Milk, Market, Fluid	Stanislaus	Almonds, All
Mariposa	Cattle & Calves, Unspecified	Sutter	Rice, Milling
Mendocino	Grapes, Wine	Tehama	Walnuts, English
Merced	Milk, Cow's, Unspecified	Trinity	Forest Products, Timber[2]
Modoc	Cattle & Calves, Unspecified	Tulare	Milk, Cow's, Unspecified
Mono	Hay, Alfalfa	Tuolumne	Livestock, Unspecified
Monterey	Berries, Strawberries, Fresh	Ventura	Berries, Strawberries, Fresh
Napa	Grapes, Wine	Yolo	Tomatoes, Processing
Nevada	Cattle & Calves, Unspecified	Yuba	Rice, Milling

Source: California Agricultural Statistics Review 2020-2021

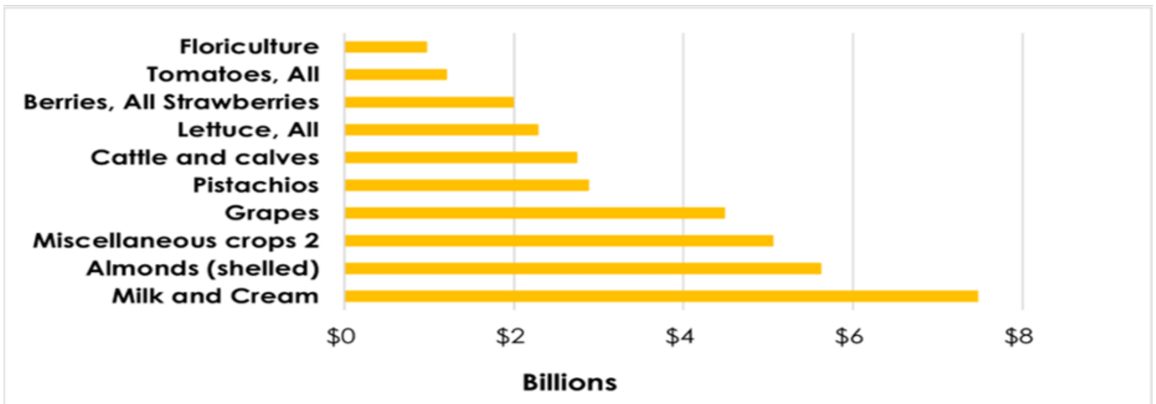
1. As of 2015 county crop report
2. As of 2016 county crop report
3. As of 2017 county crop report

cdfa PDAS

Figure 3.24: California's Highest Gross Value Commodity by County (California Department of Food and Agriculture, 2021)

During the same year, agricultural production and processing industries accounted for 2.8 percent of the state's gross domestic product.[96]

The State is the nation's sole provider (100 percent) of artichokes, celery, garlic, honeydew melons, processing tomatoes, almonds, kiwifruit, nectarines, olives, pistachios (in-shell), plums/prunes, and walnuts. California is also the nation's leading agricultural exporter. In 2020, California exported $20.8 billion, or 14.3 percent of the U.S. agricultural exports.[97] According to



1 Total value is based on USDA Economic Research Service cash receipts, September 2021 release.
2 Includes nursery/greenhouse crops (excluding Floriculture), Christmas trees, seed crops, and miscellaneous field, vegetable, berry, tree fruit, & nut crops.

Figure 3.25: California 2020 Top 10 Agricultural Commodities by Value (Source: USDA Statistics Service California Field Office, 2021)

the California Agricultural Statistic Review – California Agricultural Exports 2000-2021, the State's top ten agricultural products by export values listed by ranking include almonds, dairy and products, pistachios, walnuts, wine, rice, table grapes, oranges, processed tomatoes, and beef and products. The European Union, Canada, China/Hong Kong, Japan, and South Korea were the State's top five agricultural export markets.

ECONOMIC CONSIDERATIONS

Agriculture is a volatile industry, as the income is determined by the cost and returns that are not consistent. Many farmers and ranchers, especially smaller noncorporations, rely on agricultural loans to cover the upfront costs of seeds, services, fertilizer, fuel, livestock, feed, and wages. They have no guarantee that the income they receive from selling their goods will cover their costs. Unexpected weather changes, cost increases, fires, road closures, and port congestion can easily result in farmers tilling under crops, ranchers culling cattle, and industries collapsing into bankruptcy.

AGRICULTURAL TRANSPORTATION AND SUPPLY CHAIN

Agricultural commodities are transported along the supply chain by multiple modes, including trucks, railroads, airplanes, tractors, ships, and pipelines. Agricultural service industries provide farmers and ranchers with seed, feed, fertilizer, and other critical inputs to produce commodities. After harvest, the produce is transported to collectors, sold, and transported to food processors. After processing, packaging, and labeling, the final goods are distributed to domestic and national markets.

Figure 3.26: Agriculture Supply Chain

Cold Supply Chain

The Cold Supply Chain (Cold Chain) is a highly complex, expensive, and distinctive supply chain that uses specialized equipment, facilities, and technologies to quickly move and manage the temperature of goods through a precisely coordinated and unbroken series of movements from the farm, collector, and processor to the distributor. It complements the regular supply chain, involves all modes of transportation, and is utilized by most agricultural producers and industries. Cold Chain haulers and carriers use special refrigerated truck trailers, rail containers, and shipping and air cargo containers referred to as "reefers "to transport goods like beef, pork, poultry, seafood, fruit, and vegetables.

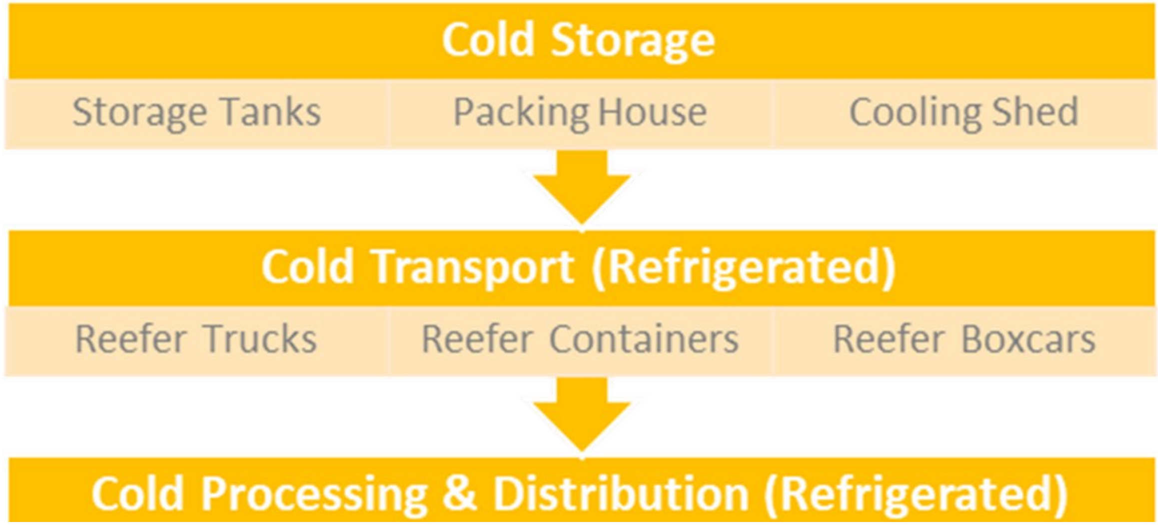


Figure 3.27: Agricultural Supply Chain

COLD CHAIN EXAMPLE

The dairy Cold Chain involves complex planning and coordination between the farmers, haulers, processors, distributors, loaders, and shippers. It begins when the milk is immediately moved from the cow through tubing to farm cooling tanks to reduce its temperature. Daily, the milk from the storage tank is loaded into a sealed insulated tanker to maintain its temperature and quickly transported to a dairy processor. The milk is heated and cooled at the processing plant to kill bacteria and processed into milk, cheese, butter, and other dairy items. After packaging, the dairy commodities are stored in refrigerated rooms until they are loaded onto refrigerated truck trailers called "reefers" and transported to retail outlets, retailers, and restaurants or exported to international markets in refrigerated containers.

California's nursery industries offer another example. Flowers are cut, moved to refrigerated facilities, and transported by reefer trucks, airplanes, and containers to ensure freshness. For cut flowers to maintain value, they must be moved through the entire Cold Chain (farms to shops) within 24 and 48 hours.

COORDINATION

A successful Cold Chain includes the quick movement and precise coordination between farmers and ranchers, various transportation haulers and carriers, food processors, freight forwarders, governmental inspection agencies, and distributors using advanced technology. One slip in the chain, such as a late pick-up, will impact all proceeding schedules within the chain. This short timeline and cold-chain technology add to the final cost.

TEMPERATURE CONTROL

Maintaining a constant low temperature through the Cold Chain is a challenge. Many refrigerated "reefers" trucks, containers, and boxcars only maintain the temperature at which the product is delivered and do have the capability of reducing the temperature. Each time the trailer or container is opened (e.g., deliveries, inspections) provides an opportunity for the temperature to let warm air in and raise the temperature. As a result, it is not uncommon to have loads of produce rejected at the final destination because the temperature was not maintained.

Trucks

Figure 3.28: Travels by Truck

Trucking is a component of every agricultural supply chain and the cattle industry's sole mode for moving animals. The cow-calf sector of the cattle industry raises and maintains a herd of cows and is the foundation of the beef industry. After weaning, calves and cows are separated, and a limited number of the calves are trucked to grazing areas to retain the herd size. Most of the remaining calves are trucked across the U.S. to feeding yards in Nebraska and other Midwestern States to supply the national beef industry. However, a few are trucked to the Central Valley and the Imperial Valley feeding lots.

RURAL CONNECTIVITY

Most of California's agricultural produce travels by truck for all, if not part of its journey. Rural highways and local roads provide first- and last-mile access to critical freight agricultural facilities and markets. These roads have much poorer pavement conditions than urban highways and often are not constructed or brought up to current design standards to accommodate the heavy loads they must bear. For example, many California farms and ranches are located in rural areas with no direct link to the interstate systems and where the SHS has not been upgraded since the 1940s.

ELECTRONIC LOGGING DEVICE (ELD) RULE AND THE HOURS OF SERVICE (HOS) REGULATIONS

ELD and HOS enforcement poses a substantial risk to the livestock industry.[98] Most of the nation's cattle feeder operations are concentrated outside the state and concentrated from Texas to the Dakotas. Therefore, after the cow-calf production, most of California's calves are packed into livestock trailers and transported accost the United States. The on-duty time and maximum drive time limits, coupled with the required rest period (before returning to duty), do not provide enough time for the haulers to complete their trips.

Unlike other goods, livestock haulers cannot idle or unload cattle, sheep, hogs, and poultry when their hours run out without jeopardizing the health of the animals. Not only does repeat animal loading and unloading stress and harm the animals, it also can endanger the haulers. Since ELD's enactment, the livestock industry has secured annual exemptions. In 2020, during the COVID-19 pandemic, the FMCSA exempted livestock haulers via an emergency declaration for HOS enforcement. Later, FMCSA expanded the waiver to include livestock feed deliveries.

While ELD and HOS exemptions are currently in place, there is no guarantee that they will continue. Flexibility is critical when transporting live animals, and regulations must be flexible enough to allow haulers to safely perform their work while simultaneously maintaining the safety of the livestock they are hauling. The regulations disproportional impact small ranching operations and drive them out of business. For more information, please refer to Chapter 4 Future of Freight, 4A: Trends, Issues, and Opportunities.

CALIFORNIA KINGPIN TO REAR AXLE LAW (KPRA)

One significant transportation challenge impacting the livestock industry is California's KRPA law which requires the center of the rearmost axle on all two or more axle semi-trailers to be at the forty-foot mark, or thirty-eight feet when configured with a single axle trailer. Many trailers have sliding tandems that allow the haulers to adjust the KPRA and rearmost axle distance. However, livestock haulers move cattle utilizing unique, industry-specific trailers with a permanent compartment between the kingpin and the rearmost axle that does not allow for adjustment.

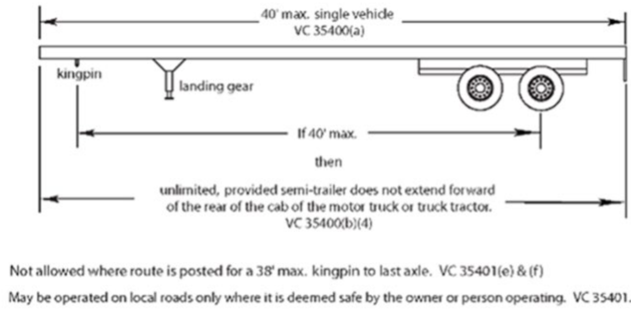


Figure 3.29: Two or More Axle Semi-Trailer

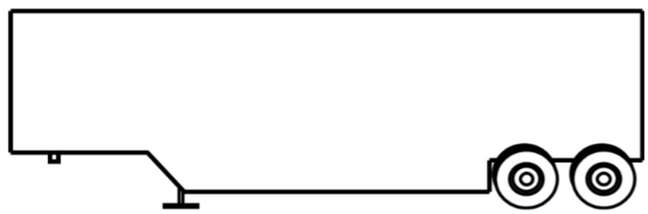


Figure 3.30: Livestock Trailer

Because the livestock trailers cannot be adjusted, cattle haulers risk non-compliance using the two-axle livestock trailer. Splitting their load, and using smaller trailers, is inefficient and results in higher transportation costs (more trips, higher fuel consumption), increased emissions, and higher retail prices. Furthermore, the KPRA law is specific to California, so cattle haulers from the other forty-nine states run the same risks as California haulers. Occasionally they are turned.

FEDERAL AND STATE HIGHWAY WEIGHT LIMITS

California highways have a federal gross vehicle weight restriction of 80,000 pounds. Many commodities, such as milk, are heavy and moved in bulk. For consumer health and safety, haulers pick up bulk milk from a farm collection tank and must load the entire stock produced that day, not the amount that keeps them compliant with state and federal limits. As a result, dairy truckers are constantly at risk of exceeding weight limits. While they can break the tanker seal and remove a portion of the load to become compliant, doing so increases the transportation time and compromises milk security and safety.

CHALLENGES TO ZEV TRANSITION

Agriculture relies on high-energy usage, so ZEV transition poses unique challenges to these industries. These challenges include, and are not limited to, product availability, cost and maintenance, and weight limits.

While a few tractor manufacturers are developing electric equipment, the equipment is limited to small to medium-sized vehicles, such as small tractors and orchard vehicles. The electric versions are not competitive with the existing diesel and gas counterparts and are more expensive and less flexible and durable.

As discussed earlier, the federal government limits the gross vehicle weight to 80,000 pounds (a few states have exemptions) for highways. However, agricultural machinery and trucks also utilize local and county roads. Zero-emission vehicles and equipment are heavier than their standard diesel-fueled counterparts, and aging rural roadways, culverts, and bridges cannot accommodate the extra weight. The older infrastructure must first be upgraded to accommodate the larger and heavier ZEV and equipment, or haulers must increase the number of trips to transport their goods.

Seaports

California's strategic Pacific Rim location is a key international gateway for agricultural trade. While the state hosts more than twelve seaports, the Ports of Oakland, Stockton, West Sacramento, and Humboldt specifically support agricultural trade.

Each port provides different types of agricultural goods, including natural resources. These ports connect farmers, ranchers, foresters, and fishermen to international markets.

Figure 3.31: Shipping

Table 3.28: California Ports, Agriculture Imports and Exports

Seaport	Rail Access	Highest Value Agriculture Exports	Highest Value Agriculture Imports
San Diego	On-Dock	Food Products	Perishables, Construction, Materials, Heavy Equipment
Long Beach	On-Dock	Petroleum Coke, Bulk Chemicals	Crude Oil
Los Angeles	On-Dock	Animal Feeds, Soybeans	Automobile Parts
Hueneme	Near-Dock	Produce	Produce, Liquid Fertilizer, Bulk Liquid
Redwood City	On-Dock		Aggregates, Sand, Gypsum
San Francisco	Near-Dock	Tallow, Vegetable Oil	Aggregate, Sand
Oakland	Near-Dock	Fruits and Nuts, Meats, Machinery, Wine, Spirits	Machinery
Richmond	Near- Dock	Vegetable Oils, Coke, Coal, Aggregate, Zinc, Lead	Petroleum, Bauxite, Magnetite, Vegetable Oils
Stockton	On-Dock	Iron Ore, Sulfur, Coal, Wheat, Rice, Machinery, Petroleum Coke, Safflower Seed	Liquid Fertilizer, Molasses, Bulk Fertilizer, Ammonia, Lumber
Benicia	On-Dock	Petroleum Coke	Automobiles
W. Sacramento	On-Dock	Ag. & Industrial Products	Ag. & Industrial Products
Humboldt Bay	N/A	Logs, Wood Chips	Logs, Petroleum, Wood Chips
Source: Southern California Association of Governments – Comprehensive Regional Goods			

The Port of Oakland (PoOAK) is California's most crucial agricultural port due to its centralized location, proximity to the agriculturally rich Central Valley, and direct rail link to the Midwest. It is a vital international agricultural gateway to the world.

SEAPORT CONGESTION – NATIONAL SUPPLY CHAIN CRISIS

The congestion at the POLB and POLA dramatically impacted the state's ability to export agricultural commodities in many ways. It drove up the value of empty shipping containers making it more profitable for shippers to directly return the empty containers to Asian markets rather than having them filled with agricultural commodities at the Port of Oakland.

The canceled PoOAK bookings dramatically impacted the walnut industry's ability to export their produce during the peak demand months, as one hundred percent of their exports leave the state as containerized cargo through this port. Haulers have difficulties securing containers and equipment, and it has become common for them to schedule appointments only to have their loads refused upon arrival at the port.

The significant economic losses to California's agricultural industries due to the inability to export their goods via the PoOAK has driven many nut crop and other agrarian commodity exporters and shippers into talks with the steamships and railroads to expand supply chain resiliency by transporting their products to Southern California, and East Coast and Gulf Coast state ports for international export, thereby bypassing the PoOAK. As congestion at the POLB and POLA has decreased, agriculture exports from the PoOAK have gradually increased, reaching over 40,000 TEUs in 2022.

Freight Rail

Figure 3.32: Rail

Grain producers from Nebraska and other Mid-western states utilize the Union Pacific railroad to transport feeder grain to California's livestock feeder yards located in the Central and Imperial Valleys and to ranches and farms across the State. Union Pacific's Grain Shuttle Program includes over 110 covered hopper (freight) cars dedicated to transporting whole grains moving as a unit (train) from a single origin to a single destination. The program provides high-volume grain shippers, who commit to moving specific volumes each month (annually) long-term, a dedicated train set.

California's Short Line Railroads (SLRR) play a critical role in moving agricultural freight. It often provides vital connectivity between individual industries and markets by moving raw goods from their origin to processing and refinement. With this said, SLRRs provide the critical first and last-mile connectivity that allows local agricultural and natural resource producers to access markets and reduce transportation costs on bulk commodities like timber, aggregate, and fertilizer. Examples of agricultural SLRR utilization include moving produce from farms to distributing plants, harvesting logs from forests and moving them to sawmills, moving iron ore from mines to a steel mill, and moving containers between ports and long distances.

Common California agricultural and resource commodities moved by SLRRs include lumber and forestry products, food products (tomato paste, grain, beans, rice, wine, nut oil, and berries), minerals and stone, fertilizer, and perlite.

Recently, rail has become an essential mode within the almond industries' supply chain. Almond production takes place in the Central Valley orchards.

NATIONAL SUPPLY CHAIN CRISES

Freight railroads did not escape the impacts of the national supply chain crises. High demand for freight rail and lack of rail and labor capacity resulting from years of industry consolidation stress the resiliency of the national rail service that slows down the Union Pacific's service between the critical Los Angeles and Midwestern rail hubs. California livestock industries solely rely on the railroads to deliver feed for dairy cows, cattle, chicken, and turkey producers. Rail delays in February 2022 place millions of chickens, turkeys, and thousands of cattle at risk of starvation or culling[99].

Air Cargo

Figure 3.33: Air Cargo

Most common agricultural commodities are produced and sold in bulk, and heavy, so it is not cost-effective to move them by air. Air cargo typically travels long distances, as a high value-to-weight ratio is time-sensitive and usually costs more to send than other modes. However, high-value, perishable produce such as cut flowers, fresh beef, cherries, and strawberries also utilize this mode. The main destinations for the State's airborne agricultural commodities are Japan, China, South Korea, Taiwan, and Hong Kong, with lesser markets in Europe and Latin America.

4

Chapter 4: Future of Freight

4A. Trends, Issues and Opportunities

California's goods movement sector is a dynamic sector that has dramatically changed and grown since the end of World War II. Major technological advancements, such as containerized cargo, and open global markets, have contributed to the state's success as an international gateway, while population growth, high-tech manufacturing, and e-commerce have led to increases in domestic freight. Additionally, although environmental issues are still a critical concern in freight planning, the state has made significant strides towards addressing community impacts associated with moving goods. For example, when the CARB met for its first time in 1968, the Los Angeles basin experienced 200 Stage 1 Smog Alerts that first year. By 1985, that number had fallen to 43, and since 2008, the only Stage 1 Smog Alerts issued have been because of wildfires. Even so, air quality attainment status continues to evade much of the state, thus driving transportation policy toward strategies that will further reduce air pollution and greenhouse gas emissions from the transportation sector.

California has strived to invest in infrastructure improvements to seaports, airports, rail facilities, and roads and bridges. These investments have improved freight fluidity and safety, reduced congestion for freight and passengers, significantly reduced emissions that impact health and contribute to greenhouse gases, and attracted industries to do business here, resulting in jobs and economic benefits. As the world's 5th largest economy[100], and poised to become the 4th largest[101], California's economic health matters to the nation. This careful balance between environmental protection and commerce provides the backdrop for many of the trends that will be described in this chapter.

E-Commerce Consumer Trends

The growth of e-commerce has been rapid. According to the most recent 2020 Annual Retail Trade Survey, e-commerce sales has continued at a faster rate than traditional retail. As shown in the **Figure 4.1**, total retail growth has increased by $1.7 trillion or 46 percent since 2010, whereas e-commerce has gone from $170 to $815 billion, a 380 percent increase in the same time period. Even during the 2008-2010 global recession when total retail trade slowed and dipped, e-commerce grew, capturing an additional 1 percent of the total retail share.

While the significant growth of online shopping can be attributed to increased convenience and efficiency, the COVID-19 pandemic has accelerated the trend. The lockdowns of the early pandemic facilitated a strong shift in consumer behavior from in-store retail shopping to online purchases. Most retail stores closed during the lockdowns, leaving online shopping as the only choice. E-commerce saw sales increased by $244.2 billion or 43 percent in 2020, the first year of the pandemic. According to the US Census, e-commerce as a share of total retail sales reached near 17% in 2020, and has slightly decreased but remained constant at around 15% of total retail sales through the first quarter of 2023.[102] Most forecasts expect continued growth in the U.S. based upon global trends in e-commerce market share of retail, the variety of goods becoming available, convenience of product delivery, and change in consumer behavior since the pandemic.

E-COMMERCE IMPACTS TO FRIEGHT INFRSTUCTURE IN CALIFORNIA

The rise in e-commerce has drastically changed the nature of purchasing behavior in that a larger percentage of consumers prefer the convenience of having goods shipped to their homes rather than going to a brick-and-mortar stores to purchase goods. This change has had profound impacts to the freight infrastructure in California. The state has seen multiple distribution centers (DCs) and warehouses built, affecting our land use patterns and traffic. E-commerce has increased demand for products produced overseas, which has increased imports, and impacted the ports and their operations. E-commerce has generated a large increase in light and medium duty trucks that perform last mile deliveries directly to consumer's homes. The increase in "last mile" deliveries has caused an increase in light and medium duty truck VMT. The increase in VMT causes degradation of pavement not only on the State Highway System, but also local arterials and neighborhood roads. Also, most of those vehicles rely on fossil fuels, which increase emissions. There is also the issue of retail returns, as a certain percentage of e-commerce sales are expected to be returned to the retailer, which induces more VMT and emissions. The specific quantitative impacts that e-commerce has on freight infrastructure is currently not well understood and is a topic that warrants more study and will be a focus for research in the coming years. In the meantime, the State will endeavor to support the transition of light and medium duty vehicles to zero emission technologies, and mode shift to zero emission modes such as e-cargo bikes where feasible. See **Chapter 6A** for specific strategies that mitigate impacts from freight generated by last mile deliveries.

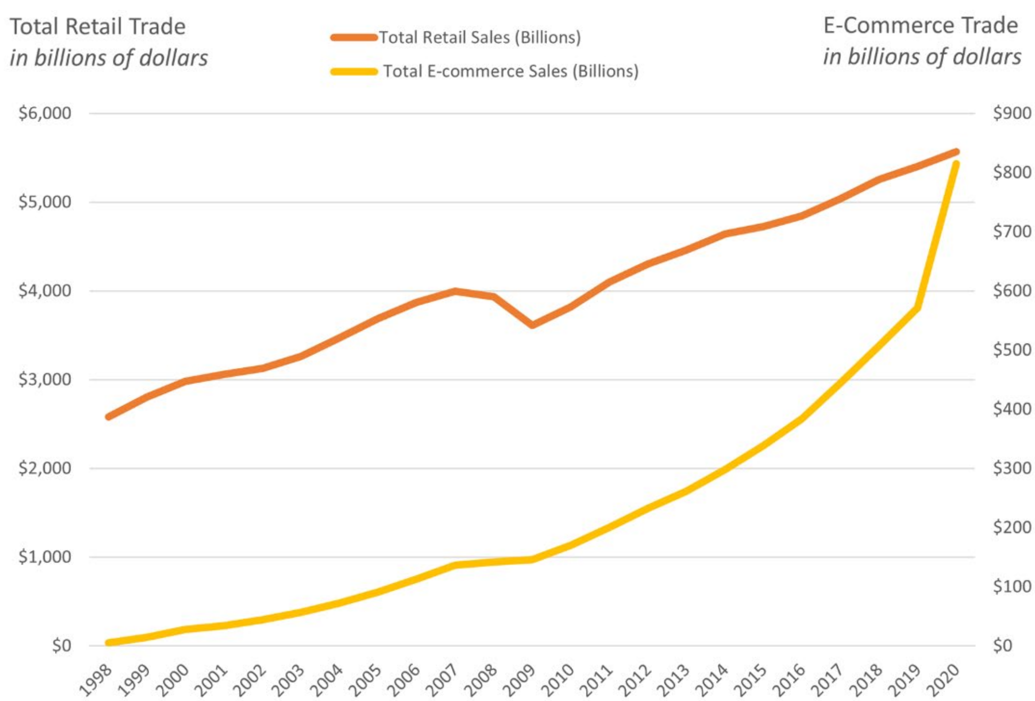


Figure 4.1: Historic National Total and E-Commerce Retail Trade Sales (Source: U.S. Census Bureau's 2020 Annual Retail Trade Survey

E-COMMERCE AND AIR CARGO DEMAND

One factor contributing to the rise of e-commerce as opposed to traditional retail is the large variety of goods available for same-day and next-day delivery. Greater emphasis is being placed on reliable deliveries throughout these networks as delivery windows continue to shrink[103]. According to Caltrans' latest California Air Cargo Groundside Needs Study, the cargo tonnage at airports is expected to grow at most airports by 2040, as shown in **Table 4.1.** Since the completion of this study, e-commerce growth and demand for same-day and next-day delivery service is resulting in increases in air cargo at urban airports, such as Sacramento, Ontario, and Los Angeles. For example, in the summer of 2022, Amazon announced that they are constructing their largest warehouse near Ontario International Airport. The warehouse will be a 4.1 million-square-foot, 97-foot-tall and should be completed within a year. However, Amazon also has plans to sublease current warehouses to other companies and scrap other plans for new warehouses across the state to balance the added capacity that the Ontario warehouse will generate. Whether or not that this trend could continue given the anticipated growth in e-commerce or return to pre-pandemic consumer behaviors is unknown. If the air cargo demand does continue at this rate for many of California's airports, intermodal connection improvements should be explored to accommodate for the increased demand.

INDEPENDENT DELIVERY DRIVERS: TRANSPORTATION NETWORK COMPANIES AND DELIVERY NETWORK COMPANIES

In addition to increased demand in the air cargo sector, Transportation Network Companies (TNCs) have become one of the mechanisms used by shippers to deliver goods between fulfillment centers/retail establishments and consumers. For example, Amazon has been partnering with different delivery and courier services to reduce the delivery time on Amazon orders but has seen limited success. Due in part to complaints about missed delivery times, missing orders, and overall dissatisfaction with courier services used by Amazon, the company made the decision to alter last-mile, same-day delivery operations. In 2016, Amazon began contracting with its own drivers through a program called AmazonFlex.[104] Like TNCs, independent owner-operators of light vehicles work for Amazon to make reliable, same-day delivery possible.

In response others, such as Walmart, Target and Costco have contracted with Delivery Network Companies[105] (DNC's) like Instacart, Shipt, Roadie(a UPS company) to provide one day delivery capabilities that compete with Amazon. Unlike the Uber and Lyft passenger services, they do not currently operate within the same market areas.[106] For smaller, local businesses, Postmates.com and DoorDash.com act in a similar capacity. Independent owner-operators of passenger cars respond to online orders for goods, ranging from restaurant orders to groceries to home improvement products, and deliver the items within an hour. These services allow local, non-Amazon retailers to better compete with the faster and more convenient delivery options that consumers are demanding.[107]

According to a 2020 report by the California Public Utilities Commission, there were over 200,000 active TNC drivers in California in 2019, a 26% increase from the previous year. In addition, TNCs completed over 900 million trips in California in 2019, an increase of 17% from the previous year[108]. In terms of DNCs, a 2020 report by the California Air Resources Board found that e-commerce sales in California have increased by over 50% in recent years, with companies such as Amazon and Walmart leading the way[109].

California's Top Air Cargo Airports	2013	2018	2021	% Change from 2018	2040
Los Angeles International Airport (LAX)	1,917	2,444	2,972	22%	3,016
Ontario International Airport (ONT)	461	826	956	16%	972
Oakland International Airport (OAK)	556	670	698	4%	779
San Francisco International Airport (SFO)	400	628	582	-7%	592
San Diego International Airport (SAN)	162	192	146	-24%	278
Sacramento International Airport (SMF)	74	127	167	31%	90
Sacramento Mather Airport (MHR)	55	77	836	986%	69
San Jose International Airport (SJC)	47	61	36	-41%	49
Hollywood Burbank Bob Hope Airport (BUR)	55	55	54	-2%	72
Stockton Metropolitan (SCK)	NA	45	64	42%	NA
Long Beach Airport (LGB)	26	24	16	-33%	20
Santa Ana (John Wayne) Airport (SNA)	18	20	16	-20%	22
Fresno-Yosemite International (FYI)	12	11	17	55%	16
*Source: Historic data is provided by Caltrans Division of Aeronautics. 2040 estimates are reported from California Air Cargo Groundside Needs Study, Caltrans, 2018 *percentage change is from 2018 to 2021*					

Table 4.1: Air Cargo Tonnage Trends (in thousands)

LAND USE TRENDS

The advent of e-commerce has changed business as usual for the retail industry, resulting in the closing or restructuring of many traditional retail operators. Consequently, the space previously occupied by retail stores is often being repurposed to office, residential, and other uses. Major malls are closing in favor of other uses.

Large retailers, such as Sears, The Gap, JC Penney, and others have closed hundreds of stores over the past couple of years. Such closings could accelerate, as lease terms for big retailers are typically between 10 and 25 years, meaning many were negotiated before e-commerce really took off. In 2018, only 44 million square feet of retail space opened in the 54 largest U.S. markets, down 87 percent from 325 million in 2006, according to CoStar Group, Inc., a real-estate research firm.[110] There will continue to be more of this trend, as the growth and demand for easy and convenient online shopping and merchandise returns continue. [111]

The biggest unknown for cities and counties is the true impact of e-commerce on, land use, and infrastructure. These trends will impact local sales tax revenues, traffic patterns, and occupancy of retail centers. Initial research indicates that e-commerce will reduce overall vehicle trips,[112] eliminate local sales staff jobs, and increase high-tech and warehouse jobs, but the impact on local sales and property tax revenues is not yet well-documented.[113]

TRENDS IN E-COMMERCE FULFILLMENT AND DISTRIBUTION CENTERS

The Inland Empire, Bakersfield, and Stockton have all seen a significant rise of industrial warehouse development and particularly development related to e-commerce distribution and fulfillment centers. This trend is best explained by exploring the keys to successful e-commerce businesses. According to Prologis, a major industrial warehouse developer/operator, warehousing needs for e-commerce requires three times more logistics space than traditional brick-and-mortar retailers[114]. This need for space, predicated by consumer demand for a wider variety and selection of merchandise (i.e., more Stock Keeping Units, or SKUs) that can be delivered within two days, has led to the development of high-cubed, automated warehouses with minimum ceiling heights of 66 feet. The rise of e-commerce and the need for more logistics space, in lieu of retail space, is rapidly changing the real estate market. In traditional retail, the most desirable spaces are located on places with heavy foot-traffic, successful e-commerce facilities have a very different set of requirements. The most desirable locations for distribution center development have proximity to major urban population centers, available land for the development of a minimum facility size of one million square feet, zoning that allows minimum building heights of 66 feet, good access to major transportation (road, rail, airports and seaports), an available workforce, and a business-friendly environment.

Another potential impact of a network reconfiguration is a rise in rent for facilities in infill markets.[115] The fulfillment centers are typically smaller with average sizes between 50,000 and 500,000 square feet located in urban areas. Companies, such as Walmart, use their retail centers to fulfill orders. Others, including Amazon, rely on a network of local fulfillment centers to respond to same-day, next-day, and two-day demand. Amazon (at the time of this report) has 29 fulfillment centers operating in California[116] and ranked the state as number 2 on its list of "Top 10 Most Entrepreneurial States," with more than 175,000 small and medium-sized businesses in California selling on Amazon.[117]

Emerging Technology Trends

TRANSITION TO ZERO EMISSION VECHILES

California continues to see a trend in the accelerated deployment of zero and near-zero emission vehicles and equipment through regulatory actions, incentive programs, and voluntary adoption by companies that recognize the operational and environmental benefits of these technologies. The transition of the goods movement fleet from internal combustion engines to NZE/ZE engines will have major implications on freight mobility and the environment. For example:

- Amazon recently agreed to order 100,000 electric delivery vans from the manufacturer Rivian.[118]
- FedEx has announced that it will add 1,000 electric delivery vans to its fleet.[119]

- Anheuser-Bush has partnered with Nikola Motors to utilize hydrogen-powered heavy-duty trucks to deliver its products.[120]

Truck technologies that provide ZE and NZE benefits while in operation and in electric mode include: Dual-Mode Hybrid Electric Vehicles (HEVs), Plug-In Hybrid Electric Vehicles (PHEVs), Range-Extended Electric Vehicles (REEVs) with integrated engine, REEVs with integrated fuel cell, Battery Electric Vehicles (BEVs), and range extenders utilizing roadway power. The market readiness of these truck options continues to evolve, and as batteries become lighter and the amount of energy they can store increases, ZE and NZE engines become a more viable alternative to internal combustion engine trucks. As alternative fueling infrastructure supports charging these batteries and as hydrogen and renewable natural gas fueling becomes more readily available, consumers and original equipment manufacturers (OEM) are anticipated to respond. An overview of the truck technology types under development can be found in the **Appendix G**.

Adoption of ZE and NZE technology is also a trend in freight rail. Currently, line haul locomotives and switcher locomotives are powered by a diesel engine that drives an electric generator or alternator. Locomotives and railyards are a significant source of NOx, PM2.5, and GHG emissions. Due to historical land use planning, many railyards and tracks are located near residential areas, which exposes residents to harmful emissions. To reduce these emissions and meet GHG emission goals, CARB has developed and implemented a number of measures to understand and reduce locomotive and railyard emissions, including studies, regulations, enforceable agreements, and funding of clean technology. CARB also administers financial incentives for operators to adopt NZE/ZE locomotives and equipment.[121] In the absence of Federal leadership, California will continue to be a leader in deploying NZE and ZE technologies in the freight rail sector.

At the federal level, the Infrastructure Investment and Jobs Act (IIJA) provides historic investments of $7.5 billion in ZEV-related projects, research, and infrastructure. The Inflation Reduction Act (IRA) invests $1 billion to replace dirty heavy-duty vehicles with clean, zero-emission vehicle infrastructure, and to train and develop workers. At the state level, California state budget includes $2.7 billion in fiscal year 2021-22 and $3.9 billion over three years for zero-emission vehicle and infrastructure. This will scale the zero-emission vehicle market in ways that benefit all Californians and accelerate the state toward meeting climate and transportation goals established in the Governor's ZEV Executive Order N-79-20 and consistent with California's Zero Emission Market Development Strategy. California's commitment towards zero-emission vehicles has created a trend that is driving vehicle transitions, infrastructure needs, public investment.

According to data from the California Energy Commission (CEC), electric vehicle sales made up 19 percent of new vehicle sales in California in 2022, with a total of 292,496 battery-electric vehicles hitting the state's roads[122]. Currently, there are about 80,000 EV chargers in California. To meet the increasing charging requirement, there will be approximately 90,000 more EV chargers to be installed as a result of the new funding.

On April 27, 2023, The California Air Resources Board (CARB) passed the "In-Use Locomotive Regulation", a rule aimed at reducing emissions from locomotives when they operate within the state.[123] Under the new rule, operators will be required to pay into a spending account, and the amount will be determined by the emissions they create while operating in California.

Companies will be able to use the funds to upgrade to cleaner locomotive technologies. The rule mandates locomotives will have a 30-minute idling limit. Additionally, switch, industrial and passenger locomotives built in 2030 or after will be required to operate in zero-emissions configurations while in California, and in 2035 for freight line haul.

On April 28, 2023,CARB approved the "Advanced Clean Fleets" rule, a first-of-its-kind rule that requires a phased-in transition toward zero-emission medium-and-heavy duty vehicles in California.[124] Under the new rule, fleet owners operating vehicles for private services such as last-mile delivery and federal fleets such as the Postal Service, along with state and local government fleets, will begin their transition toward zero-emission vehicles starting in 2024. The rule includes the ability to continue operating existing vehicles through their useful life. Due to the impact that truck traffic has on residents living near heavily trafficked corridors, drayage trucks will need to be zero-emissions by 2035. All other fleet owners will have the option to transition a percentage of their vehicles to meet expected zero-emission milestones, which gives owners the flexibility to continue operating combustion -powered vehicles as needed during the move toward cleaner technology. The flexibility is intended to take into consideration the available technology and the need to target the highest-polluting vehicles.

These rules are anticipated to spur the adoption of zero emission technology and the construction of zero emission infrastructure in the state and encourage adoption at the national level as well. Many of these types of projects are already being proposed for funding – please see **Appendix I** for a list of projects that are either fully ZEV or have ZEV components programmed for funding under the Trade Corridors Enhancement Program Cycle 3, approved by the California Transportation commission in June 2023.

3D PRINTING/ADDITIVE MANUFACTURING

As a subset of Additive Manufacturing, 3D printing refers to technologies that fabricate products by building up thin layers of material from three-dimensional, computer-aided designs. 3D printing uses machines to "print" successive layers of materials to create a full-range of products. 3D printing, often dubbed the Third Industrial Revolution,[125] is anticipated to cause significant disruptions in both manufacturing and supply chains, including re-shoring manufacturing jobs back to the U.S., co-mingling of manufacturing, storing, and fulfilling orders under one roof, and encouraging local production and customization opportunities for everything from the latest tennis shoes to automobile parts – and all with zero waste. One potentially radical impact of 3D printing is driving down the volume of finished goods shipments. In turn, the nature and destination of raw materials shipments might change dramatically. Businesses will have to figure out which products (or parts of products) can be printed and, accordingly, what manufacturing, assembly and shipment options need to be reinvented. Logistics services providers might offer customers 3D printing services at centralized warehouse locations connected to their shipping facilities. For example, instead of shipping a product from Cleveland to Seattle, a manufacturer might sell the rights to the digital model to a logistics company, which then prints the product in Seattle and delivers it to the customer. [126]

3D printing can lead to more sustainable manufacturing – both economically and environmentally. The ability to print on- demand as orders are received could eliminate shipping costs of unsold goods, discarding unsold goods, and eliminating waste in the manufacturing process itself, which in turn would reduce the amount of energy consumed for both producing and transporting unwanted merchandise.

3D printing is scalable and can support the production of very small items, such as nuts and bolts, to very large-scale items such as houses. The process can occur in small spaces and could lead to the redevelopment of underutilized and antiquated industrial uses in key locations throughout California.

The importance for California is the flexibility and speed to market of 3D printing technology by allowing specialized or additive parts to be generated onsite rather than ordering and waiting for those parts to arrive. The total impact on logistics and truck trips is not yet known, but since bulk material requires less space in a truck than manufactured parts, 3D printing may result in fewer truck trips.

DRONE DELIVERY

Large and small delivery companies have been testing alternative delivery vehicles. For example, UPS, Amazon, and DHL have been testing drones since 2016, following a letter from Amazon to the FAA requesting permission to use drones for delivery. In its letter, Amazon stated that 80 percent of the packages that they ship weigh less than five pounds. In 2015, the FAA established a working group to investigate regulatory changes that would be needed to allow drone delivery, including requirements of drone operator's visual contact with the drone, flight height limits of 400 feet, flight prohibitions over government buildings and within five miles of an airport, sense and avoid capabilities, and drones' ability to be identified (which would require Section 336 of the FAA code to be lifted). In April of 2015, the FAA provided limited approval to Amazon for testing drone delivery,[127] and in May 2018, additional approval was provided for a three-year testing period for using drones for deliveries, inspections, and other tasks. Aside from the FAA regulations, limited battery life (approximately two hours) and efficient/accurate delivery drop-off pose additional challenges for the successful use of drones for package delivery. In 2022, Walmart and Amazon announced that they would begin launching drone deliveries by air to specific markets in Northern California and other states of the United States.

AUTOMATION AND SUPPLY CHAIN ANALYTICS

The adoption of robotics and automation is growing rapidly. Robots have been used for the past 22 years on assembly lines in manufacturing, but as costs continue to decrease and machine learning aided by computing power has increased, robots have become much more common. The advancement of robots through tools such as artificial intelligence (AI) to emulate human activities has led to new applications for robots that are now benefitting the entire supply chain. Technological advancements in both robotics and automation create more efficiencies and increased safety throughout the supply chain – from warehouses to port complexes, robots and automation are being leveraged to address changing dynamics of the freight industry.

According to the 2022 MHI Annual Industry Report:

- 21 percent of the surveyed supply chain companies are currently using Internet of Things (IoT) technology, but that is likely to increase to 80 percent within five years.
- Currently, 22 percent of surveyed companies say they are currently using predictive analytics, but over the next five years the adoption rate is expected to jump to 82 percent.
- Current adoption rate for AI is 14 percent among surveyed companies, that number should grow to about 73 percent by 2027.[128]

WAREHOUSE AND MANUFACTURING AUTOMATION

Emerging automation technologies are enabling companies to make same-day deliveries easier and increase efficiencies. Not only does the system help retrieve and track thousands of different SKUs, but automation also assists with providing real-time inventory and replenishment requests. This is important for California because these systems allow sellers to meet consumer demands within a smaller footprint and with less labor in a state where available industrial land and labor are costly.

BLOCKCHAIN

Blockchain, defined as a system of digital transactions across a database or ledger shared among several computer nodes across a peer-to-peer network, is also making its way into the supply chain. Two major challenges for blockchain continue to be:

- Integration of many very different systems
- Trust

The use of blockchain applications, although growing more slowly than previously projected by industry leaders such as General Electric, continues to rise. In September 2018, Walmart announced the use of its Food Traceability Initiative, a blockchain technology platform developed by IBM to track food through the supply chain beginning with leafy greens. The globalization of food and lack of tracking food has led to large-scale recalls of both contaminated and non-contaminated products because of the inability to differentiate between them. In response, global retailers have begun to employ technology to better track food and prevent full-scale recalls of products. For California's supply chain, additional deployments of blockchain could provide real-time information about how cargo is moving through the system. This would also allow truck drivers to plan arrival times, terminal operators, could reduce peak-hour congestion, truck idling at terminals, and reduce truck-turn times.

AUTOMATED MARINE TERMINALS

Automated marine terminals involve the use of automated Rail Mounted Gantries (RMG) and automated trucks. This technology can potentially move more goods while generating fewer emissions than traditional manned marine terminals. In addition to deploying electric and battery-operated equipment, this technology also processes trucks more quickly, resulting in less idling. However, quicker cargo processing at the terminals also potentially means more trucks are released at once into the surrounding roadway network and more demand is placed on the infrastructure beyond the ports. The POLA, POLB, and other California Ports are not contemplating fully automated marine terminals currently. When and if automated marine terminal technology is adopted, close coordination will be necessary between the Ports, Caltrans, and local jurisdictions.

AUTOMATED RAIL YARDS

Automated rail yards offer significant advantages, including decreased dwell times, increased safety, and increased throughput; however, due to complexities and cost, development, and implementation of automation in freight rail yards has been slower than in warehousing. Like marine terminals, automation of intermodal rail yards requires a significant amount of data to successfully plan, implement, and operate. One of the greatest challenges to designing an automated rail yard is developing the Terminal Operating System (TOS) that links equipment, computers, machines, and other elements via a single platform to provide real-time communication and information-sharing throughout the facility for operations, as well as planning and monitoring activity. Fully automated freight rail yards do not currently exist in California but may be deployed in the future.

AUTONOMOUS TRUCKS

Autonomous, or self-driving, vehicles are increasingly identified as a "disruptive trend." Disruptive trends are defined as a trend that upends business as usual. It is anticipated that driverless technologies will create several societal benefits ranging from safety to productivity, but this technology will require workforce development for displaced drivers. McKinsey & Company, an American management consulting firm, published an in-depth article on the future of automated trucks in 2020[129]. According to their research, they anticipate Level 4 (nearly fully autonomous trucks capable of operating within a constrained geo-fenced environment without a driver) will be deployed as early as 2025. **Figure 4.2** depicts the anticipated timeframes for technology deployment based on this research. It is important to note that in California regulations allowing for the testing and deployment of autonomous motor trucks weighing less than 10,001 pounds (such as delivery vehicles) on public roads is allowed with an approved permit from the DMV. The DMV began approving new applications for permits for these types of vehicles on January 16, 2020. The DMV's regulations exclude the autonomous testing or deployment of vehicles weighing more than 10,001 pounds.[130]

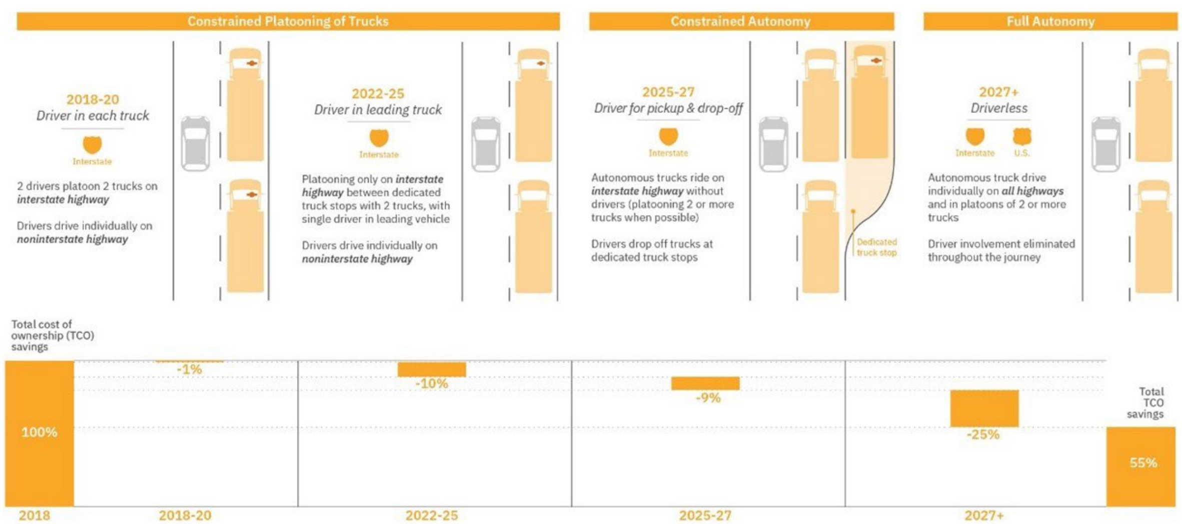


Figure 4.2: Timeframes for Autonomous Truck Deployment

Some regions are identifying local trucking networks for testing this technology. The Kern region's SAFETEC proposal have identified rural autonomous truck routes for testing autonomous trucks on warehouse to warehouse runs in rural areas.

The Federal Automated Vehicles Policy released in 2016 by the National Highway Traffic Safety Administration (NHTSA), outlines the federal government's approach to autonomous vehicles and emphasizes safety, vehicle performance guidance, model state policy, and regulatory tools[131].

The California Department of Motor Vehicles (DMV) has established regulations for the testing and deployment of autonomous vehicles on public roads. These regulations outline requirements for vehicle manufacturers, safety operators, and reporting obligations. Additionally, California Vehicle Code (CVC) includes provisions related to autonomous vehicles, defining their operation, testing, and requirements for manufacturers. It also covers liability and insurance aspects[132].

Many local jurisdictions in California have developed their own regulations to address the operation and deployment of autonomous vehicles within their boundaries. These regulations often include pilot programs, testing permits, and guidelines for autonomous vehicle operators.

TRUCK PLATOONING

Connected trucks, also known as truck platooning, refers to the linking of two or more trucks in a convoy using technology to link and automate acceleration and deceleration of the connected trucks. The technology automatically sets and maintains close distance between each vehicle allowing for fuel savings and increased safety.

A truck platoon is a series of trucks following each other on the road, with acceleration and braking controlled automatically (steering is typically still manual). When any truck's speed changes, the others behind it are instantly notified wirelessly, and those trucks respond immediately by braking or accelerating. This allows for much closer following distances, which reduces wind resistance and increases the number of trucks that can fit on the road at high speeds, thereby increasing roadway capacity. This also protects against rear-end crashes by automating brake reaction time.

Government and industry have worked closely on the permitting of platooning testing on public roads, and so far the technology has been effective and safe. As of December 2018, California permits platooning for testing purposes, while 17 states (including neighboring Nevada and Oregon) permit it without limitations. Four other states (including neighboring Arizona) allow for limited commercial deployment. The most significant change to the rules is how closely trucks may follow one another.[133] Currently, there is no formal process for implementing new freight technologies. The Federal Government is responsible for approving the technology, while the state is accountable for the actual implementation of the new technology.

The certification of vehicles is the responsibility of the original equipment manufacturer, but industry organizations are the ones that provide the recommendations for certification standards and practices. However, Driver Assisted Truck Platooning (DATP) in Nevada has been classified as only Level 1 automation, which does not require special registration; other states are following suit. California, an early adopter of truck platooning demonstration projects, can capture the full benefits of DATP if the state continues to move towards enabling legislation to support implementation of this technology. The actual benefits of national truck platooning deployment are not yet fully understood because it is unclear how willing competing truck companies will be to connect with one another. However, fuel savings, based on recent truck platooning demonstrations conducted by UC Berkeley Institute of Transportation Studies Partners for Advanced Transportation Technology (PATH) at the Aerodynamics Laboratory in Canada, indicate potential net fuel efficiency gains for a three-truck platoon of 5.2-5.7 percent.[134]

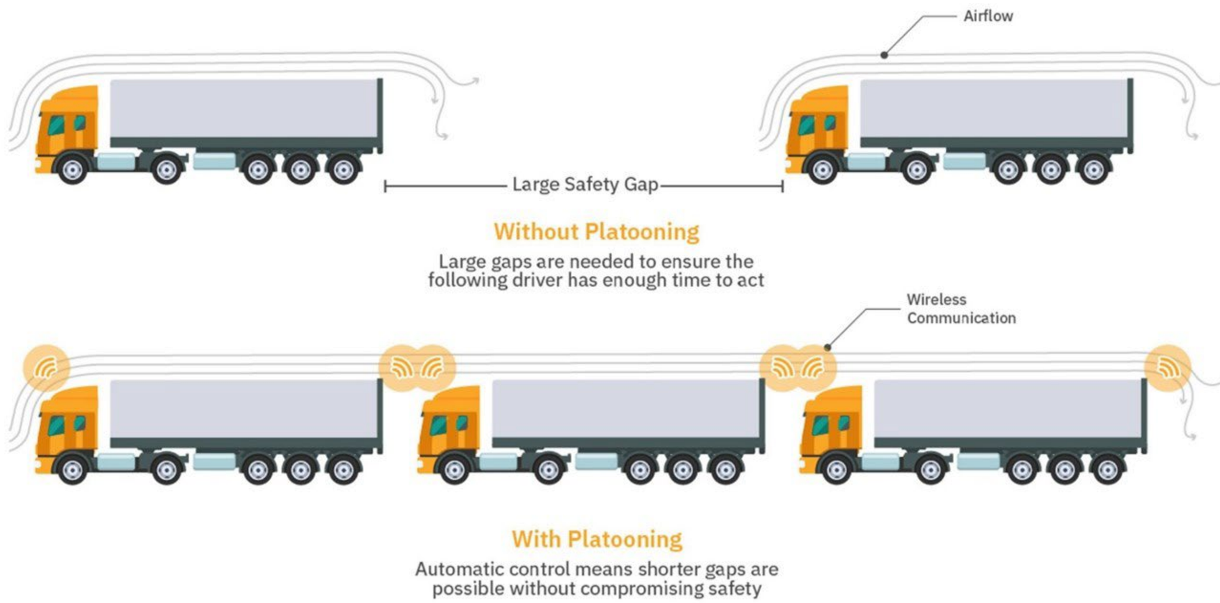


Figure 4.3: Truck Platooning Concept

Issues

CLEAN ENERGY CAPACITY AND INFRASTRUCTURE

There is a fine balance between equipment and infrastructure, as operators need available energy to fuel equipment, while energy providers require enough demand to support significant infrastructure investments. For example, large truck fleets enable manufacturers to achieve economies of scale when they order large quantities of alternatively fueled vehicles, which in turn, creates a guaranteed demand for alternative fuel, thus supporting infrastructure investments by the energy providers. These investments may also benefit other users, such as the general motoring population, taxi and TNC drivers, as well as transit providers. However, the cost of new equipment required to meet more stringent emissions standards is difficult for smaller trucking companies to meet and could result in the closure or relocation of small trucking firms if standards are enforced without assistance from public and private partners.

Electricity

California electricity is generated and distributed to much of the state by Pacific Gas & Electric (PG&E) in Northern California, Southern California Edison (SCE) in the Los Angeles region, and San Diego Gas & Electric (SDG&E) in the greater San Diego region. One significant concern raised during industry stakeholder interviews is the competitive advantages and disadvantages that electricity rates already pose for the state's seaports and industrial uses, and how much the gap could grow as the requirements for all-electric equipment go into effect. In 2022, the average rate for the largest regions in in California were: Los Angeles at 24.40¢/kWh, San Francisco at 31.10¢/kWh, and San Diego at 40.90¢/kWh. This significant rate discrepancy gives much of Southern California a competitive rate advantage over the Bay Area and San Diego region. Energy competitiveness may be more critical to the ports designated as Special Districts of the state of California, such as San Diego, Hueneme, Humboldt Bay, and Stockton as state entities, and for the Port of Benicia, a private port that does not receive municipal rates. Ports such as Long Beach, Los Angeles, and Oakland are city departments, so they receive lower rates than most others. For example, the Port of Los Angeles benefits from power provided by the City of Los Angeles Department of Water and Power ($0.12-$0.15 per kWh), and the Port of Long Beach receives the SCE municipal rate ($0.04 to $0.33 with an average of $0.14/kWh) – both rates are nearly half of the cost of what the Port of San Diego pays (current rate of $0.23 per kWh and proposed effective rate increase to $1.00 per kWh),[135] due to the higher SDG&E overall rate structure. For cold ironing (also called shore-to-ship power) purposes, running vessel auxiliary power while at port, conversion of cargo handling equipment from diesel and natural gas to electric, and places at the ports for trucks to plug in, these energy cost differences could negatively impact California's smaller, niche ports. Demand charges are also being reconsidered in light of SB 100, which encourages more use of electricity and less use of fossil fuels. At present, high electricity use is penalized by rate increases as much as four times the base rates. Suggestions from industry interviews include for the CPUC to revisit rate structures, identify infrastructure investments to facilitate conversion of fuel sources for transportation, and develop policies and plans accordingly.

A recent issue associated with electricity is planned blackouts. Climate change has increased the frequency of wildfires in the state and has made the state vulnerable to wildfires that are caused by faulty or damaged electrical equipment. Six of the ten most destructive files in California's history were started by electrical equipment. In response, electric companies are shutting down the electric grids where high winds and other weather events occur, which could cause electrical equipment such as power lines to fall to the ground and create a spark, which could potentially cause a catastrophic wildfire. Electrical blackouts reduce the likelihood of a wildfire being started – however, blackouts disproportionally affect rural and poor neighborhoods. Planned electrical blackouts are projected to be a persistent issue until existing electrical infrastructure is upgraded, possibly with underground power lines and the application of a "smart grid," which would shut down the electrical grid automatically if a problem is detected.[136] Until these improvements are made, planned electrical blackouts are an issue that may affect the reliability of electricity as a source for freight NZE/ZEV vehicles and infrastructure in the years to come.

Natural Gas

Renewable Natural Gas (RNG) is one of the most promising, near-term, fully-renewable alternatives to conventional diesel fuel for Class 8 trucks. RNG-configured heavy-duty tractors combine strong pulling power and long range, so they compete operationally with comparable diesel-powered tractors while offering a lower emission profile. The cost of operation can be lower as well because RNG is growing in availability from sources within the United States, while diesel fuel is experiencing significant price increases due to changes in vessel fuel requirements. Renewable natural gas is a biogas, a form of methane derived from biomass, and upgraded to a quality similar to fossil natural gas (a methane concentration of 90 percent or higher). Many waste facilities and dairy farms power their fleets with renewable natural gas, and companies such as Kroger have been investing heavily in anaerobic digester equipment that is capable of digesting grocery waste into natural gas fuel and high-quality fertilizer. In contrast to electricity, however, RNG results in the same emissions as fossil-based natural gas. The difference is that RNG is generally considered carbon-neutral because it does not introduce new carbon, but rather regenerates carbon needed for the next generation of plant life.

Hydrogen

Through the San Pedro Bay Ports' Technology Advancement Program (TAP), Hydrogen Fuel Cell (HFC) trucks have been tested by willing partners, and in 2018, CARB awarded $41 million to the Port of Los Angeles to partner with Toyota to develop and demonstrate 10 ZE Class 8 fuel cell tractors using Kenworth's T680 platform, and to develop two new heavy-duty truck fueling stations. The Toyota fuel cell truck has an operational range of 300 miles. In addition to CARB's award in 2018, Hyundai announced a planned deployment of 1,000 such trucks in Switzerland in 2019, and Toyota announced its development of a 300-mile range truck. High costs remain a considerable deployment constraint; hydrogen-fueled trucks cost three to four times more than diesel trucks and offer only one-third travel range. Despite this, hydrogen can be produced through electrolysis from clean, renewable energy sources and does not emit harmful emissions when used as a transportation fuel. Furthermore, one of the benefits of HFC vehicles is they are quicker to refuel than other ZE alternatives, such as battery electric vehicles.

LABOR LAW COMPLIANCE

Federal Labor Laws (Hours of Service / Electronic Logging Devices)

The federal hours of service (HOS) rules (**Figure 4.4**), updated on March 9, 2017, dictate the allowable driving time for commercial vehicle drivers. In 2018, full implementation of Electronic Logging Devices (ELD) to monitor and track HOS went into effect.

Drivers or carriers who violate the hours of service rules face serious penalties:

- Drivers may be placed out of service (shut down) at roadside until the driver has accumulated enough off-duty time to be back in compliance;
- State and local enforcement officials may assess fines;
- The driver's and carrier's scores under the Compliance, Safety, Accountability (CSA) enforcement program can go down, which could result in a variety of enforcement actions;

- The Federal Motor Carrier Safety Administration may levy civil penalties on the driver or carrier, ranging from several hundred dollars to many thousands of dollars per violation, depending on the severity;
- The carrier's safety rating can be downgraded for a pattern of violations;
  Federal criminal penalties can be brought against carriers who knowingly and willfully allow or require hours of service violations.

Figure 4.4: Hours of Service Rules

California Labor Laws

During the industry outreach, several industry participants cited concerns about California's rest and break periods as they related to their drivers. While the reasoning behind these standards is obvious, concerns about Labor and Rest Mandates were among the primary issues cited by respondents to the American Truck Research Institute (ATRI) 2018 Survey[137]

Section 512, Meal Periods, of the California Labor Code reads, in part, as follows:

> "(a) An employer may not employ an employee for a work period of more than five hours per day without providing the employee with a meal period of not less

> than 30 minutes, except that if the total work period per day of the employee is no more than six hours, the meal period may be waived by mutual consent of both the employer and employee. An employer may not employ an employee for a work period of more than 10 hours per day without providing the employee with a second meal period of not less than 30 minutes, except that if the total hours worked is no more than 12 hours, the second meal period may be waived by mutual consent of the employer and the employee only if the first meal period was not waived. (b) Notwithstanding subdivision (a), the Industrial Welfare Commission may adopt a working condition order permitting a meal period to commence after six hours of work if the commission determines that the order is consistent with the health and welfare of the affected employees."

On December 21, 2018, in response to a petition by the American Trucking Association (ATA), the Federal Motor Carrier Safety Association (FMCSA) pre-empted California Labor Law's Meal and Rest Break Rules as they apply to "property-carrying commercial vehicle drivers covered by the FMCSA's hours of service regulations." Federal law provides for preemption of California's law, as it was found to 1) provide no additional safety benefit, 2) be incompatible with federal regulations, and 3) cause an unreasonable burden on interstate commerce.

As mentioned previously in this chapter, In 2019, the Governor of California approved Assembly Bill 5 (AB5) Worker status: employees and independent contractors, which requires companies that hire independent contractors to reclassify them as employees, with a few exceptions. On February 3, 2020, in response to the passage of AB5 the American Trucking Association released a statement in petition of the new law. "AB5 is overbroad: In attempting to protect workers who are misclassified as contractors, it lumps them together with those who have made a deliberate choice to provide freelance services." In Sept of 2020 an additional bill was passed, Assembly Bill 2257 (AB2257), which rewrote several requirements of AB5 and exempts a substantial list of job categories. However, trucking companies who contract with drivers for delivery of goods are not one of those job categories.

The impact on independent carriers or owner-operators who work with multiple shippers is less clear, but more examples should surface quickly as carriers review their lease agreements. In many cases, AB5 would require employers to pay independent truckers as full-time employees.

Federal and State Emission Regulation Compliance

More stringent standards in California than neighboring states impacts the competitiveness of California trucking. However, the demand for cleaner and more efficient means of goods movement are driving technological advancements. Truck VMT increased from 85 million to 98 million between 2014 and 2018. Vehicle Miles Traveled is projected to reach 119 million by 2040. The growth in demand for trucking could exacerbate the truck driver shortage and result in longer delivery times and missed opportunities; however, it may also result in speedier implementation of autonomous trucks to address the long-haul segment. Additionally, an increasing number of truck trips, especially in urban areas where an increasing number of distribution/fulfillment centers are being constructed could increase congestion. Short-haul truck trips in urban areas have increased by more than 17 percent per year since 2015.[138]

While much of the conversation about the challenges of meeting emissions standards centers on trucking, marine facilities also face many of the same obstacles. The most significant new regulation facing vessel owners and operators is the full implementation of the International Maritime Organization (IMO) 2020 regulations that reduce sulfur oxide emission from 3.5 to 0.5 percent m/m. This rule went into effect on January 1, 2020. This change caused significant increases in fuel costs, a cost that already equals 50 percent of all operating costs.

FREIGHT RAIL CHALLENGES

Rail Cargo Transport Changes

Rail transport has experienced a shift in commodities and implementation of new regulations to address shipping growth of hazardous materials, such as crude oil and liquified natural gas.

Impacts and issues of these changes include the following:

- Decline in the transport of coal by rail has created additional capacity for moving intermodal containers by rail
- The truck driver shortage is creating capacity barriers on the railways as reflected in a 53 percent jump in rail spot rates in 2018 as compared to the same time in 2017[139]
- The deadline for implementing positive train control was postponed from 2015 to December 31, 2018
- New rules implemented in 2015 improve the safety of transporting crude oil and other hazardous materials by rail. Improvements include enhanced tank car standards, new braking standards, new testing, and sampling requirements to determine product stability and new operational protocols, such as routing requirements, speed restrictions and information sharing with local jurisdictions[140]

Short Haul Rail and Modal Shift

Use of short haul rail and inland waterways have had some success in California, but costs and operational issues have been persistent challenges. Both operations are limited to bulk cargo unless they have container moving equipment (lifting onto and off rail cars or barges to or from trucks). These extra handling points create competitive price and time advantages for trucking over rail and barge services for short-haul trips. However, with the shortage of truck drivers and the associated upward pressure on trucking rates, the three modes appear to be more closely priced. The following provides a list of impacts and issues associated with these two alternatives to trucking:

- Much of the freight rail infrastructure in urban areas near California's ports is shared with passenger rail, such as Caltrain and Metrolink. Demand for passenger rail is increasing with population growth, higher gas prices, and congestion, and demand for freight service is increasing, due to the shortage of truck drivers.
- Trucks provide the first/last mile connection for most goods moving by short-haul rail or by barge.
- Trucks typically retain a competitive time advantage over goods moved by rail or barge. Railed and barged goods must wait to be loaded with other goods destined for the same inland point, off-loaded at the intermodal yard or inland port, and picked up by a truck for delivery. Trucks provide a direct connection between the arrival and destination.
- Short haul rail, such as would be needed to support an inland port, may require an operating subsidy to be price competitive with trucking. However, the subsidy cost might compare favorably with the debt service and ongoing maintenance costs for a capital

project alternative, such as a dedicated truck lane. The permitting challenges may also be fewer and require less time to complete.

AIR CARGO CHALLENGES

Air cargo arriving at and departing from the state's airports have been exceeding the projected growth rate of less than three percent. In 2017, international air cargo grew by 9.7 percent, and in 2018, air cargo grew by 3.5 percent. The softer 2018 growth correlates with the potential risks of tariffs during the Trump administration.

Impacts and issues of this trend include the following:

- Increased demand for air cargo at California's international airports due to e-commerce and new technology platforms that employ solutions, such as blockchain, will improve the ease of streamlining online consumer orders across an omni-channel supply chain.
- Growth in air cargo from e-commerce will generate more truck trips to/from the air cargo terminals.
- Access to and from air cargo facilities will become a critical first/last mile issue for many airports in California.

WAREHOUSING CHALLENGES

Warehousing vacancy rates are at all-time lows. The increased demand for e-commerce during COVID-19 lockdowns combined with backlogs created by supply chain congestion has created an unpresented need for warehousing space. Vacancy rates in 2021 were at 3.4% despite adding 270 million square feet of supply. Prologis has forecasted that warehousing capacity nationwide will need to increase by at least 15% from current levels to accommodate inventory levels and build resilience against future disruptions. This can be a challenge for regions like Southern California that has limited room to expand, and the cost of land is some of the highest in the nation.

Due to the limited land availability near the marine ports in Southern California, the warehousing industry is facing the challenge of expanding into the inland empire to meet the growing demand for storage and distribution.

Opportunities

CLEAN TRUCKS AND TRUCKING EFFICIENCIES

Clear Air Action Plans

The San Pedro Bay Ports led the nation by implementing the first Clean Truck Program in 2007 pursuant to adopted emissions reductions standards established in the Clean Air Action Plan (CAAP). The California Air Resource Board and the state's regional air districts implemented similar statewide targets. All agencies, in coordination with the federal EPA and the National Highway Traffic Safety Administration (NHTSA), worked toward setting new fuel efficiency standards for the next generation of heavy- and medium-duty trucks. The fuel efficiency standards and the state's emissions reduction targets correlated with the National Ambient Air Quality Standards (NAAQS). In 2017, the Ports of Long Beach and Los Angeles updated their

CAAP, which set new targets for trucks and cargo handling equipment consistent with the California Sustainable Freight Action Plan to reduce GHGs from port-related sources to 40 percent below 1990 levels by 2030.

Additionally, the updated CAAP set new targets for the Ports' transition to meet NZE standards beginning in 2020 which the Ports will begin assessing a fee on all drayage trucks that do not meet the NZE standard anticipated to be established by CARB in 2020. When the 2017 CAAP was adopted, additional goals set for ZE trucks were anticipated to result in full transition to NZE and ZE by 2036. These targets aligned with the Obama Administration's increasingly stringent NAAQS and fuel efficiency standards referred to as Phase I. Phase II of the emissions reductions were drafted and released for public review in 2016.

Most recently in 2018, the U.S. EPA, in partnership with the NHTSA, placed a hold on the implementation of the 2016 Phase II fuel efficiency standards. Following a letter from the Department of Energy in 2018, the two agencies not only paused the implementation of more stringent fuel efficiency standards, but also stated that a national fuel efficiency standard should take precedence over state standards, such as the more stringent CARB emissions standards passed in 2018. CARB's stringent standards are a result of more stringent federal NAAQS for 8-hour ozone in 2023. CARB and the state's Regional Air Resource Boards have identified ZE implementation as the path necessary to attain NAAQS compliance. CARB's latest ZE targets are based on meeting NAAQS.

Truck Only Lanes

The separation of heavy vehicles and passenger vehicles decreases the risk of collisions.[141] Approximately 12 percent of passenger vehicle fatalities involve trucks. Speed limits for trucks and autos typically vary by 10 miles per hour in California, impacting the overall flow of freeways. Removing trucks from the general-purpose lanes would likely result in an overall increase in travel speeds, due in part to less merge/diverge conflicts and partly because of a moderation in overall corridor travel speeds. The speeds would also increase since large trucks take up more space; removing them may increase traffic flow. [142]

The trucking industry may also benefit from the reduced accident rates of a truck-only lane. Since there would not be the disturbances in this lane usually created by passenger vehicles, the trucks will need to brake, accelerate, and change lanes less often, creating smoother and more efficient travel. An addition of an extra lane will increase capacity, relieve congestion and lower travel times.[36]

When there is a truck-only lane, platooning can be implemented. Platooning, with the aid of wireless communication technology and Dedicated Short-Range Communication (DSRC), reduces the distance between trucks, which in turn reduces wind resistance and increases capacity of a lane.[143]

Connected Vehicles and Communication Technology

The current national framework for the connected vehicle (CV) environment envisions the use of DSRC, cellular (e.g., 3G, 4G, LTE, 5G), or potentially other types of radio communication between vehicles themselves and the surrounding infrastructure. While some of the anticipated applications for CV-instrumented corridors could conceivably utilize non-DSRC communication to realize functionality, DSRC for now is the only option that would have specific impacts to the infrastructure.

Roadside DSRC has been established by USDOT as a specifically allocated set of channels and frequencies for use in the anticipated CV world. It is also central to a continuing series of field evaluations and pilot programs led by USDOT. Recent estimates indicate that 20 percent of vehicles will be equipped with some form of CV technology by the year 2025. While other technologies could be implemented to achieve interconnectivity between vehicles, those that are included in the current USDOT-sponsored CV program are the most promising ones for accomplishing nationally coordinated standards through non-proprietary (open) solutions.

On November 20, 2020, the Federal Communications Commission adopted new rules for the 5.9 GHz band by designating the lower 45 Megahertz (MHz) of the 75 MHz band for unlicensed operations while continuing to dedicate the upper 30 MHz for Intelligent Transportation Systems operations. Additionally, the Commission ordered that ITS operations in the upper band transition from DSRC-based technology to C-V2X-based technology.

For freeway and highway driving, on-board communications equipment would be integrated with application equipment and processors that would implement several envisioned application packages. Much of the enabling technology for the autonomous functions will reside in the vehicles and will include, ultimately, a wide variety of OEM on-board vehicle systems. This on-board equipment and technology will communicate with operation centers and remote application servers. The enabling architecture is expected to utilize cellular and DSRC communication.

Some or all of the proposed CV applications will require continuous DSRC coverage over the lengths of the most heavily used freeways and highways in the region (e.g., I-5 and SR 99). To enable this coverage, DSRC roadside installation sites would need to be implemented at regular intervals. Installation may also need to occur on connecting arterials to provide the degree of coverage necessary for some CV applications.

DSRC/C-V2X is capable of communicating with minimal latency over relatively short distances to ensure timely communication with vehicles. A dedicated DSRC installation would include (at minimum) a DSRC radio, pole, and cabinet. Alternative mounting options include existing light poles, catenary support structures, or signal pole standards. Existing ITS control cabinets can be used to house the DSRC equipment as well. The following list summarizes the typical DSRC field components (supporting systems, such as remote monitoring servers, are not included below):

- DSRC radio
- DSRC poles and mounting structures
- DSRC cabinet and equipment
- Communications, power conduit, and cabling
- Splice vaults and pull boxes

Moreover, Vehicle-to-everything (V2X) technologies have the potential to revolutionize the way goods are moved by enabling more efficient, safer, and more sustainable transportation systems. The impact of V2X technologies on goods movement can be significant. By improving communication with each other, sharing information such as speed, position and direction, safety, reducing congestion, and increasing efficiency, these technologies can help to reduce the costs associated with goods movement, including fuel costs, labor costs, and transportation costs. They can also help to improve the overall sustainability of the transportation system, reducing emissions and helping to address climate change.

In addition, V2X technologies can enable new business models, such as real-time tracking and monitoring of goods, which can help to improve supply chain management and reduce waste. They can also enable new forms of transportation, such as autonomous vehicles and drones, which can further improve the efficiency of goods movement[144].

Freight Roadway Pricing Applications

There are two types of tolls: fixed and variable tolls. The fixed tolls are predetermined based on the distance covered, axle amount, and/or weight per axle of the vehicle, and do not change during the day. The variable tolls are dependent on features, but also change throughout the day either in response to current conditions or according to a predetermined schedule (i.e., by time of day).[145]

California currently has no interstate system tolls that are dependent on the weight per axle of the vehicle. However, such a system of tolling would be an ideal method for mitigating the damage caused by heavy trucks. **Figure 4.5** lists the states and facilities with toll rates based on per-axle weights. [146]

Tolling can be used to fund road maintenance and generate revenue while providing greater travel reliability. Tolling also acts as a travel demand management strategy and therefore may reduce emissions. Discounted toll rates for low-emissions vehicles would encourage operators and fleet managers' greater investment in low-emissions vehicles and technologies.[147]

The elasticities of toll-paying behavior are different for freight vehicles versus passenger cars. According to a project study jointly sponsored by the National Cooperative Freight Research Program and National Cooperative Highway Research Program, only a small proportion of freight drivers are open to the idea of roadway tolling.

Truck Size and Weight Limitations Opportunities

In April 2016, FHWA completed an evaluation of truck size and weight limits established by Congress as part of the STAA. Currently, California is limited to 80,000 pounds on interstate highways, whereas Oregon and Nevada can allow up to 105,500 and 129,000, respectively, on designated corridors, thus retaining their established limits. In addition to weight, both states also allow longer trucks. Heavier and longer trucks cannot continue into California which require loads to be separated at the border in compliance with California's limits.[148] The 2016 FHWA Study resulted in no change to the federal law. The study evaluated a range of benefits and costs from fuel consumption and emissions reductions to safety, but no changes have been made to the federal size and weight limits. As U.S. regulatory agencies continue to investigate the safety and potential infrastructure-impact concerns, other countries such as the United Kingdom have increased its size and weight limit and documented a reduction of fatalities, due to freight-related accidents, by 35 percent.[149]

Figure 4.5: Interstate System Toll Roads in the United States

CLEAN FREIGHT CORRIDORS

An opportunity for the deployment of clean freight technologies was created under Senate Bill 671 (SB671), "Transportation: Clean Freight Corridor Efficiency Assessment (Gonzalez, Chapter 769, Statutes of 2021)." This bill was codified under Government Code 14517 and requires the California Transportation Commission (Commission), in collaboration with various state agencies, to develop a Clean Freight Corridor Efficiency Assessment.[150] The goal of the Assessment is to identify corridors, projects, and other information to support the transition to zero-emission freight. The Assessment is being led by the Commission with input and guidance from the SB 671 Workgroup, which is composed of public and private stakeholders. The Clean Freight Corridor Efficiency Assessment is due to the legislature on December 1, 2023. All information provided in this section is draft and subject to change until adopted by the Commission.

Senate Bill (SB) 671 requires the Commission to identify zero-emission infrastructure projects that would support medium- and heavy-duty trucks, as well as potential project sponsors. As of March 2023, the Commission, in partnership with the California Air Resources Board, the California Energy Commission (CEC), Caltrans, the Governor's Office of Business and Economic Development, and the Senate Bill 671 Workgroup, have identified the proposed top six freight corridors in California, and the number of zero-emission medium- and heavy-duty stations needed statewide. The six proposed Clean Freight Corridors are I-5, I-10, I-15, I-40, I-80, and SR 99, depicted in **Figure 4.6**.

Figure 4.6: SB 671 Proposed Clean Freight Corridors

The benefit with focusing on the number of public stations needed along the top six corridors is to ensure a "minimum viable network" for long-haul and regional truck trips, i.e., the minimum public network of charging and refueling stations required so that a truck driver can complete their freight journeys throughout the state in zero-emissions trucks. Urban centers can be the starting point of the buildout of this minimum public network, especially to support delivery and short haul or regional trips. However, the minimum statewide network will be required to support the state's goals for 100% zero-emissions trucks by 2040, since freight trips across the state cannot be supported solely by urban public infrastructure alone.

There are several potential areas where entities have expressed an interest in building zero-emission freight stations in the same place where the Commission's study has identified that it will be important to build. These areas are covered below.

1. EnergIIZE Projects

The first area of overlap is the CEC's EnergIIZE program. This program has funded a number of zero-emission freight infrastructure projects. There are several different "Funding Lanes" available in this program.

- "EV Fast Track" provides incentives of up to $500,000 per project for electric vehicle charger purchases.
- "EV Jump Start (Equity)" provides incentives of up to $750,000 per project for electric vehicle charger purchases.
- "EV Public Charging" provides incentives of up to $500,000 per project to public charging station developers. Level 2 chargers are not eligible.
- "Hydrogen Lane" provides incentives of up to $3 million per project for deployment of hydrogen refueling infrastructure equipment for medium- and heavy-duty vehicles.

Currently, there are 53 electric charging locations funded through this program and 5 hydrogen locations funded through this program. Some of these projects are located along key corridors or in dense urban areas. See exhibit 1 and exhibit 2 below. The timeframe for these projects is still developing.

On March 28, 2023, the CEC revealed a new initiative at a public workshop under the banner of EnergIIZE projects. The initiative focused on the potential solicitation for medium- and heavy-duty vehicle charging and hydrogen refueling infrastructure projects along designated corridors. The CEC will allocate up to $20 million in the initial solicitation to fund the establishment of charging and hydrogen stations along these corridors, catering to the medium- and heavy-duty zero-emission vehicles.[151]

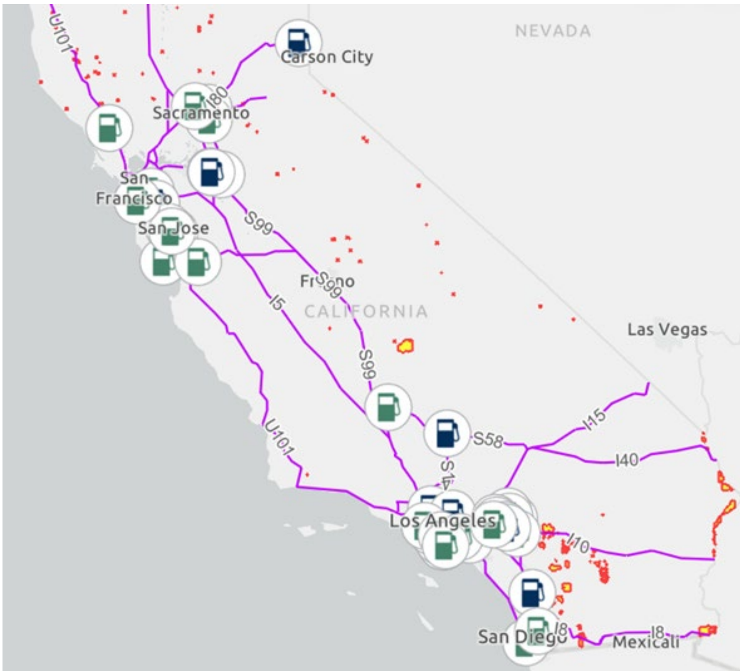


Figure 4.7: Private EnergIIZE stations

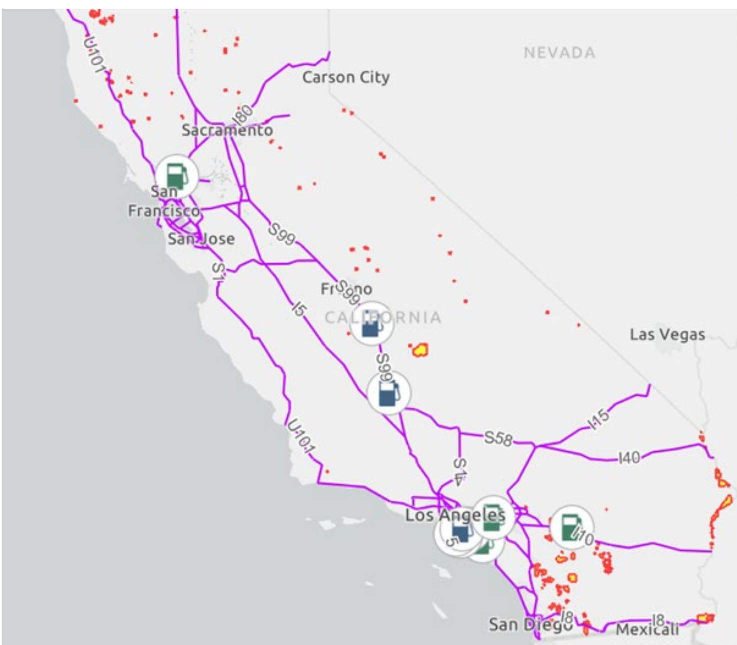


Figure 4.8: Public EnergIIZE stations

Specifically, the stations in Sacramento and Stockton along Interstate 5 and Highway 99, the stations in the Bay Area, the station on Interstate 80 at the edge of the California and Nevada border, the stations along Highway 99 in Visalia and Bakersfield, and the stations in the Los Angeles area are all near the top 6 priority freight corridors or in dense urban areas where stations will be needed early on. The exhibits included here are part of an interactive CEC map dashboard that can be accessed online here: https://calstartorg.maps.arcgis.com/apps/dashboards/93ba3501edad4f51beb4d8d4dda46647. The timeline for when these stations will be built is still unknown, but these stations are locations where entities have applied for and received incentive funding for zero-emission freight infrastructure.

2. Truck Stops

There are several large truck stop companies that have plans to add electric truck charging, hydrogen fueling, or both at their existing locations. Since truck stops are public and since many of these locations exist along key freight corridors already, these locations represent an important piece of planned zero-emission freight infrastructure.

The Pilot Company is planning to add zero-emission freight charging and/or re-fueling to all of their California locations. See exhibits 3 and 4 below for locations.

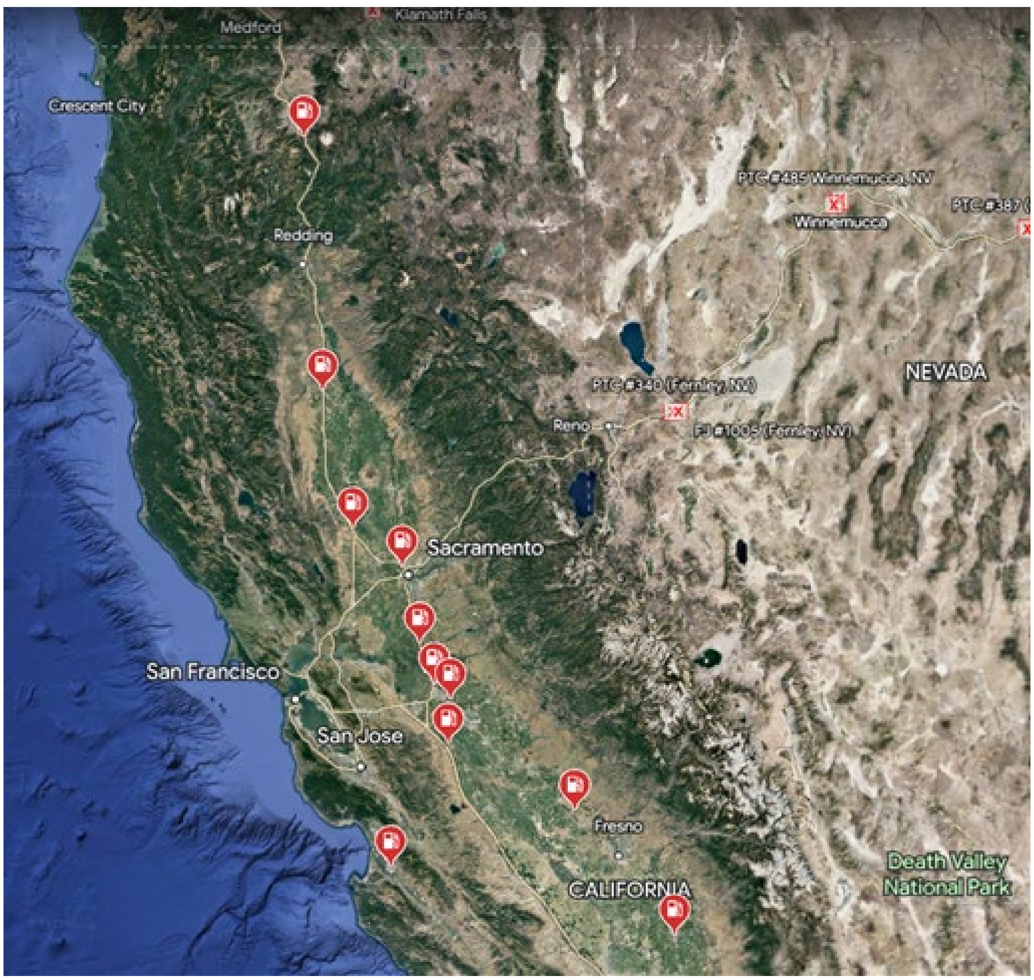


Figure 4.9: Pilot Truck Stop Locations – Northern California

Figure 4.10: Pilot Truck Stop Locations – Southern California

As you can see from these figures, many of the Pilot truck stops are located along Interstate 5. There are several locations along Highway 99, on Interstate 15, Interstate 10, and near the Otay Mesa Port of Entry. At the Truck Net LLC truck stop located near the bustling Otay Mesa Port of Entry in San Diego, the installation of the state's inaugural public chargers specifically designed for electric trucks, delivery vans, buses, and other large vehicles took place on March 27, 2023. As the busiest commercial crossing in the state, the Otay Mesa Port of Entry handles a staggering volume of 1 million trucks, 5 million vehicles, and 2.1 million pedestrians annually.

These chargers represent a milestone as the first of their kind in California, catering specifically to medium- and heavy-duty vehicles. With a power capacity of 250 kilowatts, these chargers can rapidly recharge a typical medium-duty box truck from 20% to 80% in approximately one hour, while a full charge from empty to 100% takes around two hours. Additionally, these chargers can also be utilized by passenger cars, delivering a charging rate of up to 250 miles per hour for such vehicles.[152]

Similarly, Travel Centers of America is also planning to add electric truck high power charging stations to many of their existing locations. See exhibit 5 below for details. As you can see from the exhibit, most of the locations are on Interstate 5, there is also a location on Highway 99, Interstate 40, and Interstate 10.

FREIGHT PLAN
California Freight
Mobility Plan

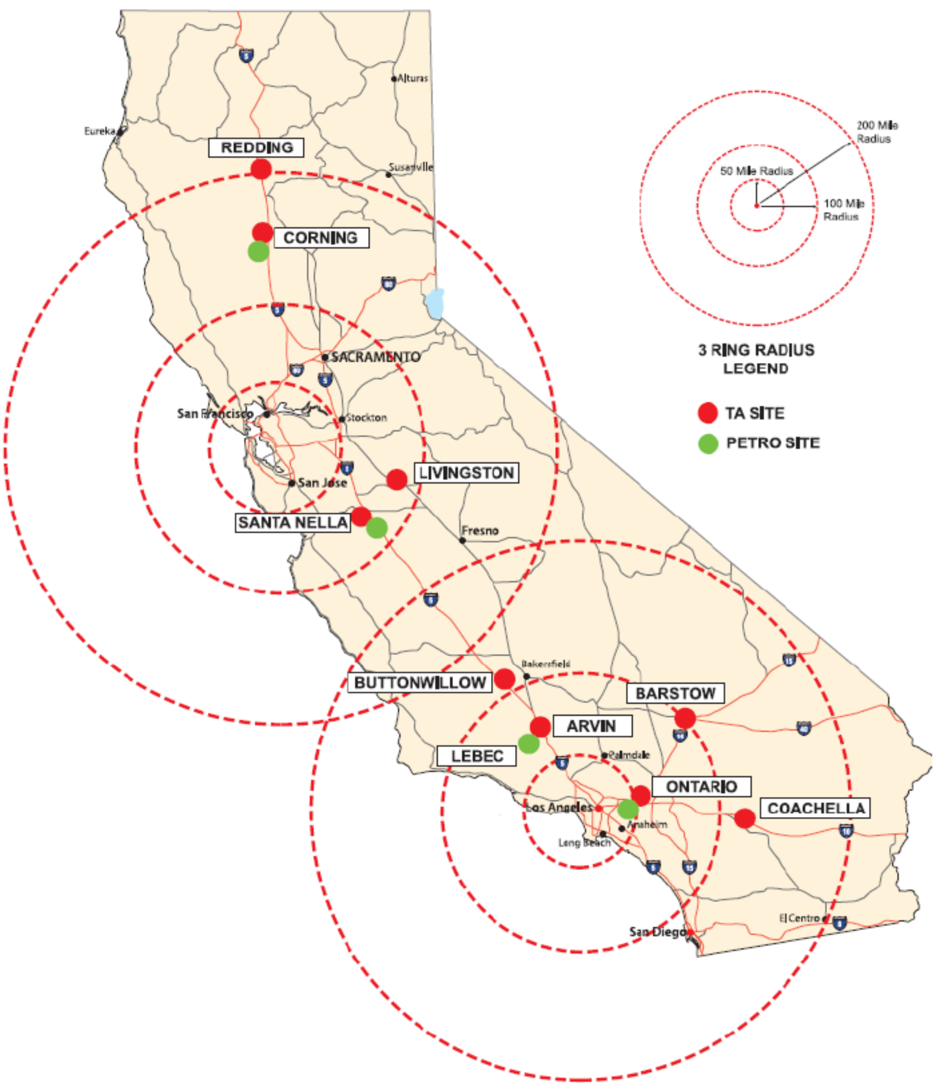


Figure 4.11: Travel Stations of America – Map of California Electric Truck High Power Charging Planned Locations

The Pilot Company and Travel Centers of America may request some state funds to build zero-emission freight infrastructure at these locations, but these companies likely also have private funds for these projects. The timeline for the build out of these projects is unknown at this time.

3. Senate Bill 671 projects

In 2022, the Commission worked with the CEC, CARB, and Caltrans to draft a project nomination form, so that SB 671 workgroup members could identify zero-emission freight charging and hydrogen fueling stations they were interested in building. Seven entities submitted 79 projects for consideration, for hydrogen fueling and charging stations.

Senate Bill 671 projects represent areas where companies have an interest in building mostly public zero-emission freight stations, although funding will be needed from the state and other

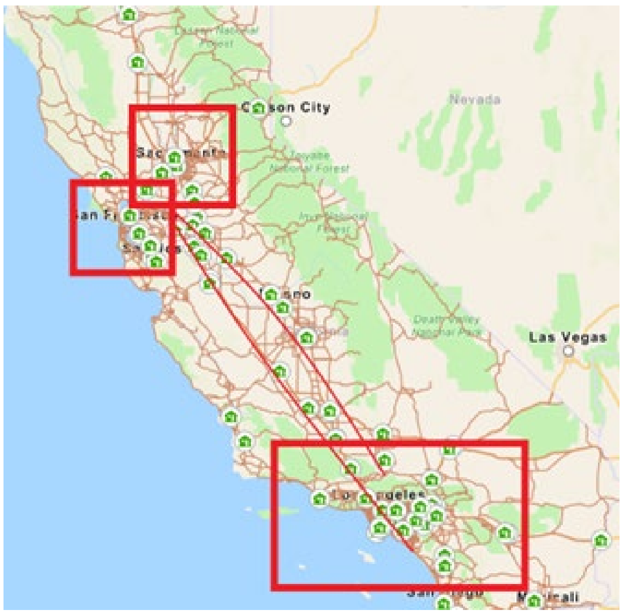


Figure 4.12: SB 671 Project Locations with Highlights

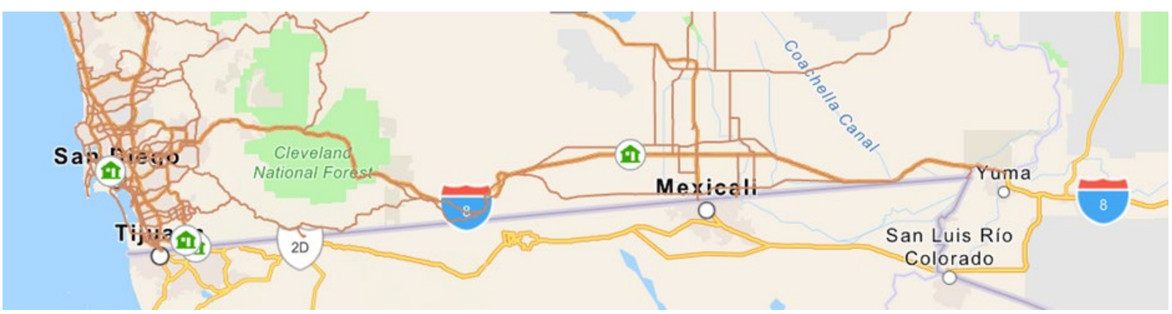


Figure 4.13: SB 671 Project Locations Near United States/Mexico Border

sources to build. Stations located along the top 6 freight corridors or in dense urban areas will be especially important to consider over the next several years.

Again, there are many potential station locations along Interstate 5, Highway 99, the Bay Area, Sacramento, Los Angeles, and the United States/Mexico border. With the exception of some maritime port projects, these locations represent public zero-emission freight stations. There are some projects that were submitted as part of the SB 671 and that were also submitted at part of the Trade Corridor Enhancement Program (TCEP) Cycle 3. These projects are under review, Commission staff recommendations are planned for release in June of 2023.

The projects submitted for both SB 671 and TCEP are:

- The San Diego Association of Governments and Caltrans – project at the Otay Mesa East Port of Entry.
- Nikola – projects in Hesperia, Rialto, and Colton.
- Travel Centers of America – projects in Buttonwillow, Barstow, Arvin, Ontario, and Coachella.

In addition, WattEV also submitted a project in Sacramento for TCEP Cycle 3 funds and for the California State Transportation Agency's Port and Freight Infrastructure Program. There are certain areas also where projects submitted as a part of SB 671 serve as a good example of locations where existing and planned stations do not already exist. Here are some examples of those projects and locations. This is not an all inclusive list or a value statement about the projects not included here.

- Travel Centers of America and Nikola both submitted projects for Redding.
- TravelCenters of America – near Corning.
- Nikola – in Truckee near the Nevada border, in Blythe near the Arizona border, on I-15 near Escondido, in Santa Rosa, and in El Centro near the US/Mexico border.
- Air Products and Nikola – on 99 near Visalia.
- Air Products – on I-15 in Fallbrook and in Colton.

Minimum Viable Network

The minimum viable network (MVN) is the minimum number of charging and refueling stations required for zero-emissions trucks to refuel publicly and to attract early adopters, addressing the "chicken and egg" issue in potential zero-emissions infrastructure investment. To build a minimum viable network, electric truck charging stations are needed every 50 miles and hydrogen fuel stations are needed every 270 miles along the top 6 freight corridors. By investing in a minimum viable network, there could be enough stations along these corridors to provide a sufficient network to spur further adoption of zero-emission trucks.

The CEC EnergIIZE funded projects, truck stop locations, and SB 671 proposed projects along the top 6 freight corridors represent projects where there is an interest from industry in building, and where the Commission's study has identified that stations are needed in the next few years.

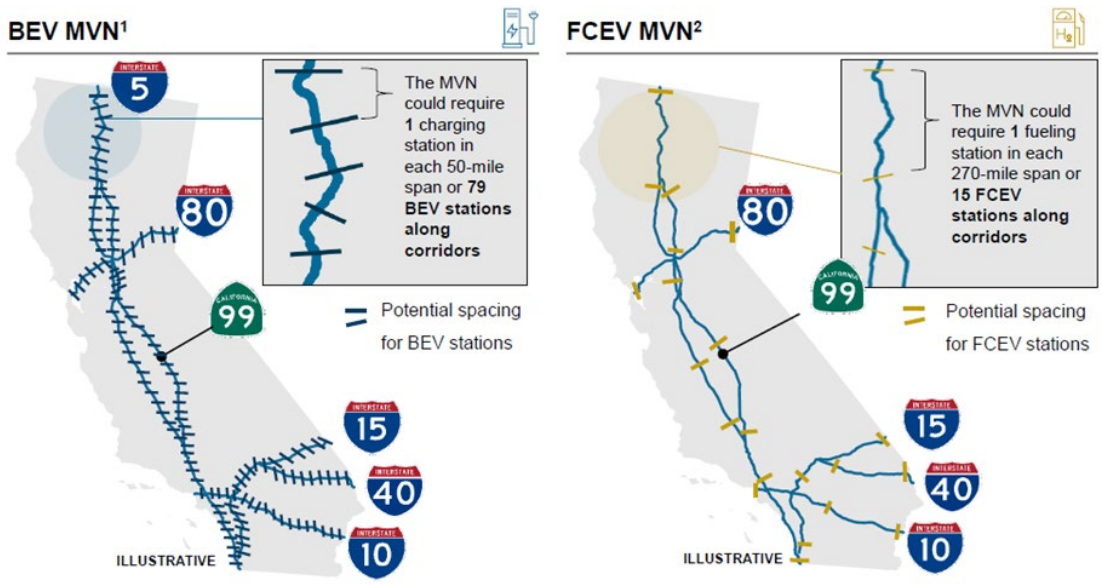


Figure 4.14: Minimum Viable Network (MVN) Along the Top 6 Freight Corridors

PORT AND WATERWAY OPPORTUNITIES

Inland Ports

An inland port is a rail or a barge terminal that is linked to a major seaport. To attract customers, an inland port must address what segment(s) of the market would be served and a financially feasible business model that will overcome competitive advantages posed by trucking. The transload and local market segments are the most likely to take advantage of a well-located short haul rail-served inland port. By consolidating imports and exports and transporting them by rail to the seaport, inland ports could reduce peak hour truck traffic in the state's congested urban centers, create opportunities for inland logistics centers (similar to Centerpoint outside of Chicago, Illinois), and create more opportunities for off-peak delivery of goods from inland points to regional destinations. East Coast inland ports have demonstrated the feasibility of inland ports in the U.S., but in most cases, the state government has control over the ports and statewide economic development that allows for subsidization and streamlining of development. Arizona, Nevada, and Utah have all identified the potential for inland ports that serve the Ports of Oakland and Los Angeles/Long Beach, and the Utah Inland Port Authority recently released (November 2018) a request for proposals for a business plan.[153]

Decentralization of goods in favor of storage at regional facilities has led to a significant decrease in average length-of-haul truck trips in favor of shorter truck trips. Since 2000, the average dry van truckload length-of-haul has declined from 800 miles to 500 miles.[154] California offers many location advantages over competitor states such as Utah, Nevada, and Arizona, including having the following: proximity to major population centers, major seaports and air cargo hubs, one of the nation's most efficient freight rail networks, high-tech research and development, internationally recognized universities, a ranking as the nation's top manufacturer, and proximity to Mexico's manufacturing and production centers that rely on U.S. exports and also produce key inputs to California's manufacturing activity. However, in the past two years, California lost a bid for the Tesla manufacturing plant and the Hyperloop One test site and fabrication plant to Nevada in large part due to labor costs, site development timeframes, and government incentives. California has also been losing international, containerized cargo market share for the past few years to East Coast and Gulf Coast ports. The development of inland ports could cluster several aspects of supply chains, which would increase efficiencies, decrease costs, and improve competitiveness. Three locations have been (or are being) investigated for inland port operations, as described below.

The Port of Hueneme's SEA LINC Project (Spurring Economic Advantages with Logistical Investments for New Connectivity)

The SEA LINC project was awarded official designation by the U.S. Department of Transportation, marking the first time a project has been designated in Southern California since the inception of the American Marine Highways Program in 2007. The SEA LINC Project aims to move cargo off federal and state highways by shifting the cargo to barge along Marine Highway 5 (M-5) instead. The cargo, currently being trucked from the Pacific Northwest to Southern California, will now move on the water and reduce traffic and air emissions, improve safety, and eliminate wear and tear on the roadways spanning across three states. The Port's project is also the first American Marine Highway Coastal Service project designated on the entire West Coast of the United States. The SEA LINC Project includes expansion options for future potential stops along the M-5 including the Ports of San Diego, Los Angeles, Long Beach, Oakland, San Francisco, and Coos Bay. This federal designation will also enable program participants to apply for federal grants to support the new services.

Stockton Area (San Joaquin County)

The area east of the Port of Oakland on the east side of the Altamont Pass (I-580) has been experiencing significant growth in logistics facilities for the past five years. Some of this growth is due to the high land values in the Bay Area, and some of this new development is in response to e-commerce.

Cities such as Stockton, Lathrop, French Camp, Tracy, Patterson, and Manteca provide good alternatives to the Bay Area, due to available developable industrial land, lower cost of housing, easy access to consumers in the Bay Area, Portland, Oregon and Reno, Nevada, and national access to additional markets via the UPRR and BNSF rail corridors. In 2016, Shippers Transport Express (STE), a subsidiary of SSA Marine, opened an inland cargo depot in French Camp to minimize empty container moves to and from the Port of Oakland. This facility allows drivers to both drop off and pick up empty containers for customers in this area. This idea stemmed from SSA Marine's operations of dray-off yards at the Ports of Oakland and Long Beach where SSA operates 24/7 empty yards near the two ports that allow drivers to drop off and pick up containers during off-peak periods when the marine terminal gates are closed. Similarly, the inland cargo depots operate 24/7 and reduce the need for drivers to take empty containers back to the Port of Oakland or go to the Port to pick up empty containers, drive them to warehouses in the Stockton area, and then drive them back to the port loaded. STE is considering expanding this facility for use by all ocean liners. If expanded, this facility could support and inland port concept. CenterPoint is currently developing a new logistics park adjacent to UPRR's Lathrop Intermodal Yard, and the Port of Stockton is in the process of requesting conveyance of the 500-acre Sharpe Army Depot. The conveyance could be the hub of an inland port as it provides access to both Class I railroads and resides adjacent to major industrial warehousing uses.

Bakersfield Area (Kern County)

Kern County is a growing logistics hub. In the past decade, 20 new major warehouse and distribution centers were completed or are under construction with development occurring in Shafter, Bakersfield, Delano, and Tejon Ranch. Similar to Stockton, City of Shafter has access to both Class I railroads and has developed a container yard with 160 container spaces similar to the STE yard in Stockton. However, the Shafter load matching model has morphed into a "virtual" container yard and is designed to save empty container hauls to/from the ports. Known in the industry as "street turn containers," the Wonderful Industrial Park development in Shafter is home to several importers including Target and Ross Dress-For-Less. The Ross facility has an agreement with the Wonderful Company, a major pistachios and almonds exporter, to use the same oceangoing carrier.

The hard-won agreement enables the nearby empty containers at Ross to be picked up by Wonderful for shipping back to the ports full of agricultural products, rather than traveling a 300-mile roundtrip to pick up an empty from the Los Angeles/Long Beach Ports. This coordination reduces operation costs, on road emissions, and wear and tear on roads. It is anticipated that the City of Shafter container yard may yet be needed to support the virtual container yard by providing storage, trade and clean-out services for shipping containers or as an intermodal rail access node. The Kern region offers same-day delivery access to both the Bay Area and the Southern California region populations, as well as to the Ports of Oakland, Los Angeles, Long Beach, San Diego and Hueneme. In addition, the City of Shafter, Bakersfield, and Kern County have environmentally cleared industrial development for logistics facilities on over 10 square miles in the Shafter/BFL International Airport area, and another 2.5 square miles along I-5 near the base of the Grapevine at the Tejon Ranch Commerce Center, the primary gateway between Southern California and the Central Valley. Tejon also provides truck parking at two major truck stops allowing trucks to delay entry into Southern California and the ports until off-peak periods. Tejon Ranch followed suit with a master planned logistics park on nearly 1,500 acres. The region also provides truck parking at six other major truck stops near Tehachapi (2), Edison, Buttonwillow, Lost Hills, and North Shafter.

High Desert Region Inland Trade Ports

2022 saw two new inland trade ports proposed for the California High Desert region in Mojave, Barstow. The Mojave Inland Port has been completely environmental cleared and lies at the confluence of SR 58, SR 14 and the UPRR branch line to Searles Valley and is just off the BNSF/UP mainlines through Mojave. The line currently sees weekly bulk hall service between Searles Valley Minerals and the Port of LA. This service could be used to attach double stack containers to from this new intermodal rail facility. Being developed by Pioneer Partners, the .65 square mile, $700M facility is anticipated to service 200 to 3,600 trucks per day.

Then BNSF Barstow International Gateway is 7 square miles, $1.5 Billion facility and is has been estimated to service up to 5,000 trucks per day (20% of the trucks on the I-110/710 corridor that would be redirected to this facility via SR 58. Just beginning the environmental process, the private sector financed facility has complete backing of the BNSF. The also sees daily bulk haul rail services between Rio Tinto borax and lithium mining to the Port of LA.

Inland Empire (San Bernardino/Riverside Counties)

The Inland Empire (IE), located east of the Ports of Los Angeles and Long Beach, has experienced significant growth in warehouse and logistics facilities over the past 20 years. The development was derived due to large acres of available farmland, access to both Class I railroads, the San Bernardino Intermodal Yard, Ontario Airport, the conversion of March Air Force Base to a cargo airport, and same-day access to major markets in Southern California, Nevada, and Arizona. In 2017, the City of Moreno Valley approved a 41 million square-foot logistics park. This new development does not have direct rail access; however, the region has been discussing the possibility of a logistics park of similar size that would be rail-served by both short-haul rail to/from the San Pedro Bay Ports of Long Beach/Los Angeles, as well as expand the IE's intermodal capacity to serve the rest of the nation. To date, no potential sites for such an inland port has been identified in the region.

In California, the Port of Stockton may have a future opportunity to develop a new intermodal rail yard on surplus government property, and this new facility could provide an inland port opportunity for the Port of Oakland. The U.S. Department of Defense has determined that the Sharpe Army Depot is no longer needed. Port of Stockton has requested conveyance of the 500-acre site with existing rail infrastructure that serves both Union Pacific Railroad (UPRR) and BNSF Railway. The site is south of a major UPS logistics facility and west of the UPRR Lathrop Intermodal Terminal and the CenterPoint Intermodal Center, a 190-acre logistics park.

MARINE HIGHWAYS

In 2007, the Energy Independence and Security Act (Energy Act), directed the Secretary of Transportation to establish a short sea transportation program and designate short sea shipping routes. The Maritime Administration (MARAD) implemented "America's Marine Highway Program" (the Program) pursuant to this mandate. The Program is intended to expand the use of our inland, Great Lakes Saint Lawrence Seaway System, intracoastal, and coastal waterways for the transportation of freight (loaded in containers and trailers) and passengers to mitigate landside congestion, reduce greenhouse gas emissions per ton-mile of freight moved, etc. USDOT initiated a program to encourage the use of navigable waters to move goods and alleviate traffic and maintenance issues caused by trucks. California has access to two of the designated marine highways: (1) M-5 along the Pacific Coastline from San Diego to Seattle, and (2) the M-580 from Port of Oakland to the Sacramento River and San Joaquin River connecting to the Ports of Stockton and West Sacramento.

In 2014, the West Coast Corridor Coalition sponsored a study of Marine Highway (M-5)[155] to determine the market and operational feasibility of short-sea shipping between multiple pairs of West Coast ports, including the following:

- Port of San Diego → San-Pedro Bay
- Ports (Ports of Los Angeles and Long Beach)
- San-Pedro Bay Ports (Ports of Los Angeles and Long Beach) → Port of Hueneme
- Port of Oakland → Port of Redwood City
- San-Pedro Bay Ports (Ports of Los Angeles and Long Beach) → Port of Oakland
- San-Pedro Bay Ports → Pacific Northwest Ports (Ports of Seattle and Tacoma)

- Port of Humboldt Bay → Port of Crescent City
- Port of Oakland → Pacific Northwest Ports

The plan also identified the following key challenges to implementing this type of service:

- Shortage of efficient, right-sized vessels eligible to transport U.S. domestic cargoes
- Shortage of credible market data to identify cargoes available for Marine Highway services
- Lack of maritime entrepreneurs willing to take the risk of starting up a new service

Preliminary discussions regarding a barge service from Seattle to Portland occurred in 2018, and that same year, the Port of San Diego also received some interest from barge operators to provide a short-sea shipping alternative.

Caltrans worked with the Port of San Diego and the Port of Bellingham (Washington) to have the West Coast M-5 Coastal Connector Project officially designated by the United States Maritime Administration (MARAD) under their America's Marine Highway (AMH) program. The M-5 Coastal Connector utilizes the movement of goods by waterborne routes that are served by highway or railway, therefore reducing and augmenting land-based transportation, vehicle-miles-traveled, and associated greenhouse gas emissions. One sailing from the Port of Bellingham to the Port of San Diego carrying 6,000 tons of lumber removes an estimated 250 truck trips and 272,500 truck miles traveled; 197,000 of those miles are in California. In addition to air quality benefits, the shift from roadway to waterway goods movement will dramatically decrease roadway maintenance costs. The project designation was officially awarded in August of 2021, allowing Caltrans and partners to request federal funding for implementation.

In February 2010, USDOT awarded a $30 million TIGER grant to the Ports of Oakland, Stockton, and West Sacramento to establish a container-on-barge service between the Central Valley and the San Francisco Bay area. The Port of West Sacramento received $8.5 million for the purchase of a mobile harbor crane, which can load and unload shipping containers. The Port of Stockton received $13 million for infrastructure and equipment, which it applied towards the purchase of two 140-ton mobile harbor cranes and infrastructure improvements at the Port to support the project. The Port of Stockton also purchased two barges to support the new service. The M-580[156] barge service operated for 14 months as a pilot project with the intent of shifting truck trips to barge by using the M-580 inland waterway to move containers between the Ports of Oakland and Stockton. This barge service focused on reducing port trucks on the I-80, I-205, I-580, I-238, I-880, and I-980 corridors. Due to operational issues that led to significant cost overruns of approximately $1 million per month, the service was cancelled.

Per the CSFAP, Caltrans is the implementing agency to Action 3.G: Inland Facility, Short-haul Rail Shuttle, and Inland Seaports Utilization with Less Impact on Nearby Communities. This action tasks Caltrans and Agency to "increase opportunity for use of short haul rail shuttles and waterways that lead to inland seaports and freight distribution hubs that will have less impact on nearby communities (CSFAP, Appendix C: State Agency Actions; Action 3, Sec. G)".

In an effort to reinstate the M-580 barge service, Caltrans completed the M-580 Corridor Multimodal Freight Network Optimization Study[157] in Spring 2021. The study looked at several different modal scenarios which included short-haul rail, but placed more emphasis on possible barge service options from the Port of Oakland to both the Port of Stockton and the Port of West

Sacramento (see project area in map below). The study's model predicted that the only potentially profitable service would depend on a large barge going to either Stockton or West Sacramento. Even so, the service would operate at a loss during its initial stages and need to be subsidized for the first several years. According to the model, it could take 10 years for a barge service to generate profits. Any potential service would require infrastructure improvements at the smaller ports and potentially designated cargo scanning areas at the Port of Oakland to ensure the security of containers moving further inland.

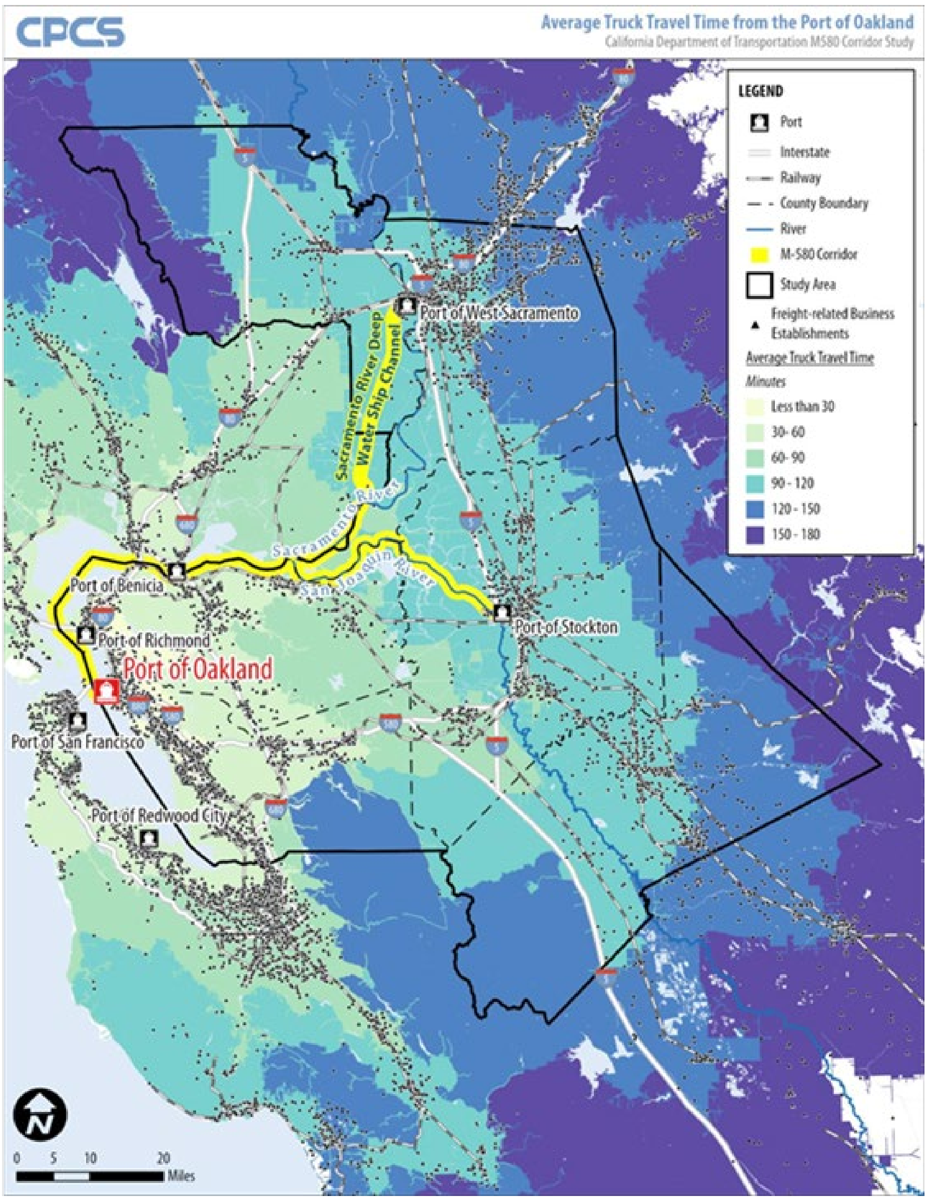


Figure 4.15: Average Truck Travel Time from the Port of Oakland

However, the model also showed substantial air quality benefits, not only in the Bay Area and San Joaquin Valley, but across the entire state. PM2.5 emissions are expected to decrease by more than 30% in the M-580 study area and up to 10% across the state. Meanwhile, PM10 emissions are forecasted to only slightly decline across the State while decreasing by about 17% in the M-580 study area. Forecasts also show a 16% decline in daily CO_2 emissions in the M-580 study area and an 18% decline across California. Diesel engine emissions of other pollutants such as NOx are also expected to decrease significantly (by more than 40%).

The statewide truck miles traveled are expected to increase by 20% (from 98 million truck miles in 2019 to about 119 million truck miles) by 2040. Such an increase in the number of truck miles traveled along with the recent rise in the development of warehousing and distribution facilities (especially along the highways in Central Valley) can increase congestion, which in turn leads to added truck emissions. Modal shift of freight away from the State Highway System and onto waterways could potentially mitigate, in part, the increase in truck miles traveled and increase travel reliability time for some products.

SHORT-HAUL RAIL ACCESS TO PORT OF HUMBOLDT

The Port of Humboldt Bay currently has little shipping activity. It is a deep-water port (35-38 feet) located between San Francisco, California (258 miles south) and Coos Bay, Oregon (180 miles north). There has not been rail service to the Port for over 20 years due to destruction of the previous railway line, which followed a North-South route to Napa. Currently, there are no plans to rebuild the route. Pacific Charter Financial Services Corporation, with the assistance of Humboldt Eastern Railroad LLC, is seeking to create an "American Gateway" with the construction of the Pacific Northwest Railroad rail lines, docks, and hub terminals. It is anticipated that the completion of the Pacific Northwest Railroad connection to the national rail network in the Central Valley near the towns of Red Bluff and Gerber will increase population and economic activity in northern California. Such a rail connection would also provide access between Northern California and other major world regions along the Pacific Rim.

Emerging Opportunities

HYPERLOOP

While some companies are reacting to the increase in demand for same-day and next day deliveries using existing technologies, others are seeking a more efficient way to deliver orders with a short turn-around. In 2013, a new transportation system called Hyperloop was introduced. Hyperloop consists of a hyperloop vehicle, or "pods," that accelerate gradually via electric propulsion through a low-pressure tube.[158] In 2018, DP World and Virgin's Hyperloop One jointly created DP World Cargospeed, an international brand for Hyperloop-enabled cargo systems to move palletized cargo. DP World Cargospeed will focus on e-commerce. This new partnership was developed in anticipation of projections for a fourfold increase in global trade, which could spur demand for hyperloop technology by 2050.[159] Speed to market creates a competitive advantage for global trade and national, regional, and local distribution. The Hyperloop delivery system intends to deliver goods at air flight speeds at a cost closer to over-the-road trucking rates.[160]

Hyperloop One, a California-based company, has identified ten initial Hyperloop One routes; however, of the four identified in the U.S., none of them are in California. The four U.S. routes are proposed in Texas, Colorado/Wyoming, Illinois/Indiana/Ohio/Pennsylvania, and Florida. Hyperloop One began initial testing in Los Angeles but eventually established its Apex Test and Safety site in Nevada. In May 2017, the company became the first in the world to test a full-scale Hyperloop, including vacuum, propulsion, levitation, sled, control systems, tube, and structures. Missouri completed the first hyperloop feasibility study for the I-70 corridor from St. Louis to Kansas City, a major freight route. Two Environmental Impact Statements (EIS) are being prepared for routes in Ohio and Colorado. Virgin Hyperloop has conferred extensively with the POLA over the last several years and is currently not proposing their system to serve the POLA-POLB.

ALTERNATIVE AND RENEWABLE FUELS

At the state level, the CEC's Clean Transportation Program has provided significant investments "to develop and deploy innovative technologies that transform California's fuel and vehicle types to help attain the state' climate change policies" (Perea, Chapter 401, Statues of 2013). These investments include electric vehicle charging infrastructure and hydrogen fueling stations, as well as innovation in medium- and heavy-duty advanced technology vehicles. The CEC has also been investing in workforce training in cleaner transportation technologies.

California is leading the nation in building hydrogen fueling stations for Fuel Cell Electric Vehicles (FCEVs). The CEC is investing in public stations to support and encourage these zero-emission vehicles; the Hydrogen Refueling Stations dashboard that shows Hydrogen Refueling Stations in California can be accessed online here:[161]

https://tableau.cnra.ca.gov/t/CNRA_CEC_PUBLIC/views/DMVDataPortal/Hydrogen?:embed=y&:isGuestRedirectFromVizportal=y&:display_count=n&:showAppBanner=false&:origin=viz_share_link&:showVizHome=n

In a typical year, the Clean Transportation Program allocates up to $100 million to promote accelerated development and deployment of advanced transportation and fuel technologies. The Clean Transportation Program funding source is set to expire at the end of 2023, however, for 2021 through 2026, through the Budget Acts of 2021 and 2022, and Infrastructure Investment and Jobs Act federal funding, additional funding of nearly of $4 billion will be provided for ZEV infrastructure and ZEV related manufacturing.

The Clean Transportation Program has been an essential part of making California a leader in near- and zero-emission transportation. Since 2009, the Clean Transportation Program has invested more than $1 billion in projects supporting zero-emission vehicle infrastructure, alternative fuels, and advanced vehicle technologies. Key highlights through April 2022 include but are not limited to:

- Funded more than $125 million to 54 zero and near-zero emission vehicle demonstration projects ranging from cargo handling equipment to medium- and heavy-duty trucks, including plug-in hybrids, battery-electrics, fuel cell, low NOx natural gas, and several biofuel platforms
- Funded more than $175 million to 83 medium- and heavy-duty zero-emission vehicle infrastructure projects
- Funded 27 manufacturing projects supporting in-state economic growth while reducing the supply-side barriers for alternative fuels and advanced technology vehicles, primarily in electric drive-related components and vehicles

- Funds the nation's first commercial vehicle fleet incentive project titled "EnergIIZE Commercial Vehicles" to accelerate the deployment of electric and hydrogen infrastructure needed to fuel zero-emission trucks, buses, and equipment
- Assesses electric charging infrastructure needs of the off-road, light-, medium-, and heavy-duty sectors in response to AB 2127 (Ting, Statutes of 2018), in collaboration with CARB and CPUC
- Assesses fuel cell electric vehicle infrastructure and fuel production needed to support the adoption of zero-emission trucks, buses, and off-road vehicles (Archuleta, Chapter 646, Statutes or 2021), in collaboration with CARB and CPUC
- Develops the Zero-Emission Vehicle Infrastructure Plan (ZIP), in coordination with various state agencies including the CPUC, CARB, California State Transportation Agency (CalSTA), California Department of Transportation (Caltrans), GO-Biz, and Department of General Services (DGS), to support decision-making in the public and private sectors by documenting plans and strategies to deploy ZEV infrastructure for all Californians
- Releases targeted grant funding opportunities to provide zero-emission charging and refueling infrastructure for trucks, buses and off-road equipment, with a recent opportunity directly partnering with CARB to provide funding for vehicles that will result in over 250 heavy-duty trucks and related zero-emission infrastructure being deployed

Three noteworthy projects that have been funded through the CEC's Clean Energy Transportation Program include:

- Zero-Emission Drayage Truck and Infrastructure Pilot Project – The CEC and CARB released the first-ever collaborative grant funding opportunity to support large scale projects where CARB will provide funding for zero-emission, on-road, class 8 trucks, and the CEC will provide funding for the infrastructure necessary to support the deployed trucks, in addition to workforce training and development. Five projects were proposed for award to support 250 battery electric and 30 fuel cell electric trucks. These projects will show the feasibility of large-scale infrastructure projects, provide best practices and key lessons learned for resiliency and future replicability, and help other freight transportation fleets understand which technology may work best for their particular duty cycles and driving environments.
- Hydrogen Fuel Cell Demonstrations in Rail and Marine Applications at Ports (H2RAM) – The CEC's Clean Transportation Program and the CEC's Natural Gas Research and Development Program collaborated on this grant funding opportunity to fund the design, integration, and demonstration of hydrogen fuel cell systems and hydrogen fueling infrastructure for locomotive and commercial harbor craft applications at California ports. Several projects were proposed for award including one $4 million award of Clean Transportation Program funding toward shared hydrogen refueling infrastructure at the Port of West Sacramento that will be capable of providing fueling for a switcher locomotive and will offer a public fueling for heavy-duty on-road trucks.
- Blueprints for Medium- and Heavy-Duty Zero-Emission Vehicle Infrastructure – The CEC released this solicitation to fund planning "blueprints" that will identify actions and milestones needed for the implementation of medium- and heavy-duty zero-emission vehicles and the related electric charging and/or hydrogen refueling infrastructure in the state. 35 projects were awarded to support both public and private entities, totaling

nearly $7 million. These projects will create roadmaps for large-scale infrastructure projects, plan for resiliency, and provide best practices for future replicability within other public and private agencies. These "blueprints" will help agencies and fleets understand which technology may work best for their applications, routes, and driving environments, which will accelerate meeting the state's goal of transitioning medium- and heavy-duty trucks, buses, and off-road equipment to zero-emission.

CRITICAL MINERALS

California is home to some of the world's critical material and mineral industries including lithium, boron, and rare earth metals, as shown in **Figure 4.16** and **Figure 4.17**. The International Energy Agency (IEA) in 2021 estimated global demand for critical minerals to increase by 400-600% in the coming decades. With this projected growth, GO-Biz, Caltrans, and its regional partners will continue to work closely with this sector to identify potential infrastructure projects key to these supply chains. For example, the Salton Sea in Imperial County is poised to be a major location for lithium extraction and processing, as brines have been located in a geothermal field below the surface. Critical mineral demand for use specifically in clean energy and transportation technologies is expected to grow exponentially by 2040 and in the International Energy Agency's modelling of that demand, lithium saw the fastest growth rate. Estimates for that resource alone project California's capacity to meet up to 40% of current global lithium demand[162]. The State is invested in preparing the region for this activity through outreach activities and planning and development. Due to this expected growth rate, particularly coming from the lithium extraction expected to take place at the Salton Sea, there will be additional demands on Imperial County's infrastructure to accommodate the increased freight activity from this activity and ancillary developments tied to Lithium Valley.

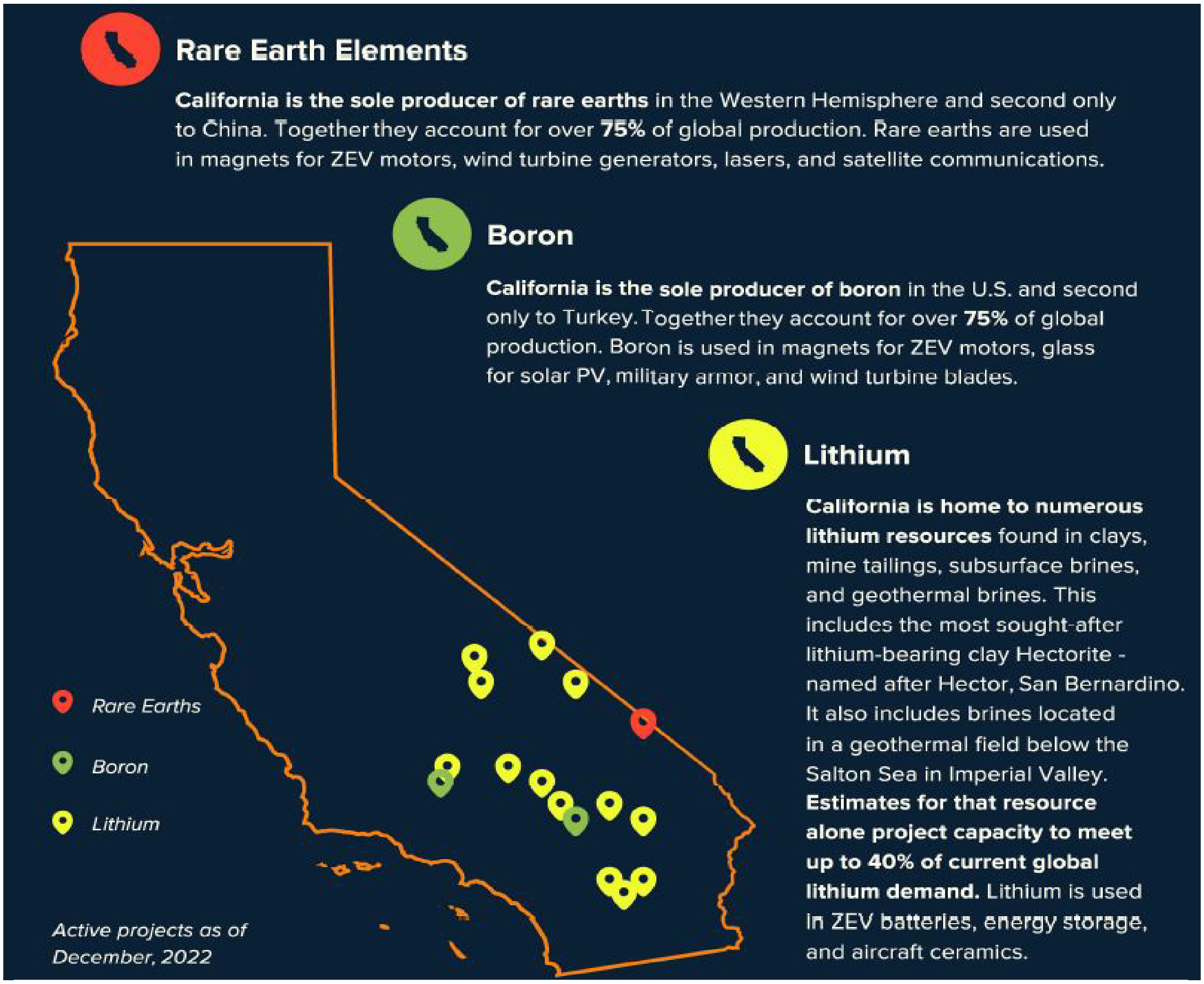


Figure 4.16: California Critical Minerals (Source: GO-Biz Critical Materials and Critical Minerals in California)

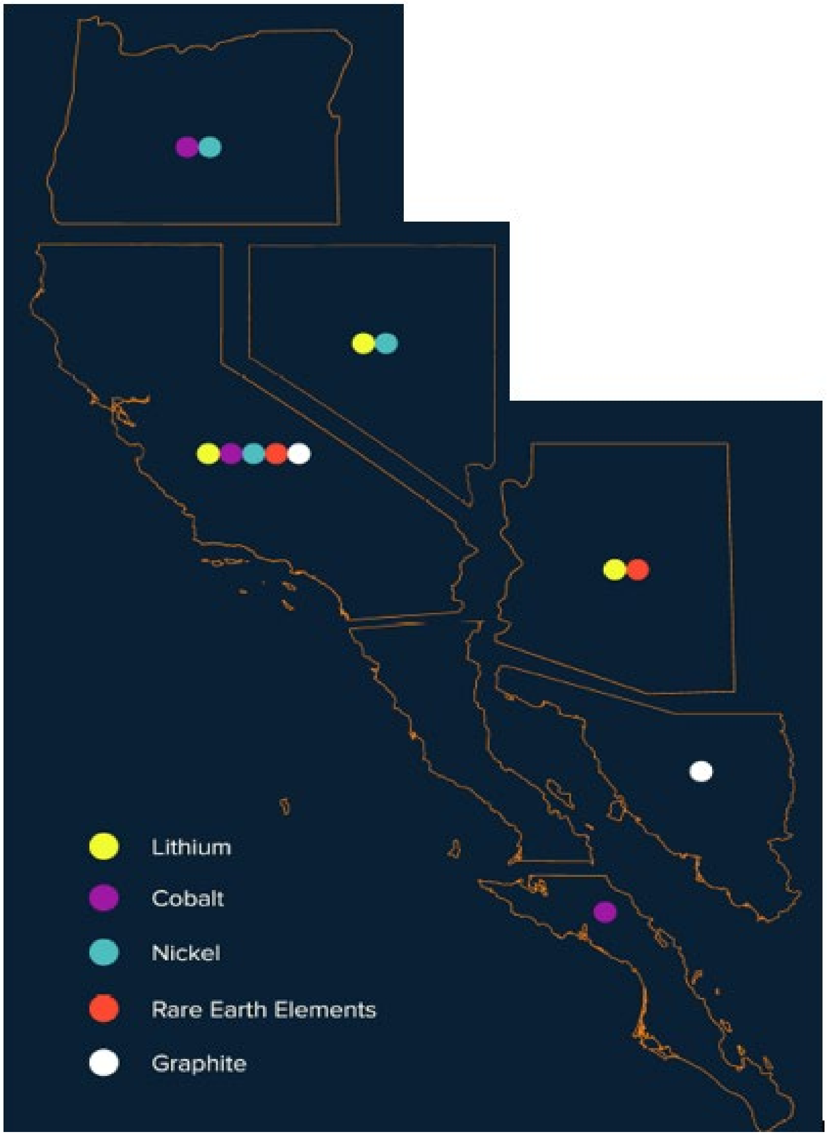


Figure 4.17: Critical Minerals in a Broader Context (Source: GO-Biz Critical Materials and Critical Minerals in California)

4B. Freight Safety, Security and Resiliency

The freight system is a complex network that is susceptible to natural disasters and human-caused events. Whether the result of natural processes, accidents, criminal activity or terrorism, freight system disruptions can have devastating consequences. California's economy is dependent on the strength, reliability, and resiliency of its freight sector. Disruptions may impact the economic health of individual companies, communities, regions, the State and nation.

California needs to ensure that the freight transportation system prevents and minimizes negative impacts from such events and quickly recovers when they occur. California's freight system needs to be particularly adaptable so that emergency supplies can be transported and distributed when and where they are needed.

To affirm Caltrans commitment to Safety First, enhancing freight security and resiliency, the Department is incorporating a Safe Systems approach principles into all work. It works by building and reinforcing multiple layers of protection to both prevent incidents from happening in the first place and minimize the harm caused to those involved when incidents do occur. It is a holistic and comprehensive approach that provides a guiding framework to make places safer for people. This is a shift from a conventional safety approach because it focuses on both human mistakes AND human vulnerability and designs a system with many redundancies in place to protect everyone.

Safe Systems approach incorporates the following principles:

- Death and Serious Injuries are Unacceptable. A Safe System approach prioritizes the elimination of crashes that result in death and serious injuries.
- Humans Make Mistakes. People will inevitably make mistakes and decisions that can lead or contribute to crashes, but the transportation system can be designed and operated to accommodate certain types and levels of human mistakes and avoid death and serious injuries when a crash occurs.
- Humans Are Vulnerable. Human bodies have physical limits for tolerating crash forces before death or serious injury occurs; therefore, it is critical to design and operate a transportation system that is human-centric and accommodates physical human vulnerabilities.
- Responsibility is Shared. All stakeholders – including government at all levels, industry, non-profit/advocacy, researchers, and the general public – are vital to preventing fatalities and serious injuries on our roadways.
- Safety is Proactive. Proactive tools should be used to identify and address safety issues in the transportation system, rather than waiting for crashes to occur and reacting afterwards.
- Redundancy is Crucial. Reducing risks requires that all parts of the transportation system be strengthened, so that if one part fails, the other parts still protect people.[163]

In the 2023 State Highway System Management Plan, Caltrans updated funding strategies that address performance objectives aligned with the Climate action Plan for Transportation Infrastructure (CAPTI). This document includes the 10-Year State Highway Operation and Performance Protection Program (SHOPP) Plan and a 5-year maintenance plan that will fund system resiliency objectives. System resiliency objectives address Caltrans Strategic Plan goals in Stewardship and efficiency as well as climate action with objectives including bridge scour Mitigation, Bridge seismic restoration, Major Damage (Emergency Restoration), Major Damage (Permeant Restoration), protective Betterments and climate adaptation and resilience. Over the next 10 years Caltrans plans to spend $21,278,000,000 in system resiliency objectives..[164] This funding will allow the state highway system to be more adaptive and resilient to the impacts of extreme weather and natural disasters on freight mobility.

State Highway System Management Plan Resilience Performance Targets:

- Major Damage System Resiliency Objective:
  - The Emergency Restoration objective: The Emergency Restoration includes emergency repair of assets damaged or imminently threatened by natural or human-caused events. Qualifying repairs include those needed to restore essential travel. To be considered, the work is typically tied to an identifiable natural event such as a storm, flood, fire, earthquake, tsunami, or volcanic action. Human-caused events such as vehicle collisions, Programs & Performance Objectives: Major Damage explosions, civil unrest and acts of war or terrorism are included. Repair to current design standards is allowed. The level of repairs needed varies depending on the situation. Funding needs are estimated in real-time when the event(s) occur, based on the damage experienced and cost of repair. The goal is to repair 100 percent of damaged assets as soon as possible.
  - Permanent Restoration Objective: The Permanent Restoration objective includes permanent repair and restoration of assets to pre-emergency condition and either follows or runs concurrently with the emergency restoration phase. Restoration to current design standards is allowed and may include elements of betterments. These projects go through the project development process and are mitigated in more depth than typical Emergency Restoration projects. However, they can be expedited into construction when the immediacy of an emergency arises during the design phase. The funding needs are more detailed and accurate compared to an Emergency Restoration project.
- Bridge Goods Movement Upgrades Other Assets and Objectives: The Bridge Goods Movement Upgrades objective is to identify and address geometric restrictions to permit vehicle traffic on the SHS. Bridge Goods Movement Upgrades address restrictions from reduced vertical clearance as established in the Caltrans HDM, and load capacity restrictions as identified by state guidelines. The emphasis of this objective is to address poor condition bridges impacting Interstate mainline traffic. The goal of this objective is to improve Goods movement bridges to 75% to good condition, 15% to fair condition.
- Bridge Scour Mitigation System Resiliency Objective: Ideally, the goal of the Bridge Scour Mitigation objective would be to address all identified scour critical (poor) bridges. Due to the dynamic nature of identification of scour critical bridges (major flooding or storm events) and the time required for the project delivery process, it is not realistic to assume that at the end of the 10-year cycle all scour critical bridges would be addressed. The Bridge Scour Mitigation target is to reduce scour critical bridges to 10 percent of the projected 10-year scour critical need. The performance target is to achieve 90% of bridges into good state of repair.
- Bridge Seismic Restoration System Resiliency Objective: Ideally, the goal of the Bridge Seismic Restoration objective is to address all seismically vulnerable (poor) bridges identified in the preliminary screening process. The screening process is a preliminary review of bridges that may be seismically vulnerable based on the element configuration of the structure and the surrounding soil prior to detailed seismic analyses being completed. Because bridges identified in the screening process may be found to not require seismic restoration during detailed seismic analysis, and due to the length of the time required for the project delivery process, it is not realistic to assume that at the end

of the 10-year cycle all currently identified seismically vulnerable bridges would be addressed. Therefore, the Bridge Seismic Restoration target is to reduce seismically vulnerable bridges to 30 percent of the projected 10-year seismic need.

- Protective Betterments: The goal of the Protective Betterment objective is to address all identified vulnerable locations in the roadway system. However, due to the dynamic nature of natural events that often expose more vulnerable locations or the discovery of new, vulnerable locations, it is not realistic to assume that at the end of the 10-year cycle all vulnerabilities would be addressed. Protective Betterment protects infrastructure at vulnerable locations to reduce risk of roadway closures during anticipated natural events (storms, floods, landslides, etc.) or human-caused events. Typical SHOPP-funded treatments or projects may include protecting rock slopes, preventing rock fall, stabilizing slopes and trenches, improving retaining walls, improving pumping stations at depressed sections, and security improvement

Emergency Support Functions

The State of California is prepared to respond quickly and effectively to large-scale safety and security events on a 24-hour basis. When an event or potential event is first detected, the California Office of Emergency Services (Cal OES) is activated to a level appropriate to the magnitude of the threat. All state agencies and volunteer organizations that comprise the State Emergency Response Team (SERT) are grouped into 18 Emergency Support Functions (ESF) to carry out coordination and completion of assigned missions[165]. These functions represent specific response activities that are common to all disasters. Each ESF is comprised of one or more primary agencies serving as the lead and several other agencies and organizations providing support. The State-level ESF 1 activities support the coordination of transportation across various modes, including surface, maritime, railroad, aviation, and pipeline.

The ESF 1 lead agency, CalSTA, has delegated to the CHP and Caltrans, the responsibility to provide expertise primarily for surface transportation, and has identified stakeholders from primary and supporting agencies to take the coordination lead for other modes of transportation[166]. According to the State of California Emergency Plan, ESF 1 – Transportation, "assists in the management of transportation systems and infrastructure during domestic threats or in response to incidents." ESF 1 also provides recommendations and subject matter expertise to Cal OES including ESF 1 preparedness, mitigation, response, and recovery.

Caltrans specific responsibilities directly related to ESF 1 activities:

- As the owner operator of the state highway system (SHS), has administrative orders to repair, maintain and operate the SHS during and following emergencies and disasters;
- Provide assessments of transportation infrastructure and traffic conditions;
- Assess damage to highway system and establish route priorities during recovery efforts;
- Operate as the liaison to the U.S. DOT and FHWA regarding the status of the SHS;
- Provide transportation policies and guidance as needed;
- Coordinate state agency plans, procedures and preparations for route recovery, traffic regulation and air transportation; and

- Develop routing and directions for the movement of incident victims out of an impacted area and for the delivery of necessary personnel and medical supplies to local medical facilities and shelters.

CHP specific surface transportation responsibilities:

- Act as the Director of the State Motor Transport Division during times of emergency;
- Perform tasks assigned in the California Emergency Resources Management Plans for transportation during times of a war emergency;
- Continue emergency traffic regulation and control procedures as required;
- Assist Caltrans with traffic route restoration;
- Provide police escorts on closed routes;
- Activate appropriate CHP Emergency Resource Centers to coordinate resources and ensure the timely dissemination of intelligence information;
- Secure routes, regulate traffic flow, and enforce safety standards for evacuation and re-entry into evacuated areas;
- Coordinate interstate highway movement on regulated routes with adjoining states;
- Establish highway safety regulations consistent with location, type and extent of emergency conditions; and
- Support Caltrans with traffic route re-establishment and continued emergency traffic regulation and control procedures as required.

Hazardous Materials Transport

Industrial hazardous materials that are flammable, corrosive, toxic, explosive, or infectious play a vital role in the U.S. economy. They are used by industries from farming and mining to manufacturing and pharmaceuticals, and come in the form of raw materials, fertilizers, fuels, constituent parts, and other essential inputs. Of all hazardous materials, Toxic Inhalation Hazard (TIH) chemicals are among the most dangerous[167]. Chlorine gas and anhydrous ammonia are the most common TIH chemicals; others include sulfur dioxide, ethylene oxide, hydrogen fluoride, and a variety of other products that are important manufacturing inputs. The potential consequences of a TIH release depend on the severity of the accident or event.

One widely discussed risk-mitigation proposal involves re-routing trains containing TIH tank car loads, for example, by choosing a route with less population exposure. TIH tank cars passing through major population centers were recognized as potential chemical weapons. Proponents of mandatory re-routing of TIH products argued that diverting trains around cities would place fewer people at risk of a terrorist attack and/ or collisions.

Many hazardous chemicals transported over long distances by rail, and for shorter distances by truck, may be particularly vulnerable to sabotage and disruption. At the federal level, the U.S. DOT and Transportation Security Administration (TSA) have sought to reduce the risk of terrorist attacks on freight. TSA worked with railroad carriers to implement a security program, the TIH Risk Reduction Program. TSA assumes that the risk of hazardous materials transport is directly proportional to the dwell time (the length of time that a rail car sits at a particular location), volume, and type of materials transported through densely populated areas. First implemented in New Jersey and New York, the program seeks to establish secure storage areas for TIH materials and to expedite their movement through the system.

Rail Freight

California has increased state-level oversight of rail freight and strengthened the regulation of railroad security. In addition to its role enforcing federal rail safety regulations, the California Public Utilities Commission (CPUC) is developing the capacity to improve rail security. The CPUC was charged with enforcing the provisions of AB 3023 requiring railroad operators to conduct risk assessments of their facilities and to develop and implement infrastructure protection programs. CPUC has more than 40 federally certified inspectors who are authorized to issue security enforcement recommendations under the auspices of federal law. Additionally, California actively seeks to bring State-level knowledge regarding rail safety and security to short line rail carriers that may not have the resources to establish robust safety and security programs on their own.

POSITIVE TRAIN CONTROL PROGRAM

Positive Train Control (PTC) systems are integrated command, control, communications, and information systems for controlling train movements with safety, security, precision, and efficiency. PTC systems improve railroad safety by significantly reducing the probability of collisions between trains, casualties to railway workers, damage to equipment, and overspeed accidents. The system can recognize a threat of collision or accident and slow or stop a train automatically to avoid the incident. The National Transportation Safety Board (NTSB) has named PTC as one of its "most-wanted" initiatives for national transportation safety.
The Rail Safety Improvement Act of 2008 required all Class I railroads (the largest) and intercity passenger and commuter railroads to implement a PTC system on mainline track that carry passengers or TIH materials by December 31, 2015. Currently PTC is completely implemented in all Class I railroads in California.

Trucks

Trucks can weigh more than 30 times more than passenger vehicles and requires more stopping distance, especially when loaded. When involved in a collision, the size and weight of large trucks increase the severity of impact when a passenger vehicle is involved. Furthermore, truck crashes are more likely to result in severe injuries or fatalities than those involving only passenger cars; between 2013 to 2017, the number of collisions involving trucks increased by 23 percent. Also, during this period, statewide truck VMT increased by 15 percent, followed by an overall increase in the number of collisions per one million VMT. However, commercial truck collisions resulting in no injury or death increased only by 4 percent and injuries by 24 percent, though the number of commercial truck collisions resulting in a fatality decreased by 8 percent.

Another safety concern is distracted driving and driver inattention. A distraction is anything that diverts the driver's attention from his or her primary tasks of navigating the vehicle and responding to critical events. According to an in-cab driving study of commercial truck drivers by the Virginia Technical Institute, the most dangerous distraction observed was texting. Truck drivers who texted while driving had 23 times the risk of being involved in a crash or a near crash incident. However, texting and phone calls are not the only distractions. Others may include eating, drinking, grooming, handling in-vehicle navigation systems, and conversating with passengers.

The FMCSA and the PHMSA have published rules specifically prohibiting interstate truck drivers, bus drivers, and drivers who transport quantities of "placards", which are large amount of hazardous materials, from texting or using hand-held mobile phones while operating their vehicles. The joint rules are the latest actions by the U.S.DOT to end distracted driving. Violations can result in fines and/or driver disqualifications and will impact a motor carrier's and/or driver's Safety Measurement System results.

With new electronic logging device rules, the monitoring of drivers' adherence to the hours of service rules will become more rigorous because computer programs will be tracking the driving and work activity of truck drivers. The California Trucking Association (CTA) has a long history of supporting truck safety initiatives, such as banning radar detectors, prohibiting the use of mobile phones while driving, and administering mandatory drug and alcohol testing. CTA is now calling for several additional safety improvements, such as mandatory use of devices to limit maximum truck speed and a national clearinghouse to track positive drug and alcohol test results and refusals to test.

COMMERCIAL VEHICLE ENFORCEMENT

The CHP provides safety oversight of approximately 8.5 million commercial vehicles. Currently, there are 54 commercial vehicle enforcement facilities (CVEF) located throughout the State. The CHP has jurisdictional authority over the CVEFs and maintains responsibility for commercial enforcement.

CHP mobile road enforcement units are used within their eight divisions throughout California's highways and county roadways (county roadways are often not necessarily seen as commercially traveled routes). The CHP conducts over 500,000 inspections annually in accordance with the Commercial Vehicle Safety Alliance standards set forth in the North American Standard Out-of-Service Criteria. The CHP also provides off-highway enforcement utilizing the Motor Carrier Safety Unit, which includes over 300 non-uniformed motor carrier specialists assigned to one of the eight state field divisions.

The CHP and Caltrans are the State agencies designated by the Governor's Office as the certifying officials for size and weight regulations and enforcement. The CHP is the primary agency responsible for the enforcement of size and weight statutes and regulations, pursuant to the California Vehicle Code (CVC) and Title 13, California Code of Regulations.

TRUCK WEIGHT LIMITS

California follows federal law by placing weight limits on trucks to protect pavement and bridges from damage and excessive wear and tear. Truck weight is also a major factor in the severity of truck-passenger vehicle incidents. Heavier trucks and trucks carrying loads exceeding maximum weight limits can be more difficult for the driver to control because they require increased stopping distance, have an increased potential to roll due to a higher center of gravity, generate higher speeds when traveling downhill, and have decreased steering capability, especially at higher speeds.

Table 4.2 shows a summary of the CVC weight limits. (Note: The information in this table is paraphrased for brevity. Refer to CVC Weight Sections 35550 – 35558 for more detailed information.)[168]

Table 4.2: California Vehicle Code (CVC) Related to Vehicle Weight

Unit	Maximum Weight
Diesel Vehicle Combination Gross Weight	80,000 pounds
ZEV Vehicle Combination Gross Weight	82,000 Pounds*
Single Axle	20,000 pounds
Axle Group: less than 8'-6" (8-feet-6-inches) between outer axles	34,000 pounds
Axle Group: 8'-6" (8-feet-6-inches) or more between outer axles	Varies by distance between axle groups
Diesel Vehicle Combination Gross Weight	80,000 pounds

Source: California Vehicle Code Weight Sections 35550 – 35558
****State exemption of an additional 2,000 lbs for zero-emission trucks from AB 2061.***

Caltrans often receives requests to increase truck (or axle) weight limits, or to implement programs that would collect additional fees for compensation of overweight loads. There are several reasons for these requests. Hauling larger loads with fewer trucks can help industries reduce transportation costs and increase efficiency. Competition and changing market conditions puts pressure on freight-dependent industries to lower costs in an effort to provide greater efficiencies and increases in service quality. Transportation costs and flexibility for load size can have a significant effect on economic sustainability, particularly for heavy bulk commodities and highly priced sensitive goods, such as agriculture, lumber and timber, and construction materials. It is paramount to the economic vitality of California that it maintains an efficient freight transportation system and support freight-dependent industries. It is also vital that decision makers and the public understand the trade-offs between economic benefits with increased infrastructure and safety costs that occur when increasing load limits.

To support cleaner truck technologies California passed AB 2061 in 2018. To the extent expressly authorized by federal law, the bill authorized a near-zero-emission vehicle or a zero-emission vehicle, as defined in subdivisions (c) and (d) of Section 44258 of the Health and Safety Code, to exceed the weight limits on the power unit by up to 2,000 pounds[169].

TRUCK PARKING

The demand for commercial vehicle parking far exceeds the supplied capacity in California. When originally conceived, public rest areas were meant to be temporary rest areas for short-term safety breaks for the traveling public. As the trucking industry expanded, these rest areas began to serve as long-term, overnight parking for long-haul commercial vehicle operators, thereby contributing to overcrowding. The lack of availability for truck parking is not just an issue for truck drivers who struggle to secure parking but also for neighborhoods adjacent to freight facilities such as ports, intermodal facilities, warehouse and distribution centers, and manufacturing. These neighborhood streets, empty lots, and business parking lots are used as truck parking when highway rest areas are full or closed. Besides creating safety hazards, neighborhoods frequently must contend with noise, smell, vibration, degradation of air quality, loss of viewshed, and disruption to community cohesion.

Because of the limits on stays in public facilities and parking space shortages, truck drivers have few alternatives. Parking underneath overpasses, on roadway access ramps or roadway shoulders are typically unauthorized and pose safety risks for the driver and other users of the highway or road. Accelerating quickly enough to merge into the traffic stream from a parked position on the side of the road is particularly challenging for truck drivers. Additionally, errant vehicles may stray into these areas and strike parked commercial vehicles. Privately owned truck stops are also not plentiful and are frequently filled to capacity, hence they are not always available to provide long-term parking. A lack of facilities can influence which route is taken based on the availability of amenities, whether the trip is a long or short haul, the time of day, and the need for staging areas. Just-in-time delivery scheduling and "rolling warehouse logistics" put even greater demand on drivers and on truck parking facilities.

More information on truck parking is provided in **Chapter 3A, Existing Freight System Assets.**

DRUG AND ALCOHOL PREVENTION

The CHP continues to work closely with the trucking industry to educate and reduce impaired driving and to maintain the highest level of compliance. This is completed through the combined efforts of education and enforcement. Through the Commercial Industry Education Program, CHP personnel provide nearly 1000 safety presentations annually to motor carriers throughout California. The goal of the CHP's motor carrier safety program is to ensure all motor carriers located in the state are inspected for continued compliance with state and federal drug and alcohol testing requirements. These inspections are necessary in the continued efforts to reduce the number of impaired drivers on the road.

Air Freight

FREIGHT SECURITY

As with its passenger counterpart, the airline freight industry is pressured to comply with stringent security requirements. As part of the 9/11 Commission Act of 2007, Congress requires all cargo transported in the holds of passenger airplanes originating in the U.S. to be screened at a level commensurate with passenger luggage. Since 2010, TSA regulations mandates the screening of all cargo before it is to be loaded and carried by air both within the U.S. and internationally. The deadline to meet this mandate was August 3, 2010 and TSA is charged with enforcing it thereafter.

As a solution to bottlenecks experienced at airports, which further impacts the global supply chain due to the complex screening processes for both passenger and cargo packages, TSA devised the Certified Cargo Screening Program (CCSP).[170] Under the CCSP, shippers, freight forwarders, logistics services providers, indirect air carriers, independent cargo screening firms, and air carriers can screen cargo via a secure chain of custody and pass it along where it can go directly onto the aircraft without undergoing additional screening. This approach effectively creates a distributed screening network, allowing screening to be performed at the most cost-effective point in the supply chain and mitigating the impact on system performance, thereby expediting the flow of commerce. The CCSP is a flexible, voluntary program specifically designed to allow shippers with unique requirements to find the approach that best meets their needs. The CCSP requires airlines, freight forwarders, and shippers to assume the costs of these security measures and to establish a secure air freight transport chain.

NEXTGEN

The Next Generation Air Transportation System (NextGen) modernization of the U.S. air traffic system is due for implementation across the country in stages between 2007 and 2025. NextGen aims to transform America's air traffic control system from a ground-based system to a satellite-based system. Global Positioning System (GPS) technology will be used to shorten routes, save time and fuel, reduce traffic delays, increase capacity, and permit controllers to monitor and manage aircraft with greater safety margins. Planes will be able to fly closer together, take more direct routes, and avoid delays caused by airport "stacking" as planes wait for an open runway.

The FAA is undertaking a wide-ranging transformation of the entire U.S. air transportation system through the NextGen program, which is developed to reduce gridlock both in the sky and at the airports. In 2017, FAA published an Implementation Plan Update, including a summary of accomplishments and the NextGen priorities annual plan through 2019. The NextGen Integration Working Groups successfully completed 52 commitments in fiscal year 2017, advancing operational improvements to the National Airspace System (NAS) in all areas. In February 2017, the NAC chairman proposed that the NAC focus on implementing NextGen in the Northeast Corridor, recognizing that making continuous improvements to the system in the Northeast Corridor operationally benefits the entire U.S. aviation system. Although this national effort focuses more on flight improvement across NAS, operational improvements provide benefits to the air cargo industry as well.

Maritime Freight

The maritime industry has always placed a high priority on security. Terrorism, weapons and drug smuggling, customs duty evasion, and piracy have been among the chief safety concerns. The international dimensions of the shipping industry, the large number of maritime ports, the vast fleet of global shipping, the range of products carried in vessels, and the difficulty of detection has made the issue of security in shipping a persistent concern. For ports, vulnerabilities can range in levels of exploitation and severity from both land and water. Recently, more scrutiny from customs officials has focused on identifying illicit and/or dangerous cargoes within containers. All containers imported to U.S. seaports are scanned through radiation portal monitors (RPM) prior to leaving a marine terminal on trucks or rail cars. Other selected containers are also scanned or manually inspected by U.S. Customs and Border Protection (CBP) based on their assessment of risk or by random selection. The United States Coast Guard (USCG) inspects cargos and containers for compliance with the Federal Hazardous Materials Transportation Law (FHMTL) and the International Safe Container Act of 1977 (ISCA) (46 U.S.C. §80501-80509). Regulations implementing the FHMTL are codified in 49 C.F.R. §107-180. Regulations implementing the ISCA can be found in 49 C.F.R. §450-453. The Coast Guard inspects containers of general cargo to ensure hazardous materials are being shipped legally. Undeclared hazardous material shipments are a leading cause of transportation incidents.

The USCG also has responsibility for the Transportation Worker Identification Credential (TWIC) program. The TWIC program was developed following the legislative provision of the Maritime Transportation Security Act (2002, 2010) and the Security and Accountability for Every Port Act of

2006. The TWIC identification card is a tamper-resistant credential that contains biometric information about the holder, rendering the card useless to anyone other than the rightful owner.

VESSEL SAFETY AND SECURITY

The Maritime Transportation Security Act of 2002 (P.L. 107-295) was designed to protect the nation's ports and waterways from terrorist attacks. The basic elements of this legislation were adopted by the International Maritime Organization (IMO) in 2002 as the International Ship and Port Security code (ISPS). There are three important features of these interventions. First is the requirement for an Automated Identity System (AIS) to be fitted on all vessels from 300 gross tonnage and upward. The AIS requires vessels to have a permanently marked and visible identity number, and there must be a record maintained of its flag, port of registry, and address of the registered owner. Second, each port must undertake a security assessment of its assets and facilities, quantifying the effects of damages caused. The port must then evaluate the risks to its physical security, communication systems, and utilities. Lastly, all cargoes destined for the U.S. must receive customs clearance prior to the departure of the ship. It is proposed that biometric identification for seafarers are implemented and that a national database of sailors be maintained.

The ISPS code is being implemented in ports around the world. Without certification, a foreign port would have difficulty in trading with the U.S. Thus, it is becoming a factor in a port's competitiveness. The need to comply with ISPS has become an urgent issue in ports of various cargo volumes around the world. The costs of securing sites, undertaking risk assessments, and monitoring ships all represent an additional cost of doing business without any commercial return. U.S. ports have been able to tap funding from the Department of Homeland Security, but foreign ports must comply or else risk the loss of business. In 2008, legislation in the U.S. required that all containers being shipped to the U.S. undergo screening. Foreign ports will be expected to purchase gamma-ray and x-ray scanners, and undertake screening of all U.S.-bound containers, regardless of the degree of the security threat. This is a further financial and operational cost for foreign ports to comply with. Security has become an additional element in determining competitive advantage.

Land Ports of Entry Freight

BORDER SAFETY AND SECURITY

California and Mexico share over 130 miles of international border. The border is a vital economic gateway for international trade and a key contributor to the economic well-being of both countries. Under the auspices of the Department of Homeland Security, the U.S. Customs and Border Protection (CBP) safeguards the U.S. - Mexico Border. Its top priority is "keeping terrorists and their weapons out of the U.S. while facilitating lawful international travel and trade." Regarding to freight, the CBP's primary responsibility is to "safeguard America's borders thereby protecting the public from dangerous people and materials while enhancing the Nation's global economic competitiveness by enabling legitimate trade and travel."

The CBP creates and implements programs using sophisticated technologies, and trains personnel to help achieve the goals of securing U.S. ports and borders while supporting and expediting trade. Initiated after 9/11, the Free and Secure Trade (FAST) Program is a commercial clearance program for known low-risk shipments entering the U.S. from Mexico and Canada.

FAST allows for expedited processing for commercial carriers who have completed background checks and certain eligibility requirements.

Customs Trade Partnership Against Terrorism (CTPAT) is a voluntary government and business initiative intended to build cooperative relationships that strengthen and improve the overall international supply chain and U.S. border security. Nationwide, there are over 78,000 commercial drivers enrolled in the program and over 10,000 companies worldwide are certified under CTPAT. Free and Secure Trade (FAST) membership, a commercial clearance program for known low-risk shipments entering the United States from Canada and Mexico, is $50 U.S. or Canadian currency and covers five years. One of the key benefits of enrollment for carriers is access to dedicated lanes in transborder shipments which allow for greater processing speed and overall efficiency. For the U.S., Mexico, and Canada, the program helps to support supply chain security while promoting economic prosperity.

In 2016, the U.S. CPB announced the full implementation of Automated Commercial Environment (ACE). As the platform that enables the United States' Single Window, ACE provides a single, centralized access point for the trade community to connect with CBP and its Partner Government Agencies. ACE is the system of record by which electronic trade transactions are conducted and recorded by CBP. ACE has streamlined collection and improved enforcement. With the ACE cargo processing system, trade transactions are more efficient, standardized, simplified, less costly, and more predictable for importers and exporters.

CBP has also been working to design a government-wide 'trusted trader' partnership program that would integrate CBP's C-TPAT and the Importer Self-Assessment with other U.S. government trusted trader programs. In July 2016, CBP published the draft "Trusted Trader Strategy Framework" whose objective is to co-create a strategy in terms and practice, one which acknowledges the significant commitment of partnership between the U.S. government and trade, in global trade and security. The Trusted Trader framework begins with a foundation of security and continues through current certified membership in C-TPAT baseline of engagement. This Trusted Trader pilot program was announced on June 16, 2014 in Federal Register 79FN13992 and transforms the existing Importer Self-Assessment program into the new Trade Compliance Program, which provides importers and exporters a platform to achieve an integrated partnership for security and compliance. The pilot program has since been continued and expanded. In January 2018, CBP, the Trusted Trader Subcommittee members, and the Trusted Trader Pilot participants met in Long Beach, California.

Freight Transportation Resiliency

"Freight resiliency" is the ability for the freight system to quickly detect, absorb, and recover from disruptions and return to a balanced and synchronized operating environment. These disruptions can range in severity and scale, and from small-scale events with a localized impact (such as a power outage at a distribution center), to large events with far-reaching effects (such as earthquakes, mudslides, or terrorist attacks). The ability of freight mobility to rebound depends on many factors, including: the structure of the specific freight system (manufacturing, shipping, processing, delivery), personnel training, transportation redundancies (such as having multiple options, modes, or routes), time of year, and public and private actions taken to preserve, restore, or unintentionally further disrupt service in case of a disaster or disruption to freight mobility.

In 2022 the Infrastructure Investment and Jobs Act amended Section 70202 of title 49 of the United States Code to improve State Freight Plans to include strategies and goals *to decrease the severity of* impacts of extreme weather and natural disasters on freight mobility.[171] In Section 6.A California's resiliency goals and strategies are identified. These Goals and strategies were developed through the California Freight Advisory Committee and will guide California towards a safe and sustainable freight system.

Resilience in the state's freight system is needed for California to meet its growing needs for efficient freight mobility, as well as to help meet challenges presented by California's changing climate and human threat landscape impacts. Without resiliency, infrastructure will be subjected to faster deterioration due to extreme weather events. The public will be faced with increases in system disruptions, and private enterprises in the California economy may lose competitiveness. The 2018 update to California's Fourth Climate Change Assessment has shown a dramatic shift in California's climate future that will affect people, the natural landscape, and infrastructure. Table 4.3 shows the key findings from the Fourth Climate Change Assessment for statewide climate trends that are expected to occur between 2050 and 2100 and suggestions from the California Freight Resilience Alliance[172]. Effects on freight are added to this summary table to illustrate potential outcomes because of these changing climate conditions.

Table 4.3: Key Findings Adapted from California's Fourth Climate Change Assessment to Include Potential Impacts to Freight Systems

Climate Stressor	Future Change	Impacts to Freight
Temperature	**By 2100**: 5.6°-8.8° increase in daily temperature	Increase in daily temperatures can lead to hotter warehouses and damage to truck tires and engines. Workers will need more protections from overheating (e.g., access to air conditioning, more frequent breaks, and shorter shifts).
Water	**By 2050**: Water supply from snowpack is projected to decline by two-thirds	Agricultural shortages could arise from the limited water supply, which would change patterns of freight from California's Central Valley to more reliance on food imports from other countries.
Wildfire	**By 2100**: Average land area burnt will increase by 77%	Road closures from damaged highways could results in freight trucks needing to be rerouted to other highways that may be further away, thus increasing delivery and shipping costs and times.
Sea Level Rise	**By 2100**: - 31%-67% of Southern California beaches may completely erode - $17.69 billion worth of residential and commercial buildings could be inundated statewide	Inundation could cause relocation of container yards, commercial buildings, and warehousing, especially those found in coastal areas that have not Implemented adaptation measures. Impacts from sea level rise are projected to inhibit operations and accessibility for rail and vehicular facilities at all of California's ports.

	- The number of highway miles exposed to coastal flooding will triple	Flooding of highways will lead to road closures which could affect the trucking industry.
Source: California's Fourth Climate Change Assessment		

The projected changes in California's climate highlight the need for transportation systems to be resilient and quickly regain a balanced and synchronized operating environment despite changing circumstances. System disruptions are almost impossible to predict with accuracy because they can stem from many sources and have many different types of impacts. This highlights the need for the freight system to be flexible and be able to swiftly recover from shocks. **Table 4.4** shows disruption events and possible corresponding freight impacts to illustrate unpredictability the freight system faces.

The wildfires that now occur nearly year-round in California are recent examples highlighting the need for a resilient freight system. From 2017 to 2022 California experienced some of the most devastating fires in its history, whether in terms of acres burned, structures destroyed, or lives lost. These fire events interrupted freight rail and roadway mobility and closed freight-related businesses. The interruptions, though necessary to save lives and speed up emergency crew movements, impede freight movements and shipments of goods, both perishable and shelf stable. The rate of natural disasters is predicted to increase due to California's changing climate.

Table 4.4: Event Types and Possible System Failures

Disruption Source	Event Type	Possible System Failures
Natural Hazards	Wildfires	• Damage and loss of electrical grid infrastructure* • Road closures • Damage to transportation and supply chain* infrastructure • Post-Fire Debris Flows* • Evacuations *
	Increased Tornado/Hurricane Strength	• Damage and loss of electrical grid infrastructure* • Damaged or destroyed buildings • Inaccessible roads
	Sea Level Rise/Storm Surge	• Flooding • Salt water intrusion and corrosion of electronic systems • Damage to rail, highway, seaport, airport infrastructure • Liquification*
	Winter Storm	• Road Closures* • Delays in Goods Movement *

	Intense Precipitation	• Flooding • Flash Flooding* • Low visibility • Washout of roads and rail substrates
	High Winds	• Downed power lines • Vehicles blown off roadways or overturned • Increased threats to bridges • Delays to air freight flights
	Increased Temperatures	• Vehicles overheating • Tire blowouts • Rail track expansion and buckling • Thermal expansion of bridge joints
	Cliff Retreat/Coastal Erosion*	• Unstable roadways • Inaccessible roads • Loss of connectivity between cities
Geophysical	Tsunamis	• Flooding • Saltwater intrusion and corrosion
	Earthquakes and surface rupture	• Uneven pavements • Downed powerlines and communications • Liquefaction*
	Sinkholes	• Unstable roadways
	Landslides (mass movement)	• Inaccessible roads • Debris clogging tunnel passages
	Volcanic Eruptions	• Inaccessible roads • Disruption to aviation traffic* • Impacts from Ashfall*
Human Activity	Transportation Accidents	• Traffic congestion • Closed roads
	Utility Failures	• GPS failures • Telephone failures • Electrical Grid failures • Fuel shortages
	Cyber Attacks	• Disrupted distribution operations
	Terrorism/Physical Attacks	• Destroyed infrastructure • Closed roads
	Economic Shocks	• Disrupted freight operations
	Civil Unrest	• Disrupted freight operations

		• Inaccessible distribution centers • Closed roads • Goods unable to be sold • Boycotts
	Hazardous Materials	• Regional road closures • Impacted Communities • Habitat and environmental disaster
	Nuclear/ Radiological Incidents	• Disrupted freight operations • Evacuations • Transportation Infrastructure and utility damages
	Electromagnetic Pulse	• Loss of communication networks • Disruption to electric power grids •
	Changes in ordinance and law	• Tariffs • Hours of Service • Stay at home orders
Sources: California's Fourth Climate Change Assessment, *California Resiliency Alliance[173]		

The rapid development of e-commerce, economic globalization, just-in-time production, and logistics and supply chain systems over the past decades have led to a significant need for efficient and effective management of freight movements. Businesses and consumers have become increasingly dependent on the freight transport system to deliver their goods on time, because increasingly, far less inventory is stored in regional warehouses and stores. Freight movement in the U.S. has increased dramatically over the past 20 years with relatively little expansion of the highway system during that time. Significantly more freight is being moved on the same relative number of lane miles, which results in increased delays from higher traffic volumes and more maintenance needs on the road network.

Disruptive, weather-related events have increased dramatically over time. Individuals, businesses, industries, and public sector government agencies are not immune to sudden events that disrupt normal daily activities. Trucking companies, rail carriers, infrastructure managers, and terminal and port operators must invest to prevent or mitigate the effects of disasters. Whether attributable to acts of nature, human error, mechanical failure, or intentional disruptions, identification of future threats and plans for the ability to quickly respond to them is needed.

Due to increased goods movement activity, it is imperative for the freight system to be equipped to handle climate, environmental, human, and geophysical events. While it is difficult to predict when an event may occur, it is important for the system, as well as both the public and private sectors, to be prepared for its eventuality. Failure to adapt can be disastrous to individuals, businesses, governments, and the economy.

California's vast geography presents a diverse array of projected climate change impacts including more frequent devastating wildfires, stronger storms that produce more precipitation leading to more frequent flooding, longer and more severe droughts, rising sea levels, and more extreme high and low temperatures. Understanding where portions of the freight system are projected to experience impacts from climate change will be an essential step for limiting disruptions to freight activity in California. To ensure the safe movement of goods throughout the State, transportation systems will require establishing thoughtful and collaborative adaptation strategies for vulnerable facilities that are essential to freight activity. Facilities in forested areas that are prone to wildfire may consider incorporating defensible space and fire-resistant building materials to prevent damage from wildfire events. Bridges and drainage features must be wide enough to accommodate for higher projected runoff during storms in both urban and rural areas to avoid damage and closures due to flooding. Facilities in mountainous regions may require slope stabilization treatments in areas susceptible to landslides. Freight operations in coastal areas may require actions to protect, accommodate, or retreat inland to avoid significant impacts from sea level rise and storm surge. Adaptation strategies such as these will be integral to maintain a safe and resilient freight transportation system in California.

Two important points should be considered when planning for a resilient freight system:

- A mutual public-private sector understanding of capabilities and expectations is integral to building and supporting a resilient system.
- Cross-sector communication, pre-, during, and post-event is critical to restoring freight flows after a significant disruption.

Importance of Resiliency in Freight

EFFECTS TO A NON-RESILIENT SYSTEM

The impacts to a freight system unprepared for freight network resiliency have far-reaching consequences outside of private industry profit margins. Disruptions in freight movements can mean freight industry workers are unable to reach or perform their jobs, thus experiencing a loss in wages. Agricultural crops can decline in quality or even spoil if trucks are delayed between farms and distribution points. Delays in shipping products to consumers could have disastrous consequences, such as diabetic patients not receiving their insulin shipments on time, or that stores not stocked with goods necessary for helping residents weather a severe storm event.

Local, regional, state, and federal governments can be severely affected fiscally if the freight system is not adequately prepared for a major climate, human, or geophysical event. Ignoring the need for repairs, retrofitting, or adaptation measures could accelerate the failure of vital infrastructure, thereby substantially increasing the costs to repair after an event more than proactively maintaining it.

BENEFITS OF A RESILIENT SYSTEM

A freight system that has been successfully adapted to the projected changes in climate and any subsequent impacts will be better suited to quickly recover from disaster events, thus saving time, money, and lives. Private industries and public agencies can ensure a resilient system by adapting infrastructure to withstand greater shifts in climate. Proactively adapting freight transportation infrastructure to climate change will culminate in a freight system that can better withstand the challenges posed by future climate-driven events.

Public incentives are available to private businesses, such as rebates for installing solar infrastructure, which helps the state more quickly adopt climate adaptation measures, thus increasing California's resilience to energy demands. Solar infrastructure can safeguard a business to ensure refrigeration systems can still run, even in power outages, which will prevent inventory from spoiling. Other public measures, such as increasing funding for elevating bridges over bodies of water to accommodate for higher water levels from increases in precipitation or sea level rise, identifying areas prone to rockslides or mudslides and fortifying the area to protect the roadways and traveling public, or by communicating road closures and openings quickly so that truckers and delivery trucks can get back on their regular routes are examples of ways California can increase resiliency for the freight system.

Accommodating disruptions within the freight transportation system often needs a variety of measures. Reliable freight transportation is a prerequisite for an efficient supply chain. As ground transportation systems have become more congested and less able to accommodate shifting demands, improving resilience of the transportation system itself becomes a priority.

Current Efforts

PRIVATE SECTOR

The Burlington Northern Santa Fe (BNSF) rail line publicly releases its yearly "Corporate Responsibility and Sustainability Report," which outlines the continuing efforts to," enhance safety, including efforts to reduce energy consumption and carbon emissions with more sustainable operations."[174] As a rail operator that carries more than 40 percent of America's freight and as North America's second largest freight railroad network operating over 32,500 miles of track, BNSF has been striving to ensure its operations are resilient. The largest concern for BNSF is the event of a hazardous waste spill. The company operates under "Common Carriage" responsibilities, meaning that it is required to make reasonable accommodations for the transportation of any hazardous material or commodity. In 2017, BNSF carried over 1.3 million customer hazmat shipments across its network. To reduce the risk of accidents, BNSF uses," wayside detectors, track inspections, reduced speeds, positive train control, and stronger tank cars." Crude oil and ethanol are among the hazardous materials BNSF transports, and BNSF requires that trains travel no faster than 50 miles per hour (mph), with speeds under 35 mph in areas with 100,000 or greater inhabitants.

Union Pacific Railroad (UPRR), the largest railroad operator in the U.S. after BNSF, is also concerned with the human element of potential disruptions. A 2016 report published by UPRR, the "2016 Building America Report - A Report to Communities on Our Social, Environmental, and Economic Sustainability Progress," addresses a variety of concerns the company faces during its day-to-day operations, such as environmental health, employee and customer safety, and resource management. UPRR, similar to BNSF, is also highly concerned with hazardous material transportation safety. The UPRR report stresses emergency response trainings for first responders, UPRR employees, and volunteers.

By offering paid employee training on safety procedures while transporting hazardous materials, BNSF and UPRR set an example of how private responsibility is taking the lead to benefit public well-being. Employee, volunteer, and first responder training directly increases resiliency in an emergency, because well-organized and orchestrated disaster relief actions can improve responds to events and improve situation assessments. Also, the practice of using new technology, stronger equipment, and reductions in train speeds reduces the vulnerability of the freight system from accidents that can contribute to spills, destruction of property, injuries, or deaths.

PUBLIC SECTOR

Caltrans has conducted Climate Change Vulnerability Assessments for each of their 12 Districts to learn the extent to which the SHS will be affected by a changing climate by horizon years 2025, 2055, and 2085. These vulnerability assessments explore how rising temperatures, sea level rise, storm surge, and rates of wildfire may impact the SHS. To follow up on the District Vulnerability Assessments, Caltrans has produced 12 Adaptation Priority Reports which further examine the level of vulnerability of individual state transportation assets using an array of exposure and consequence metrics to identify which parts of the SHS represent the highest adaptation priorities in each District. Caltrans is currently beginning the process of updating each of these reports to keep pace with the latest climate science and will broaden the scope beyond the SHS to include rail and transit infrastructure. The outcomes of these vulnerability assessments and adaptation priority reports and any subsequent updates will lead each of the 12 Caltrans districts to develop their own Climate Adaptation Strategy. These strategies are intended to guide decisions to address the vulnerable areas of highways, with the aim to develop and incorporate design changes and other adaptation features that will help protect the SHS and its users from potential climate change impacts.

Additional guidance has also been developed by Caltrans for incorporating climate change considerations into Comprehensive Multimodal Corridor Plans. This guidance, released in early 2022, includes details for a large variety of strategies that District planners should consider to properly address any current or projected climate change impacts through each step of the corridor planning process. Properly accounting for climate change in corridor planning will result in more careful consideration of climate change at vulnerable locations during subsequent phases of planning and project development. This guidance coupled with freight considerations along these routes will improve resilience of freight transportation systems in areas where corridor planning has taken place.

Caltrans has administered the Climate Adaptation Planning Grants for three fiscal years (2017-2020). These grants, totaling $20 million, are funded through SB 1, a transportation funding bill passed by the California legislature and backed by voters in 2018. Adaptation Planning Grants aim to advance climate planning on California's transportation infrastructure, including roads, railways (public railways that both private and public rail lines use), bikeways, trails, transit lines, bridges, bus terminals, seaports, and airports.

The Climate Adaptation Grants awarded to tribal, regional, and local governments within California are helping communities plan for improvements to their transportation infrastructure in the face of increased extreme heat events, precipitation, drought, storm surges, sea level rise, and wildfires due to climate change. Over 40 planning grants were awarded, empowering communities throughout California to safeguard their transportation systems against disruptions caused by a changing climate. Findings from these plans aid local, regional, and state efforts of increasing climate and system resiliency while decreasing vulnerabilities regardless of source type. These efforts ensure that the freight system (and by extension California's economy), environment, and residents are resilient to any disasters that may disrupt normal life.

A new program was created in the State budget through Senate Bill 198, the Transportation Infrastructure Climate Adaptation Strategy (Planning) Grant Program, which includes a one-time allocation of $50M for Caltrans to administer additional adaptation planning grants to tribal, regional, and local agencies with a focus on project-level planning. These adaptation planning grants are being included in the Sustainable Transportation Planning Grant Program, and it will include a 10% tribal set-aside and will award 50% of projects to benefit underserved communities. SB 198 also created two capital infrastructure adaptation programs to oversee implementation of the new federal PROTECT Program. The Federal Infrastructure Bill created a new, first of its kind climate adaptation and resilience program, the Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Program. This program will allocate ~$631M to California over five years to advance transportation resilience projects.

In 2021, the Infrastructure Investment and Jobs Act amended Section 70202 of title 49 of the United States Code to improve State Freight Plans to include strategies and goals *to decrease the severity of* impacts of extreme weather and natural disasters on freight mobility.[175] The California Resiliency goals and strategies are identified and can be seen in **Table 4.5.** These Goals and strategies were developed through the California Freight Advisory Committee and will guide California towards a safe and sustainable freight system. Within the IIJA $8.7 billion of funding went to the Promoting Resilient Operations for Transformative, Efficient and Cost-Saving Transportation (PROTECT) discretionary grant program to assist local agencies to improve the resiliency of on system transportation infrastructure[176]. The program will provide federal funding to projects that enhance resiliency to environmental, climate and emergency response vulnerabilities.

In 2020 California Executive Order N-79-20 directed the state to transition to Zero-Emission vehicles by phasing out gasoline powered cars, trucks, and equipment. This order will reduce fossil fuel demand to achieve state emissions goals. By 2045 all new sales of medium and heavy-duty trucks will be required to Zero-emission. This change in the freight transportation system will require future resiliency strategies to include ZEV infrastructure on alternative routes to unsure redundancy.

In response to global disruptions due to the COVID-19 pandemic, Executive Order N-19-21 that will Invest $1.2 Billion for supply chain to support the States Port and freight corridors. CalSTA has guidelines a call for projects that will be a one-time funding for port and freight infrastructure funding. Projects for this funding will directly address sustainable and resilient freight system.

Table 4.5: Safety and Resiliency Goal: Objectives and Strategies

Objective	Strategies
Objective SR-1: Reduce rates of incidents, collisions, fatalities, and serious injuries associated with freight movements	***Strategy SR-1-A: Expand the system of truck parking facilities***
	• Execute the recommendations from the 2020/21 California Truck Parking Study to expand existing public and private sector truck parking facilities and the development of new parking facilities in strategic locations.

	Strategy SR-1-B: Promote public-private partnership for implementation of truck stop and shipping terminal vehicle charging or charge-in-motion
	• Support ARB, PUC, and Energy Commission efforts to work with electric utilities, technology providers, truck stops (and NATSO), and freight terminals to employ electric charging terminals along key freight corridors. Likewise, Caltrans should continue to study inductive charging opportunities within its right-of-way.
	Strategy SR-1-C: Develop design guidelines for truck routes that consider other modes
	• Utilizing logistics land use guides, develop a context-sensitive roadway design document that supplements Caltrans' Complete Street Guidance
	Strategy SR-1D: Prioritize projects that address high-crash, truck involved locations
	• Collaborate with California Highway Patrol and use a common set of performance measures to identify commercial vehicle crash hot spots statewide. Use this information to improve State and regional prioritization efforts and to focus safety-related funding efforts.
Objective SR-2: Utilize technology to provide for the resilience and security of the freight transportation system	***Strategy SR-2-A: Expand the number and scope of cargo security screenings***
	• Work with State and Federal homeland security partners to ensure that future transportation design decisions near sea, air, and land ports of entry account future space requirements for cargo screening facilities.
	Strategy SR-2-B: Ensure consistent and effective safety and security requirements at all California ports
	• Ensure consistent and effective safety and security requirements at all California ports • Strengthen partnership between State, federal, and private stakeholders to ensure the safe and secure access of goods moving to and from the State's sea, air, and land ports of entry.
	Strategy SR-2-C: Identify alternate freight routes to maintain freight movement at times of disruption by disaster
	• Conduct an alternative routes study to ensure continuity of freight movement during and immediately following a disaster. This study would include bringing critical trade lanes online and ensuring relief materials reach California's residents and businesses. Existing evacuation routes and plans must be integrated into the proposed alternative routes study.
	Strategy SR-2-D: Support V2V and V2I communication alerts on congestion and safety hazards

	• Monitor technological innovations and invest appropriately in V2V and V2I infrastructure that will allow freight users advanced information on congestion, safety hazards, and traffic information (i.e. red light count down, speed limits, etc.). This information can help truck drivers make active choices about how they select their route and how they operate their commercial vehicles.
	Strategy SR-2-E: Promote technology to support monitoring of truck parking locations and areas where rail traffic commonly stops
	• Increase transportation security and decrease theft by placing cameras and other technologies in truck parking areas and near rail locations where intermodal trains frequently stop.
	Strategy SR-2-F: Support the creation and development of a freight technology research center to advance research in innovative freight practices and incubate innovations to meet future demand
	• Support the creation of a freight technology research center at the university level, or within a state agency department, to undertake freight related research and development.
Objective SR-3: Develop freight resiliency strategic plan	***Strategy SR-3-A: Develop resiliency vision, goals, and objectives***
	• Work with agency partners to develop a vision for a resilient freight system. This vision would be supported by goals and a series of objectives. The Freight Resiliency Strategic Plan would focus on identifying future issues as it relates to national disasters, sea-level rise, and the individual resiliency of major trade lanes in California. Collaborate with State, regional, and local agencies to leverage funding opportunities for implementation of climate resiliency work, adaptation plans, climate action plans, and/or master plans to increase resiliency of assets against climate related events.
	Strategy SR-3-B: Identification of high priority safety concerns, critical infrastructure, and aspects of the State's key supply chains that have resiliency concerns
	• Increase the resiliency of California's key industry supply chains. Identify and prioritize improvements to improve safety and keep business moving – these improvements could include rebuilding, strengthening, or improving facilities.
	Strategy SR-3-C: Incorporate resilience strategies contained in port plans prepared pursuant to coastal commission guidelines
	• Work with the State's port authorities to incorporate resiliency strategies as part of Caltrans roadway improvement plans – in particular, assist ports in preparing for increased sea levels.

	• Collaborate with partners to develop Vehicle Grid Integration as a resiliency strategy. This capability allows for battery-electric vehicles and other equipment to communicate with the grid when charging, especially in places where trucks are likely to plug-in for extended sessions like truck parking sites. This is also a technology that could promote resiliency for equipment like electric-powered Transport Refrigerator Units, particularly when shore powering at port terminals and warehouses.
Source: Chapter 6A, CFMP 2023	

COVID-19 and the Lasting Impacts on California's Supply Chain

Coronavirus Disease 2019 (COVID-19) was arguably the most impactful event for California's freight industry in decades. In March 2020, as COVID-19 cases began to rapidly increase, many businesses, schools, and other civic places began to shut down or limit activities. Yet, California's freight sector kept operating to move goods essential to sustaining life in both California and throughout the United States.

Almost overnight in early March 2020, the California freight sector underwent a dramatic shift. Suddenly, with many schools and businesses closed, and restaurants operated in limited capacity in some areas, Californians became more reliant on grocery stores and goods directly delivered to their place of residence. Prior to the pandemic, many Californians ate meals at schools and restaurants near their place of employment, as well as used supplies at offices and schools. However, with the shift to remote learning and teleworking, the food and supplies used at places of residence dramatically increased. Food products that sometimes were delivered in bulk to restaurants, like cheese, had to be repackaged to meet consumer needs and be placed at grocery stores. [177] Panic buying and changes in where consumers used products led to shortages in goods—for instance—nearly half of all grocery stores in the United States were out of toilet paper on April 19, 2020. The toilet paper shortage was in part due to panic buying, but also due the type of toilet paper typically used at a residence—the toilet paper manufactured for residential use is usually of a higher quality than the bulk toilet paper manufactured for schools and offices.[178] In those early months of the pandemic, warehouses started to rapidly fill with goods that were not being shipped out to businesses that were closed or limited by the pandemic. Non-essential goods like Easter holiday-related supplies were not able to be cleared from warehouses. Meanwhile, there was limited space to store essential goods coming in through California's ports.

In the years following the beginning of the COVID-19 pandemic, California saw record volumes of TEUs at ports[179], heavily driven by the return of empty containers to Asia.

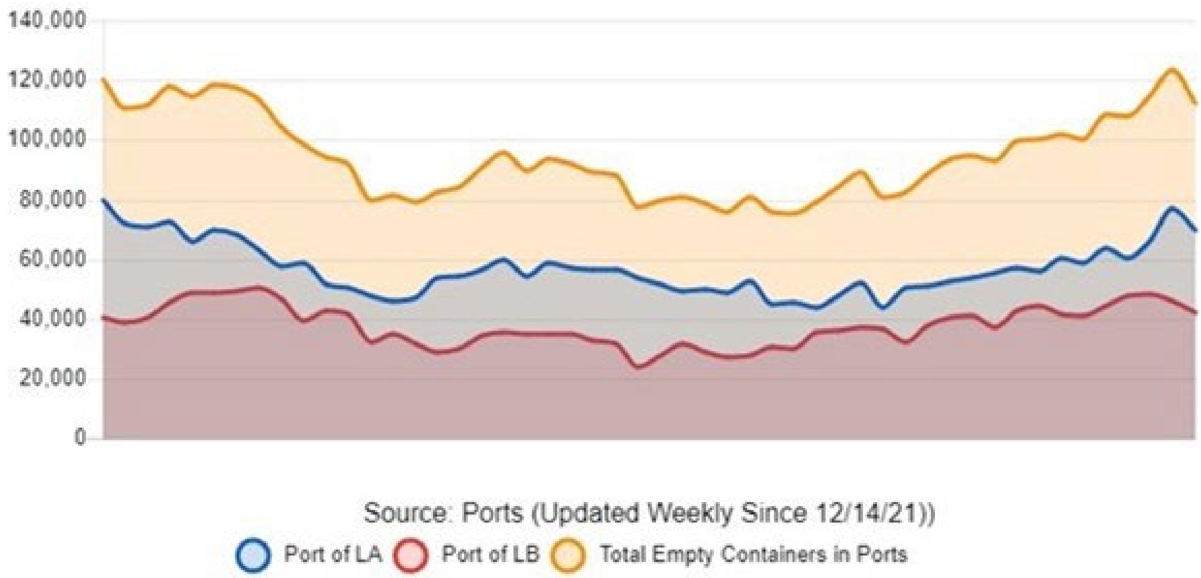


Figure 4.18: Empty Container Tracker

Congestion reached all-time levels at the ports, and ships at anchor or loitering reached all-time high levels at the San Pedro Port Complex and the Port of Oakland.[180] This was driven by several factors including, increase in demand for consumer goods (especially e-commerce, accelerating an already increasing year-over-year growth in e-commerce), decline in consumer traveling expenditures, home improvements to accommodate teleworking and virtual schooling, record consumer debt, government stimulus checks, lack of available workers in sectors of the freight industry, and demand for essential goods needed to combat and protect against COVID-19.[181] Consumer packaged goods—goods that are packaged for purchase at places like grocery stores—saw a 19% increase in demand in 2020 compared to 2019.[182] This demand for consumer goods sent shipping rates to record levels. This also meant that the prices for goods and materials also soared as demand outpaced the ability to produce and ship supply.

On November 16, 2021, San Pedro Bay saw an all-time high of 86 ocean-going container vessels at anchor or loitering in/near the Bay. CARB documented the air quality impacts of having these large vessels parked in the Bay,[183] but there are also other concerns of having ships anchoring or loitering in the Bay, including impacts to coastal aquatic habitat and animals (such as whale strikes by ocean-going vessels), and potential safety concerns by having so many vessels within the Department of Defense missile test ranges. In mid-November 2021, the Ports of Los Angeles, Long Beach, and Oakland and their partners implemented the Pacific Maritime Management Services (PacMMS) that established a queuing system for ocean-going container vessels to remain outside the boundaries of a Safety and Air Quality Area (SAQA) off the coast of California until a berth is available at a port.[184] This allows vessels to slow-steam in the Pacific Ocean, potentially reducing fuel consumption and emissions, without losing its spot in the queue for a berth at a port terminal. With PacMMS in place, the Marine Exchange of Southern California reported that the number of ships at anchor or loitering in San Pedro Bay dropped to 12 on January 9, 2022 despite 109 vessels expected to have made it to the Bay by that day (with

97 vessels in queue). This late 2021- early 2022 surge in demand was driven by some of the same factors as the rest of the pandemic but was also driven by beneficial cargo owners and businesses wanting to ensure they received their goods from overseas markets in time for when they were most needed. The timing concerns resulted from prior pandemic-induced supply chain congestion experiences, as well as the fear of work stoppage during labor contract negotiations between the ILWU and PMA.[185]

The rush to move goods across the Pacific to California put enormous strain on an already stressed supply chain. Warehouses in Southern California reached a 0.6% vacancy rate. [186] Inbound containers were left at the ports for long periods of time, creating space constraints and inefficiencies in port operations.[187] Containers were left on chassis on streets (including residential streets).[188] Containers were stacked anywhere they could be supported and monitored. Chassis and containers became in short supply.[189] In some cases, the demand for empty containers in Asian markets became so great that it made more financial sense for carriers to send back containers empty than with American exports. And several carriers began to skip calls to Oakland and other West Coast ports to only focus on the San Pedro Bay ports—especially impactful to California's agricultural markets that relied on exports and imports through the Port of Oakland.[190]

Shipments by rail were also impacted. Class I Railroads had reduced workforce leading up to the pandemic and during the early months of the pandemic. With the growth in consumer demand, the railroads were not able to match the workforce needs of clients during some months of the pandemic.[191] While hiring began to ramp up, inland railyards began to run out of space to store goods as warehouses and other freight facilities in key destinations such as Chicago, Dallas, St. Louis, and Kansas City were also near capacity.[192] This resulted in rail-bound cargo at the San Pedro Bay ports destined for inland intermodal facilities (also known as IPI - Inland or Interior Point Intermodal) dwelling for more than 16 days on average during some months.[193]

As record number of TEUs flow through the ports to inland destinations, eventually the containers are returned to the ports, often empty. The large number of empty containers stored at the ports create space concerns and inefficiencies as well.[194]

As negotiations between ILWU and PMA extended into 2023, California has appeared to lose market share to East and Gulf Coast ports. The East and Gulf Coasts ports also experienced greater levels of congestion and vessels anchoring off the coasts, likely due to vessels skipping calls to the West Coast.

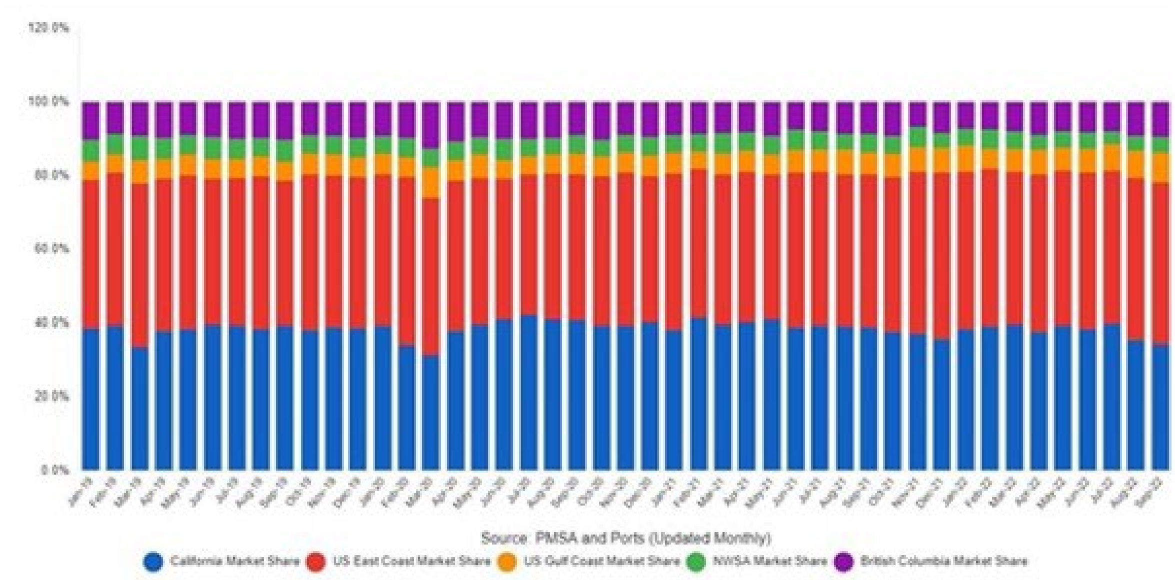


Figure 4.19: Inbound Loaded TEU Market Share USA & Canada Ports

The pandemic highlighted just how critical California's freight industry is to supply the goods of the nation. The movement of goods has often been viewed as "invisible," in that when consumers purchase something, they are likely not aware of the complex journey it likely took for a good to be manufactured, packaged, and shipped to a store or place of residence. The COVID-19 pandemic heightened the public awareness of the supply chain due to the lack of available goods like sanitizing wipes, toilet paper, meat, and semiconductor chips (creating new motorized vehicle supply shortages).[195] This helped lead to historical investments in the supply chain and freight infrastructure at the state and federal level. The pandemic also showed that there can be a high societal cost for keeping the economy moving during uncertain times, as several workers supporting the movement of goods through California lost their lives during the pandemic. The Pacific Maritime Association reported that 13 longshore workers at the Ports of Los Angeles and Long Beach alone died through January 2021 in the first year of the pandemic.[196] The lessons learned developing health and safety protocols for freight workers during the COVID-19 pandemic will be vital for keeping workers safe in future outbreaks.

ACTIONS THE STATE OF CALIFORNIA TOOK TO ADDRESS COVID-19 SUPPLY CHAIN ISSUES

In June 2022, the California State Legislature enacted Governor Newsom's Port and Freight Infrastructure $1.2 billion budget proposal through Senate Bill 198 (SB 198; Chapter 71, Statutes of 2022), which also provided policy direction for CalSTA to implement the Port and Freight Infrastructure Program. The program seeks to improve the capacity, safety, efficiency, and resilience of goods movement to, from and through California's maritime ports, while also reducing greenhouse gas emissions and harmful impacts to communities adjacent to the corridors and facilities used for goods movement.

The State of California also took several other actions to try and combat COVID-19's impact on the supply chain. In the early days of the pandemic, Governor Newsom signed EO N-52-20 that temporarily suspended restrictions of selling of commercial food at the state's rest areas to increase the number of convenient food options available to truck drivers.[197] Governor Newsom also signed EO N-19-21 which aimed to strengthen the resilience of California's and the nations supply chain. Several notable actions took place since the signing of EO N-19-21, including:

- Caltrans temporarily increased the maximum allowable gross vehicle weight on non-federal roadways in order to facilitate a greater number of goods moving from ports to freight facilities.[198]
- A few state agencies identified underused or excess land to allow for the temporary storage of shipping containers. The Department of General Services signed a lease with Chunker, the national warehouse marketplace, at six sites for one year, with an option for a second year. The state lands can support up to 20,000 shipping containers.[199]
- Caltrans also signed short-term leases with private entities that authorized storage of containers on excess Caltrans lands around Southern California that is estimated to be able to hold over 800 shipping containers.
- CalSTA and U.S. DOT signed the Emerging Projects Agreement, a strategic partnership for up to $5 billion in loan financing to advance a comprehensive, statewide portfolio of freight, goods movement, and supply chain resiliency projects.[200]
- The Department of Motor Vehicles doubled their capacity to conduct commercial driving tests to help combat a national shortage of workers.
- The California Department of Food and Agriculture (CDFA), in partnership with the U.S. Department of Agriculture, established a 22-acre pop-up container yard to assist agricultural exporters in storing goods and transferring them into containers.
- CalSTA, Caltrans, and the Federal Railroad Administration initiated the Supporting Environmental and Community Advancement and National Security (SEACANS) Program in partnership with other regional, state, and federal partners. Southern California's RTPs estimate a total funding need of over $800 billion over the next 20 years, far exceeding what funding is available in the short term. SEACANS seeks to improve Southern California's multimodal freight network and support a more fluid supply chain beginning at the seaports and extending into the interior of the nation, with an emphasis on optimizing freight rail for inland import/export movements. With rigorous technical analysis and regular coordination amongst stakeholders, the state can seize a generational opportunity to leverage available capital funding dollars and design for the freight network growth Southern California needs for the 21st century.

CALIFORNIA SUPPLY CHAIN SUCCESS INITIATIVE

With the many supply chain challenges faced during pandemic, GO-Biz, CalSTA, POLB, POLA, the Port of Oakland, CDFA, and the Center for International Trade and Transportation (CITT) at California State University, Long Beach (CSULB) collaborated to bring together participants from various sectors of the supply chain and government to identify key issues and agree on practical short-term solutions that can lead to long-term, sustainable progress. Dubbed the California Supply Chain SUCCESS Initiative, this collaboration began in the summer of 2021 and contained four key focus components: a background report that looked at "how did we get here," a social media campaign sharing valuable knowledge about the supply chain, a virtual workshop, and small group roundtable gatherings of key supply chain leaders.[201] Some of the needs identified by the Initiative included:

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- Increased supply chain data visibility
- Establishment of a state or federal level representative/coordinating body for the California supply chain

- Address barriers at intermodal facilities to efficient cargo flows
- Investments in systems, workforce development, equipment, and infrastructure to help meet demand
- Expanded hours of operation at port terminals, warehousing, and railways
- Expansion of storage and buffer locations for temporary storage spaces on unused land
- Address market failures and rewards for industry inefficiencies

California agencies will continue to collaborate over the coming months and years to implement the recommendations of the Initiative.

LESSONS LEARNED FROM THE COVID-19 PANDEMIC

There were countless lessons learned for California's freight industry over the course of the pandemic. A few of the key lessons include:

- **On-Site Infection Testing, Personal Protective Equipment (PPE) and Sanitizing Materials** – On-site testing centers at freight facilities were critical in stopping outbreaks. Large supplies of PPE and sanitizing materials such as masks, gloves, face shields, disinfecting wipes and spray, hand sanitizer, and washing stations likely saved dozens of lives of freight workers in California. Early recognition of PPE and sanitizing materials needed for freight workers to safely keep working is essential to keep freight moving during a pandemic.
- **Vaccination Protocols and Clinics for Freight Workers** – Freight workers were among the first to be prioritized for vaccination. Having protocols that allow for early vaccination of freight workers is critical to keep goods flowing during future pandemics. Having vaccination clinics at major freight facilities is also essential to ensure vaccines are distributed quickly and efficiently.
- **New Ocean-Going Vessel Queuing System to Improve Safety and Air Quality** – The PacMMS queuing system cut down on vessel emissions in Southern California and the Bay Area, allowed for slow-steaming vessels, helped reduce the probability of whale strikes and other negative impacts on the coastal environment, and kept vessels out of the range of missile testing.
- **Underused Government Lands Used to Help Keep Goods Moving** – If government agencies sign temporarily leases with private entities to store containers, it can help improve cargo throughput at ports and nearby freight facilities by freeing up space at ports and warehouses and increasing the availability of chassis. Impacts to nearby communities should be carefully considered before signing agreements.
- **Potential Institution of a Fee for Long-Dwelling Containers at Ports** – The threat of fees per each container dwelling more than six days at the Ports of Long Beach and Los Angeles resulted in a significant drop in loaded containers dwelling at the ports.[202] While there can be other societal implications of assessing a fee, the threat of fees was enough to reduce containers from stacking up and lead to greater port efficiencies.
- **Domestic Manufacturing of Necessary Freight Equipment** – The surge in demand for cargo highlighted a need to have a ready-to-serve domestic stockpile of containers and chassis. Relying on foreign-sourced supply resulted in container and chassis shortages that led to greater inefficiencies in the supply chain and increased costs for shipping. This is especially critical at wheeled terminals where containers are put on chassis and moved by yard hostlers and left in parking spots for trucks to move out.[203]
- **Flexibility in the Packaging and Supply of Goods in Emergency Situations** – Packaging should be considered in freight resiliency planning. While we may not see a large-scale

pandemic for many years, some other emergency situations may call for rapid adjustments on how food and other essential goods are packaged or repackaged and distributed.

- **Transit is Important for Essential Workers of the Freight Industry** – A survey by Metrolink found that 75% of its riders in 2021 were considered essential workers, and 14% of those riders worked in transportation and logistics. Over 1/3rd of riders had no car and almost half had an annual income of less than $50,000. Metrolink's 2021 COVID-19 Customer Survey was distributed via email to 312,929 Metrolink customers. The survey, which received 10,449 valid responses, was designed to identify riders' evolving needs, including their health and safety concerns.[204] Other transit agencies experienced large declines in ridership during the pandemic but found that essential workers made up a large percentage of its remaining riders. Without public transit options, many essential workers of the freight industry would have to find other more expensive means of travel to work or try to find new employment.

4C. Freight Flows and Forecast

As of the second quarter of 2022, California had a Gross Domestic Product (GDP) of $3.56 trillion[205]. Compared to the top 10 world economies listed in **Table 4.6**[206], California's GDP would approximately rank fifth in the world. California is comprised of 12 percent of the nation's population, accounts for 14 percent of the nation's economic output and continues to be a leading force in the U.S. economy. California's diversified economy and its prosperity are tied to domestic trade, as well as to exports and imports of goods and services through the State's key multi-modal gateways.

In 2021, California's total population was approximately 39.2 million[207]. Population growth remained strong in Central Valley and Southern California, particularly Inland Empire. The Los Angeles-Inland Empire region is home to the second largest consumer market in the U.S. after the Greater Hudson Valley region in New York state. While imported consumer goods pass through the state to other parts of the U.S., most goods stay within the state and are used by California consumers.

In 2021, California exported nearly $175 billion worth of goods, making it the second largest exporter behind Texas[208] . The value of California's exports equals to 10 percent of the nation's overall exports. In 2021, $470 billion of goods entered through California's transportation gateways, making it the largest importer in the nation[209].

Table 4.6: Top World Economies, 2022

Countries	Nominal GDP ($)
United States	$25.04 trillion
China	$18.32 trillion

Japan	$4.3 trillion
Germany	$4.03 trillion
California*	$3.56 trillion
India	$3.47 trillion
United Kingdom	$3.2 trillion
France	$2.78 trillion
Canada	$2.2 trillion
Russia	$2.13 trillion
Italy	$2 trillion
Source: International Monetary Fund ****Source: Gross Domestic Product: Second Quarter 2022, California, Bureau of Economic Analysis, 2022***	

From a global perspective, freight tonnage moving on the nation's transportation network will grow 42 percent in the next three decades, while the value of the freight will increase at a much faster pace[210]. Total freight on all modes (including air, vessel, pipeline, rail, and trucks) is projected to reach 28.9 billion tons while the value is expected to grow to $36.3 trillion[211].

FREIGHT FLOWS AND FORECASTS

Forecasting domestic and international freight flows presents many challenges. Changes in manufacturing locations, global economic forces, competition, new technologies, political dynamics, regulations, trade agreements, the opening of new routes, and labor disputes can each affect freight transportation.

The FHWA in partnership with the Bureau of Transportation Statistics (BTS) developed the Freight Analysis Framework (FAF), a database and analytical tool, to assist transportation planners and engineers in improving the planning, operation, and management of the nation's freight transportation system.

The FAF is a commodity flow database that integrates data from a variety of sources including the Commodity Flow Survey (CFS) data, Census Foreign Trade Statistics, Economic Census data, USDA's Census of Agriculture, Port Import/Export Reporting Service (PIERS), Vehicle Inventory and Use Survey (VIUS), National Highway Planning Network (NHPN), Highway Performance Monitoring System (HPMS), U.S. Energy Information Administration (EIA), and other industrial data. The data is used to depict a comprehensive national picture of freight flows among states and major metropolitan areas by all freight modes. The FAF5 (Version 5) is the most current version of the database, and it is built upon the 2017 CFS; the 2017 CFS contains 132 areas.

FAF5 forecasts are a reasonable exploration of current trends, but do not reflect major shifts in the national economy, future capacity limitations, or changes in transportation costs and technology. Simply stated, the data does offer insight into the economic impact of freight movements on a national scale and does not account for changes in the cost of transportation or advances in technology.

Data is available for the base year of 2017, the recent years of 2018 - 2020, forecasts from 2022 through 2050 in five-year intervals, and at the state level in the historic years of 1997 to 2012 in five-year intervals. Since the FAF years after 2017 are estimates, the discussion below uses 2023 as the base year to be consistent with the California Freight Mobility Plan's adoption. The 2023 statistics below are forecasts based on the 2017 benchmark and do not reflect data collected during the COVID pandemic. This approach was taken to avoid the data collected during the pandemic, which saw a disruption in global freight flows and would skew any forecasting analysis conducted for this chapter. It is important to note that both the 2023 base year and the 2050 forecast year use 2017 funding that are adjusted to the years 2023 and 2050. This allows for comparing the real value of commodities across all years.

The FAF5 mode and value calculations are based on the following nine possible freight flows depicted in **Figure 4.20.**

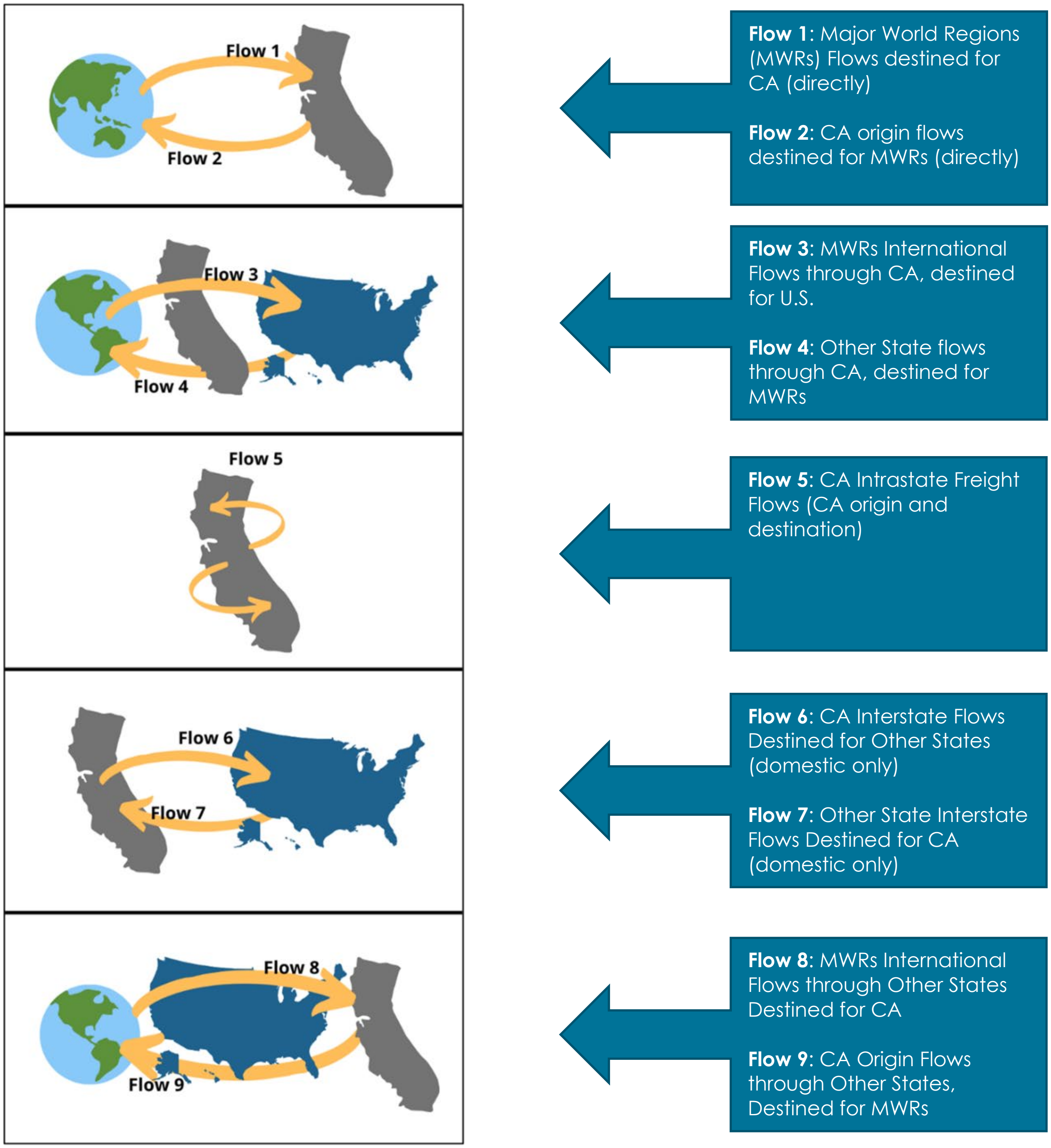

Figure 4.20: Freight Flows From, To, Within, and Through California (Source: FHWA Freight Analysis Framework, adapted by Caltrans

COMMODITIES

Before delving into specific flow data for California, it is important to highlight the diverse commodities that are being transported throughout the State. In order to wisely invest transportation funds in meeting freight transport needs and requirements, it is important to understand the type and weight of commodities moving through the transportation system. In addition, some commodities have higher values so, it is important to know which of these items will likely be more time-sensitive and impacted by issues such as congestion.

The following discussion refers to the intrastate, interstate, and international shipments of commodities that have an origin or final destinations in California. Intrastate flows originate in and are destined for California, interstate flows are between other U.S. states and California, and international flows are between MWRs and California.

Table 4.7 shows the top ten commodities listed by weight for intrastate, interstate, and international flows originating from California. The top four 2023 California intrastate freight flows by weight include gasoline, non-metallic mineral products, gravel, and coal-n.e.c accounted for 37 percent of all intrastate commodity flows. Intrastate commodity flows are expected to increase in 2050 by approximately 480,657 kilotons, a 43 percent increase from 2023. The leading intrastate commodities forecasted for 2050 include non-metallic mineral products, gravel, coal-n.e.c, and other foodstuff. These top four commodities comprise 34 percent of all intrastate tonnage, and the top ten commodities represent 62 percent of all 2050 intrastate tonnage.

The top four 2023 interstate commodities by weight include other foodstuffs, other agricultural products, non-metallic mineral products, and plastics/rubber that comprised over 35 percent of the interstate tonnage with California origins and other state destinations. The top ten commodities combined totaled 90,643 kilotons and represented more than 61 percent of the total weight transported. By 2050, the total tonnage is forecasted to increase by 70 percent. Other foodstuffs will continue to be the lead commodity, with plastics/rubber, basic chemics, and other agricultural products rounding out the top four commodities for 2050. In addition, the total share of the top ten commodities by weight will grow to around 62 percent.

In terms of value, the top 10 commodities for intrastate (flow 5), interstate (flow 6), and international (flows 2 and 9) movement of goods destined for California for 2023 and the forecasted year of 2050 are identified in **Table 4.8**.

In 2023, electronics, mixed freight, and pharmaceuticals, and motorized vehicles were the top four California intrastate commodities by value, totaling $585 billion (37 percent of all commodities). The top 10 commodities for this year totaled around $1.019 trillion (64 percent of all commodities). Between 2023 and 2050, California's total intrastate commodity values are expected to increase 81 percent to $2.870 trillion. The top four commodities (electronics, pharmaceuticals, mixed freight, and motorized vehicles) are the same as in 2023, with pharmaceuticals and mixed freight switching their ranking. Their value is projected to increase to approximately $1.177 trillion in 2050.

In 2023, the top ten categories represented over 64 percent of the total intrastate commodity value of shipments; in 2050, it will increase to 69 percent, making them important to consider as freight transportation decisions are made.

Table 4.7: Top Ten Commodities Originating from California by Weight

2023 Top Ten	Weight (kilotons)	Top 10 (%)	All (%)	2050 Top Ten	Weight (kilotons)	Top 10 (%)	All (%)
			Intrastate (CA to CA, Flow 5)				
Gasoline	110,523	14%	10%	Nonmetal min. prods.	159,572	16%	10%
Nonmetal min. prods.	106,759	14%	10%	Gravel	153,404	15%	10%
Gravel	101,768	13%	9%	Coal-n.e.c.	118,386	12%	7%
Coal-n.e.c.	93,409	12%	8%	Other foodstuffs	115,709	12%	7%
Crude petroleum	81,791	10%	7%	Gasoline	93,650	9%	6%
Other foodstuffs	76,504	10%	7%	Waste/scrap	81,090	8%	5%
Waste/scrap	54,746	7%	5%	Basic chemicals	72,797	7%	5%
Fuel oils	54,317	7%	5%	Natural sands	70,529	7%	4%
Natural sands	51,769	7%	5%	Mixed freight	64,566	7%	4%
Other ag prods.	48,056	6%	4%	Other ag prods.	63,586	6%	4%
Top Ten Total	**779,642**	**100%**	**69%**	**Top Ten Total**	**993,290**	**100%**	**62%**
All Commodity Total	**1,122,914**	**%**	**%**	**All Commodity Total**	**1,603,571**	**%**	**%**
			Interstate (CA to Other U.S. States, Flow 6)				
Other foodstuffs	24741	27%	17%	Other foodstuffs	36,334	23%	14%
Other ag prods.	10,290	11%	7%	Plastics/rubber	17,345	11%	7%
Nonmetal min. prods.	9,515	10%	6%	Basic chemicals	15,525	10%	6%
Plastics/rubber	7,906	9%	5%	Other ag prods.	14,461	9%	6%
Electronics	7279	8%	5%	Electronics	13,419	9%	5%
Motorized vehicles		8%	5%	Motorized vehicles	13,198	8%	5%
Mixed freight	6,981	8%	5%	Mixed freight	12,971	8%	5%
Basic chemicals	5,760	6%	4%	Misc. mfg. prods.	12,373	8%	5%
Articles-base metal	5,609	6%	4%	Nonmetal min. prods.	11,635	7%	5%
Newsprint/paper	5,474	6%	4%	Textiles/leather	9,953	6%	4%

Top Ten Total	**90,643**	**100%**	**61%**	**Top Ten Total**	**157,214**	**100%**	**62%**
All Commodity Total	**149187**	**164%**	**100%**	**All Commodity Total**	**254,168**	**161%**	**100%**
International (CA to MWRs, Flows 2 & 9)							
Coal-n.e.c.	12,982	26%	20%	Waste/scrap	30,027	31%	24%
Waste/scrap	11,659	23%	18%	Coal-n.e.c.	19,099	20%	15%
Other ag prods.	5,330	11%	8%	Other ag prods.	9,153	9%	7%
Other foodstuffs	4,515	9%	7%	Other foodstuffs	9,029	9%	7%
Fuel oils	3,887	8%	6%	Fuel oils	7264	7%	6%
Animal feed	3540	7%	5%	Animal feed	6,773	7%	5%
Basic chemicals	2449	5%	4%	Gasoline	4,539	5%	4%
Gasoline	2,325	5%	4%	Basic chemicals	4,290	4%	3%
Cereal grains	1,785	4%	3%	Motorized vehicles	4,264	4%	3%
Motorized vehicles	1,620	3%	2%	Plastics/rubber	2,858	3%	2%
Top Ten Total	**50,092**	**100%**	**77%**	**Top Ten Total**	**97,297**	**100%**	**77%**
All Commodity Total	**65,247**	**130%**	**100%**	**All Commodity Total**	**126,265**	**130%**	**100%**
Source: Freight Analysis Framework Data Tabulation Tool -5							

Table 4.8: Top Ten Commodities Flows Originating from California by Value

2023 Top Ten	Value (millions)	Top 10 (%)	All (%)	2050 Top Ten	Value (millions)	Top 10 (%)	All (%)
Intrastate (CA to CA, Flow 5)							
Electronics	$240,028	24%	15%	Electronics	$433,834	22%	15%
Mixed freight	$134,102	13%	8%	Pharmaceuticals	$317,662	16%	11%
Pharmaceutical	$111369	11%	7%	Mixed freight	$239,462	12%	8%
Motorized vehicles	$99,197	10%	6%	Motorized vehicles	$186003	9%	6%
Textiles/leather	$86,830	9%	5%	Textiles/leather	$171,773	9%	6%
Other foodstuffs	$72,198	7%	5%	Plastics/rubber	$153,833	8%	5%

Misc. mfg. prods.	$70,806	7%	4%	Misc. mfg. prods.	$150,974	8%	5%
Machinery	$69,388	7%	4%	Machinery	$120,072	6%	4%
Plastics/rubber	$69,254	7%	4%	Other foodstuffs	$112,367	6%	4%
Other ag prods.	$66,153	6%	4%	Precision instruments	$100,676	5%	4%
Top Ten Total	**$1,019,325**	**100%**	**64%**	**Top Ten Total**	**$1,986,655**	**100%**	**69%**
All Commodity Total	**$1,587,334**	**156%**	**100%**	**All Commodity Total**	**$2,870,163**	**144%**	**100%**
Interstate (CA to Other U.S. States, Flow 6)							
Electronics	$206,585	30%	23%	Electronics	$353,604	25%	20%
Textiles/leather	$87,354	13%	10%	Misc. mfg. prods.	$176,893	12%	10%
Misc. mfg. prods.	$71,470	10%	8%	Pharmaceuticals	$175,836	12%	10%
Motorized vehicles	$63,486	9%	7%	Textiles/leather	$172,009	12%	10%
Pharmaceutical	$62,292	9%	7%	Precision instruments	$124,207	9%	7%
Machinery	$57,078	8%	6%	Motorized vehicles	$118,348	8%	7%
Precision instruments	$50,450	7%	6%	Machinery	$105,879	7%	6%
Mixed freight	$34,007	5%	4%	Plastics/rubber	$72,022	5%	4%
Plastics/rubber	$32,492	5%	4%	Chemical prods.	$67,842	5%	4%
Other foodstuffs	$31,050	4%	3%	Mixed freight	$63,674	4%	4%
Top Ten Total	**$696,264**	**100%**	**78%**	**Top Ten Total**	**$1,430,314**	**100%**	**82%**
All Commodity Total	**$891,937**	**128%**	**100%**	**All Commodity Total**	**$1,741,872**	**121%**	**100%**
International (CA to MWRs, Flows 2 & 9)							
Electronics	$47,078	31%	25%	Electronics	$91,745	32%	25%
Machinery	$18,282	12%	10%	Motorized vehicles	$45,523	16%	12%
Precision instruments	$16,659	11%	9%	Machinery	$29,971	10%	8%
Motorized vehicles	$16,447	11%	9%	Precision instruments	$26,294	9%	7%
Other ag prods.	$13,147	9%	7%	Transport equip.	$24,044	8%	6%
Transport equip.	$12,160	8%	6%	Other ag prods.	$22,172	8%	6%
Misc. mfg. prods.	$9,431	6%	5%	Chemical prods.	$12,279	4%	3%
Chemical prods.	$6,511	4%	3%	Other foodstuffs	$12,115	4%	3%
Other foodstuffs	$5,900	4%	3%	Misc. mfg. prods.	$12,090	4%	3%

Pharmaceutical	$5,187	3%	3%	Plastics/rubber	$11,053	4%	3%
Top Ten Total	**$150,802**	**100%**	**79%**	**Top Ten Total**	**$287,287**	**100%**	**77%**
All Commodity Total	**$192,028**	**127%**	**100%**	**All Commodity Total**	**$371,281**	**129%**	**100%**
Source: Freight Analysis Framework Data Tabulation Tool -5							

Flow 6 (interstate commodities) represents the value of goods originating in California and destined for other U.S. states. In 2023, electronics were among the top ten commodities by value and totaled to approximately $206 billion. The top ten commodities accounted for around 78 percent of the value of all goods destined for other U.S. states from California. The top four commodities, electronics, textiles/leather, miscellaneous manufacturing products, and motorized vehicles add up to approximately 48 percent of the total commodity value.

Between 2023 and 2050, the value of goods originating from California and flowing to other U.S. states is expected to increase 95 percent to $1.742 trillion. The value of electronics is expected to be $354 billion in 2050 and remain the number one commodity.

In 2023, the value of international goods originating in California and destined for MWR totaled approximately $192 billion. Additionally, in 2023, electronics are the top international commodity valued at $47 billion, comprising 31 percent of the top ten and 25 percent of the total commodity value.

Between 2023 and 2050, the value of international commodities is expected to increase from $192 to $371 billion, a 93 percent increase. Electronics is the top commodity for both 2023 and the forecasted year of 2050, comprising 25 percent of all 2050 commodities. California businesses, industries, manufacturers, governments, and residents rely on the transportation system to support the movement of goods into and out of the State.

In 2023, the top interstate commodities (by weight) flowing into California included coal-n.e.c., crude petroleum, other foodstuffs, and cereal grains. These items totaled to 96,353 kilotons, comprised 72 percent of the top ten tonnages, and 49 percent of all commodity tonnage. (**Table 4.9**) Interstate tonnage flowing into California is expected to increase 65 percent between 2023 and 2050. In 2050, it is projected that non-metallic mineral products will overtake cereal grains as the fourth-ranking commodity by weight. Coal-n.e.c. accounts for approximately 40 percent of the top ten commodities and 27 percent of all commodities by weight in 2023. In 2050, coal-n.e.c is expected to hold the number one ranking, comprise 46 percent of the top ten commodities, and comprise 32 percent of all interstate commodities destined for California.

Table 4.9: Top Ten Commodities Destined for California by Weight

2023 Top Ten	Weight (ktons)	Top 10 (%)	All (%)	2050 Top Ten	Weight (ktons)	Top 10 (%)	All (%)
Interstate (USA to CA, Flow 7)							

Coal-n.e.c.	52,714	40%	27%	Coal-n.e.c.	104,350	46%	32%
Crude petroleum	22,946	17%	12%	Crude petroleum	24,736	11%	8%
Other foodstuffs	12,456	9%	6%	Other foodstuffs	17,535	8%	5%
Cereal grains	8,236	6%	4%	Nonmetal min. prods.	15,064	7%	5%
Nonmetal min. prods.	7,629	6%	4%	Plastics/rubber	13,906	6%	4%
Wood prods.	7,429	6%	4%	Basic chemicals	12,565	6%	4%
Newsprint/paper	6,478	5%	3%	Wood prods.	10,182	4%	3%
Plastics/rubber	6,247	5%	3%	Cereal grains	9,960	4%	3%
Milled grain prods.	4,888	4%	3%	Chemical prods.	9,485	4%	3%
Chemical prods.	4,389	3%	2%	Newsprint/paper	8,907	4%	3%
Top Ten Total	**133,412**	**100%**	**68%**	**Top Ten Total**	**226,690**	**100%**	**70%**
All Commodity Total	**195,173**	**146%**	**100%**	**All Commodity Total**	**322,740**	**142%**	**100%**
International (MWRs to CA, Flows 1 & 8)							
Coal-n.e.c.	45,939	50%	35%	Waste/scrap	30,105	26%	16%
Waste/scrap	6,644	7%	5%	Coal-n.e.c.	14,599	13%	8%
Other ag prods.	6,288	7%	5%	Other ag prods.	12,064	10%	6%
Other foodstuffs	6,190	7%	5%	Other foodstuffs	10,818	9%	6%
Fuel oils	6,151	7%	5%	Fuel oils	10,137	9%	5%
Animal feed	4,580	5%	4%	Animal feed	9,553	8%	5%
Basic chemicals	4,111	4%	3%	Gasoline	9,353	8%	5%
Gasoline	4,097	4%	3%	Basic chemicals	7,171	6%	4%
Cereal grains	3,838	4%	3%	Motorized vehicles	6,329	5%	3%
Motorized vehicles	3,755	4%	3%	Plastics/rubber	6,280	5%	3%
Top Ten Total	**91,593**	**100%**	**70%**	**Top Ten Total**	**116409**	**100%**	**63%**
All Commodity Total	**130,687**	**142%**	**100%**	**All Commodity Total**	**185,809**	**159%**	**100%**
Source: Freight Analysis Framework Data Tabulation Tool -5							

In 2023, international commodities flowing into California (both directly and indirectly) from MWRs to other U.S. states accounts for approximately 130,687 kilotons. The top ten commodities accounted for approximately 70 percent of all commodity tonnage. Coal-n.e.c. ranks number one in 2023 and is forecasted to rank number two in 2050. In 2023, it accounts for 35 percent of all commodity tonnage. Waste/scrap is forecasted to rank number one in 2050.

The top ten interstate and international commodities destined for California by value are displayed in **Table 4.10**. The value of international commodities destined for California both directly and indirectly (Flows 1 and 8) total $429 billion in 2023. The top commodities included electronics, motorized vehicles, textiles/leather, and machinery. These items comprised 63 percent of the total value and 75 percent of the top ten commodities. Between 2023 and 2050, the value of international commodities with a California destination is forecasted to increase from $455 billion to $884 million. In 2050, electronics, motorized vehicles, and textiles/leather, and machinery are expected to remain in the first four ranks respectfully.

Table 4.10: Top Ten Commodities Destined for California by Value

2023 Top Ten	Value (millions)	Top 10 (%)	All (%)	2050 Top Ten	Value (millions)	Top 10 (%)	All (%)
				Interstate (USA to CA, Flow 7)			
Electronics	$64,922	21%	14%	Electronics	$103,560	18%	12%
Misc. mfg. prods.	$40,588	13%	9%	Misc. mfg. prods.	$87,475	15%	11%
Motorized vehicles	$39,551	13%	8%	Textiles/leather	$59,736	10%	7%
Textiles/leather	$35,238	11%	7%	Pharmaceuticals	$57,166	10%	7%
Machinery	$26,262	8%	6%	Motorized vehicles	$55,709	10%	7%
Precision instruments	$25,554	8%	5%	Precision instruments	$50,858	9%	6%
Plastics/rubber	$23,041	7%	5%	Plastics/rubber	$50,854	9%	6%
Other foodstuffs	$21,700	7%	5%	Machinery	$41,246	7%	5%
Pharmaceuticals	$19,528	6%	4%	Chemical prods.	$40,682	7%	5%
Chemical prods.	$18,997	6%	4%	Other foodstuffs	$31,729	5%	4%
Top Ten Total	**$315,379**	**100%**	**67%**	**Top Ten Total**	**$579,015**	**100%**	**64%**
All Commodity Total	**$473,270**	**150%**	**100%**	**All Commodity Total**	**$829,489**	**143%**	**100%**
				International (MWRs to CA, Flows 1 & 8)			
Electronics	$142,430	39%	33%	Electronics	$320,042	41%	36%
Motorized vehicles	$66,268	18%	15%	Motorized vehicles	$144,643	19%	16%
Textiles/leather	$40,615	11%	9%	Textiles/leather	$91,599	12%	10%

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Machinery	$22,134	6%	5%	Machinery	$49,368	6%	6%
Misc. mfg. prods.	$20,610	6%	5%	Precision instruments	$44,976	6%	5%
Precision instruments	$19,389	5%	5%	Misc. mfg. prods.	$35,314	5%	4%
Crude petroleum	$14,819	4%	3%	Furniture	$31,255	4%	4%
Furniture	$13,478	4%	3%	Plastics/rubber	$22,296	3%	3%
Plastics/rubber	$11,692	3%	3%	Other ag prods.	$17,350	2%	2%
Other ag prods.	$10,052	3%	2%	Other foodstuffs	$17,192	2%	2%
Top Ten Total	**$361,486**	**100%**	**84%**	**Top Ten Total**	**$774,037**	**100%**	**88%**
All Commodity Total	**$429,313**	**119%**	**0%**	**All Commodity Total**	**$884,109**	**114%**	**100%**
Source: Freight Analysis Framework Data Tabulation Tool -5							

These top ten lists show that a commodity ranking high in weight does not necessarily rank high in value. In the competitive world, consideration of volume, weight, and value are crucial to maximizing effectiveness of the freight transportation system. Identifying potential damage and congestion along critical freight corridors due to volume and weight of transported commodities allows for proactive planning, operational design, construction, and maintenance of the national and statewide multimodal freight system.

CALIFORNIA'S DOMESTIC MODE SHIPMENTS

When transporting commodities to, through, or within California, the mode of transportation is considered domestic. **Table 4.11** shows total weight of shipments in 2023 and 2050 (forecasted) by flow (in kilotons), domestic mode, and total value coming into, traveling through, and leaving California.

For example, California domestic-only shipments include all shipments within the State (Flow 5) as well as U.S.-only interstate movements involving the State (Flows 6 and 7). Imports and exports originating from MWR destined for California or originating in California and destined for MWRs are represented by Flows 1 and 2. However, import shipments destined for California can also arrive indirectly through other U.S. states (Flow 8), and exports originating in California can leave the country from other U.S. states (Flow 9). In addition, there are shipments that are not destined for California but pass through the state, entering and exiting our ports as imports and exports (Flows 3 and 4).

From 2023 to 2050, the total tonnage of California domestic mode shipments is expected to increase from 1.3 trillion kilotons (in 2023) to 1.8 trillion kilotons (in 2050). The dollar value associated with these exchanged goods is anticipated to increase to approximately $4.1 trillion. The majority of movements by both weight and value begin and end within California (Flow 5). In 2023, the total number of kilotons transported within California is 958,885 and are forecasted to reach 1,350,627 kilotons by 2050.

Trucking is currently the predominant mode of transportation for the State's freight shipments. By weight, trucks transport the largest amount of goods into, within, and out of the State. This is forecasted to remain the case through 2050. In 2023, pipelines transport the next highest volume of commodities, and it is expected to hold its rank into 2045. In percentage-wise, by weight, both the air and multiple modes and mail categories are expected to increase significantly between 2023 and 2050, perhaps due to growth in demand for e-commerce.

Table 4.11: Domestic and International Shipments by Weight and Value

	2023		2050		Change 2023 to 2050	
Mode	**Weight**	**Value**	**Weight**	**Value**	**Weight**	**Value**
	(ktons)	**(million)**	**(ktons)**	**(million)**	**(ktons)**	**(million)**
Flow 1. MWRs to CA						
Truck	5,126	$24,532	9,787	$52,552	91%	114%
Rail	7-	$5	11	$9	74%	77%
Water	104,699	$208,667	137,038	$414,660	31%	99%
Air*	689	$68,745	1,465	$152,161	113%	121%
Multiple**	302	$1,444	611	$3,060	102%	112%
Pipeline	255	$3	671	$8	163%	163%
Other and unknown	14	$338	29	$617	103%	82%
--	-	-	-	-	-	-
Totals	**111,093**	**$303,735**	**149,612**	**$623,067**	**109%**	**255%**
Flow 2. California to MWRs						
Truck	5,507	$17,838	10,962	$36,706	99%	106%
Rail	774	$227	13,2091,154	$421	49%	85%
Water	44,995	- $48,306	- 87,871	- $101,509	- 95%	- 110%
Air*	480	$68,142	914	$123,318	90%	81%
Multiple**	4	$40	10	$77	128%	95%
Pipeline	10	$1	15	$1-	53%	48%
Other and unknown	1,166	$4,109	2,406	$8,500	106%	107%
-	-	-	-	-	-	-
Totals	**52,936**	**$138,662**	**103,332**	**$270,533**	**359%**	**425%**
Flow 3. MWRs Through CA to Other U.S. States						
Truck	2,135	$13,219	4,351	$28,773	104%	118%
Rail	4	$1-	8	$2	92%	-97%

Water	25,656	$141,664	49,739	$303,003	94%	114%
Air*	251	$21,500	516	$45,312	106%	111%
Multiple**	462	$2,968	927	$6,142	101%	107%
Other and unknown	5	$129	10	$243	83%	88%
-	-	-	-	-	-	-
-	-	-	-	-	-	-
Totals	**28,512**	**$179,482**	**55,551**	**$383,475**	**145%**	**301%**
Flow 4. Other U.S. States, through CA to MWRs						
Truck	1,352	$5,497	2,680	$11,262	98%	105%
Rail	1,212	$248	1,756	$377	45%	52%
Water	26,673	$51,222	52,657	$108,397	97%	112%
Air*	201	$24,816	396	$44,404	98%	79%
Multiple	546	$1,689	1,246	$3,460	128%	105%
Pipeline	424	$84	624	$123	47%	45%
Other and unknown	12,00	$3,392	2,501	$7,091	108%	109%
-	-	-	-	-	-	-
Totals	**31,608**	**$86,949**	**61,861**	**$175,113**	**223%**	**440%**
Flow 5. Within CA						
Truck	756,384	$917,379	1,128,171	$1,579,273	49%	72%
Rail	16,762	$3,187	26,908	$5,158	61%	62%
Water	13,487	$6,809	12,823	6,351	-5%	-7%
Air	26	$1,826	38	3,039	50%	66%
Multiple	7,698	$154,530	14,916	$325,798	94%	111%
Pipeline	164,527	$61,205	167,771	$56,945	-2%	-7%
-	-	-	-	-	-	-
-	-	-	-	-	-	-
Totals	**958,885**	**$1,144,937**	**1,350,627**	**$1,976,563**	**33%**	**58%**
Flow 6. CA to Other U.S. States						
Truck	78,967	$380,688	128,283	$703,968	62%	85%
Rail	5,841	$3,628	9,999	$5,965	71%	64%
Water	18	$22	26	$32	48%	45%
Air	734	$26,020	1,182	$51,624	61%	98%
Multiple	19,365	$247,075	33,368	$494,873	72%	3100%
Pipeline	3,439	$1,655	2,825	$1,187	59 -18%	64 -28%

-	-	-	-	-	-	-
-	-	-	-	-	-	-
Totals	**108,364**	**$659,089**	**175,684**	**$1,257,648**	**62%**	**91%**
Flow 7. Other U.S. States to CA						
Truck	77,180	$257,156	130,095	$444,576	69%	73%
Rail	20,115	$8,199	27,035	$12,864	34%	57%
Water	22,748	$7,179	24,521	$7,739	8%	08%
Air	121	$20,385	219	$36,267	081%	78%
Multiple	27,050	$171,561	45,967	$310,648	70%	81%
Pipeline	47,959	$8,790	94,903	$17,394	98%	98%
-	-	-	-	-	-	-
-	-	-	-	-	-	-
Totals	**195,173**	**$473,270**	**322,740**	**$829,489**	**65%**	**75%**
Flow 8. MWRs, through Other U.S. States, to CA						
Truck	5,318	$18,853	10,105	$37,303	90%	98%
Rail	6,474	$17,721	11,090	$37,441	71%	111%
Water	$7,042	$34,469	13,409	$69,730	90%	102%
Air	263	$51,908	533	$111,296	103%	114%
Multiple	214	$2,385	418	$4,766	96%	100%
Pipeline	280	$94	636	$208	127%	121%
Other and unknown	3	$146	6	$297	87%	103%
-	-	-	-	-	-	-
Totals	**19,594**	**$125,578**	**36,197**	**$261,042**	**85%**	**108%**
Flow 9. CA, through Other U.S. States, to MWRs						
Truck	5,907	$19,575	11141	$36555	4089%	53587%
Rail	2,887	$3,017	5,437	$6,100	188%	225102%
Water	2,927	$7,716	- 5,172	$16,543	- 77%	114%
Air	271	$22,454	522	$40,372	93%	80%
Multiple	29	$176	56	$324	91%	--84
Pipeline	-	$-	-	$-	-	-
Other and unknown	289	$430	605	$855	109%	353%
-	-	-	-	-	-	-
Totals	**12,310**	**$53,366**	**22,934**	**$100,748**	**86%**	**89%**
Source: Freight Analysis Framework Data Tabulation Tool -5						

CALIFORNIA INTRASTATE FREIGHT FLOWS

Table 4.12 displays the intrastate freight flows between California's six domestic FAF regions, Fresno – Madera, Los Angeles – Long Beach, Sacramento – Roseville, San Diego – Carlsbad – San Marcos, San Jose – San Francisco, and the remainder of California. In 2023, Los Angeles – Long Beach (LALB) was the strongest generator of shipments (427,729 kilotons) and the largest recipient of shipments (432,074 kilotons). Approximately 86 percent of goods originating in the LALB region stay within the LALB region. By 2050, an increase in total shipments of 605,482 kilotons is forecasted from the LALB region.

Table 4.12: California Intrastate Freight (Flow 5)

		2023		2050		Change 2023 to 2050	
From	**California Regions To**	**Weight (ktons)**	**Value (millions)**	**Weight (ktons)**	**Value (millions)**	**Weight (ktons)**	**Value (millions)**
Fresno - Madera CSA*	Fresno, Madera	9,186	$11,868	13,481	$20,461	47%	72%
	Los Angeles, Long Beach	2,142	$3,678	3,060	$5,875	43%	60%
	Remainder of CA	12,864	$12,574	19,958	$19,957	55%	59%
	Sacramento, Roseville	250	$822	376	$1,283	50%	56%
	San Diego, Carlsbad, San Marcos	206	$455	284	$792	37%	74%
	San Jose, San Francisco, Oakland	2,769	$3,426	4,319	$5,501	56%	61%
Subtotal		**27,417**	**$32,822**	**41,478**	**$53,868**	**51%**	**64%**
Los Angeles - Long Beach CSA	Fresno, Madera	2,556	$4,219	4,011	$7,182	57%	70%
	Los Angeles, Long Beach	365,759	$472,912	514,198	$836,038	41%	77%
	Remainder of CA	16,178	$29,799	25,740	$55,009	59%	85%
	Sacramento, Roseville	5,063	$8,224	7,129	$14,309	41%	74%
	San Diego, Carlsbad, San Marcos	17,879	$40,992	27,251	$77,288	52%	89%
	San Jose, San Francisco, Oakland	20,295	$33,332	27,153	$55,737	34%	67%
Subtotal		**427,729**	**$589,479**	**605,482**	**$1,045,563**	**42%**	**77%**
Remainder of CA	Fresno, Madera	9,731	$9,350	15,686	$16,273	61%	74%
	Los Angeles, Long Beach	36,325	$25,382	41,357	$35,631	14%	40%
	Remainder of CA	110,867	$76,144	159,259	$123,616	44%	62%

	Sacramento, Roseville	6,563	$6,064	9,199	$9,388	40%	55%
	San Diego, Carlsbad, San Marcos	966	$1,195	1,273	$1,954	32%	64%
	San Jose, San Francisco, Oakland	28,881	$22,542	34,748	$33,210	20%	47%
Subtotal		**193,334**	**$140,676**	**261,521**	**$220,072**	**35%**	**56%**
Sacramento - Roseville CSA	Fresno, Madera	566	$3,273	992	$8,799	75%	169%
	Los Angeles, Long Beach	1,096	$2,809	2,000	$5,102	83%	82%
	Remainder of CA	6,866	$16,706	11,588	$41,000	69%	145%
	Sacramento, Roseville	43,404	$32,603	63,538	$65,515	46%	101%
	San Diego, Carlsbad, San Marcos	282	$887	467	$1,488	66%	68%
	San Jose, San Francisco, Oakland	5,898	$32,999	10,292	$80,267	74%	143%
Subtotal		**58,112**	**$89,277**	**88,876**	**$202,170**	**53%**	**126%**
San Diego - Carlsbad - San Marcos MSA**	Fresno, Madera	148	$246	211	$414	42%	68%
	Los Angeles, Long Beach	9,259	$10,353	13,257	$17,212	43%	66%
	Remainder of CA	1,243	$1,664	1,919	$2,787	54%	67%
	Sacramento, Roseville	55	$489	88	$847	61%	73%
	San Diego, Carlsbad, San Marcos	34,803	$48,243	40,601	$73,885	17%	53%
	San Jose, San Francisco, Oakland	306	$2,511	471	$4,391	54%	75%
Subtotal		**45,815**	**$63,506**	**56,547**	**$99,536**	**23%**	**57%**
San Jose - San Francisco - Oakland CSA	Fresno, Madera	3,592	$4,369	5,982	$7,381	67%	69%
	Los Angeles, Long Beach	17,493	$24,463	29,159	$38,311	67%	57%
	Remainder of CA	17,471	$23,552	26,763	$38,704	53%	64%
	Sacramento, Roseville	8,499	$14,570	12,110	$23,036	42%	58%
	San Diego, Carlsbad, San Marcos	419	$3,820	626	$5,789	50%	52%
	San Jose, San Francisco, Oakland	159,005	$158,404	222,083	$242,132	40%	53%
Subtotal		**206,479**	**$229,177**	**296,723**	**$355,354**	**44%**	**55%**
Grand Totals		**958,885**	**$1,144,937**	**1,350,627**	**$1,976,563**	**41%**	**73%**

**** CSA - Combined Statistical Area; ** MSA - Metropolitan Statistical Area; Source: Freight Analysis Framework Data Tabulation Tool 5***

The next largest California shipment generator in 2023 is the San Jose -San Francisco – Oakland (SJSFO) region, with 206,479 kilotons of shipments. By 2050, shipment volume from SJSFO is projected to increase to 296,723 kilotons (44 percent increase). This will also increase value to $355 billion (55 percent increase).

CALIFORNIA'S DOMESTIC INTERSTATE FREIGHT FLOWS

Domestic flows from California to other U.S. states are identified in **Table 4.13** (Flow 6) and domestic flows from other U.S. states to California are represented in **Table 4.14** (Flow 7). In 2023, 33 percent of all domestic commodities by weight (36,251 kilotons) flowed from California **(Table 4.13)** to Nevada, Arizona, and Texas. In 2050, these states are expected to maintain their top 3

rankings, see an increase to 57,086 kilotons, and comprise approximately 32 percent of the total weight of all domestic flows from California to other U.S. states.

Table 4.13: Domestic Freight Flows from California to Other U.S. States (Flow 6)

	2023		2050		Change 2023 to 2050	
Other U.S. States	**Weight (ktons)**	**Value (millions)**	**Weight (ktons)**	**Value (millions)**	**Weight (ktons)**	**Value (millions)**
Alabama	1,214	$10,726	2,291	$20,178	89%	88%
Alaska	73	$878	131	$1,624	80%	85%
Arizona	12,395	$41,369	19,416	$74,073	57%	79%
Arkansas	492	$3,016	883	$5,734	79%	90%
Colorado	2,615	$15,671	4,389	$29,668	68%	89%
Connecticut	408	$6,775	791	$12,938	94%	91%
Delaware	95	$1,190	169	$2,331	79%	96%
Washington DC	34	$876	66	$1,855	95%	112%
Florida	3,012	$38,069	4,804	$66,869	59%	76%
Georgia	2,366	$18,163	4,066	$33,460	72%	84%
Hawaii	1,843	$11,115	3,383	$24,868	84%	124%
Idaho	1,113	$4,702	2,079	$10,082	87%	114%
Illinois	4,371	$25,492	7,168	$50,907	64%	100%
Indiana	2,077	$12,033	3,386	$24,322	63%	102%
Iowa	452	$4,726	735	$9,025	62%	91%

Kansas	834	$7,265	1,468	$14,099	76%	94%
Kentucky	1,044	$9,045	1,675	$19,517	60%	116%
Louisiana	464	$5,061	810	$11,059	74%	118%
Maine	107	$1,256	183	$2,521	71%	101%
Maryland	1,456	$9,921	2,467	$18,503	69%	86%
Massachusetts	782	$11,666	1,244	$20,046	59%	72%
Michigan	1,544	$12,873	3,106	$27,131	101%	111%
Minnesota	1,230	$10,886	2,049	$21,476	67%	97%
Mississippi	1,052	$8,418	1,682	$15,895	60%	89%
Missouri	4,885	$11,472	8,194	$18,353	68%	60%
Montana	803	$890	1,258	$1,477	57%	66%
Nebraska	5,024	$4,219	6,213	$7,091	24%	68%
Nevada	17,528	$13,715	31,235	$26,791	78%	95%
New Hampshire	162	$2,594	235	$3,891	46%	50%
New Jersey	1,439	$17,165	2,590	$32,544	80%	90%
New Mexico	843	$1,525	1,345	$2,575	60%	69%
New York	1,912	$25,280	3,483	$47,397	82%	87%
North Carolina	1,640	$15,474	3,016	$24,503	84%	58%
North Dakota	574	$994	787	$1,729	37%	74%
Ohio	3,317	$16,778	5,451	$27,194	64%	62%
Oklahoma	2,183	$5,341	3,930	$9,588	80%	80%
Oregon	27,428	$18,148	50,234	$31,332	83%	73%
Pennsylvania	2,248	$17,092	3,867	$30,982	72%	81%
Rhode Island	47	$1,144	82	$1,796	73%	57%
South Carolina	1,247	$6,104	2,312	$11,130	85%	82%
South Dakota	1,705	$916	2,856	$1,673	68%	83%
Tennessee	1,923	$15,500	3,269	$28,350	70%	83%
Texas	12,761	$45,775	24,756	$85,128	94%	86%
Utah	8,017	$13,379	9,214	$25,370	15%	90%
Vermont	48	$702	64	$1,098	32%	56%

Virginia	969	$5,929	1,829	$10,181	89%	72%
Washington	6,910	$23,587	10,784	$45,604	56%	93%
West Virginia	105	$475	184	$759	75%	60%
Wisconsin	2,315	$10,573	3,301	$16,002	43%	51%
Wyoming	712	$469	1,940	$1,035	172%	121%
Grand Total	**195,173**	**$473,270**	**322,740**	**$829,489**	**65%**	**75%**
Source: Freight Analysis Framework Data Tabulation Tool 5						

INTERNATIONAL FREIGHT FLOWS

Export and Import Flows Destined for California

This section addresses foreign shipments (directly and indirectly) destined for California (Table 4C.10, Flows 1 and 8), and export shipments originating in California and destined (directly and indirectly) for MWRs (Table 4C.13, Flows 2 and 9). MWR goods that are shipped directly to California (or the reverse) are considered direct shipments. Commodities originating in a MWR, passing through California, with a destination of other U.S. states (or the reverse) are considered indirect shipments.

International shipments arrive in California by various modes, however a vast majority of these shipments enter California via cargo ships. In 2023, approximately 111,742 kilotons (86 percent) of the total international (imports) shipments (Flow 1 and 8) to California arrive by ship **(Table 4.14).** By 2050, shipments via cargo ships are expected to be 81 percent of total imports**.**

Table 4.14: Total Import Flows from Major Regions to California (Flows 1 & 8)

	2023		**2050**		**Change 2023 to 2050**	
Major World Regions (International Origins)	**Weight (ktons)**	**Value (millions)**	**Weight (ktons)**	**Value (millions)**	**Weight (ktons)**	**Value (millions)**
Africa	5,835	$3,000	3,086	$3,093	-47%	3%
Canada	13,443	$18,592	25,156	$39,220	87%	111%
Eastern Asia	31,751	$232,470	59,371	$493,412	87%	112%
Europe	9,972	$41,689	16,430	$85,154	65%	104%
Mexico	13,216	$53,287	22,976	$107,010	74%	101%
Rest of Americas	28,909	$15,721	28,377	$20,098	-2%	28%
SE Asia & Oceania	10,344	$50,172	18,876	$113,415	82%	126%
SW & Central Asia	17,218	$14,381	11,539	$22,707	-33%	58%
Total	**130,687**	**$429,313**	**185,809**	**$884,109**	**42%**	**106%**

Import Modes (MWRs to CA)						
Air (include truck-air)	952	$120,653	1,997	$263,457	110%	118%
Multiple modes & mail	516	$3,830	1,029	$7,826	99%	104%
Other and unknown	18	$485	35	$914	101%	88%
Pipeline	535	$97	1,307	$217	144%	122%
Rail	6,481	$17,726	11,101	$37,450	71%	111%
Truck	10,444	$43,385	19,892	$89,855	90%	107%
Water	111,742	$243,137	150,447	$484,390	35%	99%
Total	**130,687**	**$429,313**	**185,809**	**$884,109**	**42%**	**106%**
Source: Freight Analysis Framework Data Tabulation Tool 5						

Most goods arriving by ship are break bulk (goods that must be loaded individually), or containerized, goods in shipping containers. These goods are transferred to other modes of transportation in order to be distributed throughout California and beyond. As shown in the domestic modes portion of **Table 4.15**, a large shift occurs at the ports where shipments are transferred to trucks, pipelines, and other modes.

Table 4.15: Total Import Flows from Major Regions to California (Flows 1 & 8)

	2023		2050		Change 2023 to 2050	
Major World Regions (International Destination)	**Weight (ktons)**	**Value (millions)**	**Weight (ktons)**	**Value (millions)**	**Weight (ktons)**	**Value (millions)**
Africa	5,783	$2,637	2,999	$2,487	-48%	-6%
Canada	5,586	$1,240	11,227	$1,777	101%	43%
Eastern Asia	28,284	$174,748	52,442	$371,723	85%	113%
Europe	8,418	$30,599	13,287	$62,670	58%	105%
Mexico	8,600	$28,715	14,426	$59,442	68%	107%
Rest of Americas	28,262	$13,680	27,327	$16,495	-3%	21%
SE Asia & Oceania	9,288	$40,172	17,153	$91,550	85%	128%
SW & Central Asia	16,873	$11,943	10,753	$16,924	-36%	42%
Total	**111,093**	**$303,735**	**149,612**	**$623,067**	**35%**	**105%**
Import Mode International Mode						
Air (include truck-air)	689	$68,745	1,465	$152,161	113%	121%
Multiple modes & mail	302	$1,444	611	$3,060	102%	112%
Other and unknown	14	$338	29	$617	103%	82%
Pipeline	255	$3	671	$8	163%	163%
Rail	7	$5	11	$9	74%	77%
Truck	5,126	$24,532	9,787	$52,552	91%	114%
Water	104,699	$208,667	137,038	$414,660	31%	99%
Total	**111,093**	**$303,735**	**149,612**	**$623,067**	**35%**	**105%**
Domestic Mode CA (Intrastate Mode)						
Air (include truck-air)	340	$32,253	711	$71,195	109%	121%
Multiple modes & mail	7,456	$22,347	13,608	$45,702	83%	105%
No domestic mode	42,710	$13,777	27,417	$8,844	-36%	-36%
Other and unknown	14	$338	29	$617	103%	82%
Pipeline	14	$0	37	$0	163%	163%

Rail	2,341	$3,614	3,722	$6,238	59%	73%
Truck	52,141	$223,058	96,578	$474,465	85%	113%
Water	6,076	$8,349	7,510	$16,006	24%	92%
Total	**111,093**	**$303,735**	**149,612**	**$623,067**	**35%**	**105%**
Source: Freight Analysis Framework Data Tabulation Tool 5						

Time-sensitive shipments of high value are flown into various California international airports, primarily Los Angeles International Airport (LAX). **Table 4.14** illustrates that between 2023 and 2050, international flows from MWRs into California (imports) via air cargo (by weight) are forecast to increase from 952 kilotons to nearly 1,997 kilotons (over 110 percent) and is expected to increase 118 percent in value (from $121 billion to $263 billion).

International freight arriving into California through ground transportation import modes must come from either Mexico or Canada. In 2023, approximately 20 percent combined weight from these border countries (about 26,659 kilotons) is imported into the U.S. by rail and truck. In 2050, the share will reach about 26 percent (to over 48,132 kilotons).

The total value of 2023 outbound shipments from California by all modes to Canada and Mexico is $50.6 billion **(Table 4.17)**, and inbound shipments from those countries to California were worth $71.9 billion **(Table 4.14)**. By 2050, overall outbound shipments are projected to grow to $371.3 billion and inbound shipments to $884.1 billion.

California's largest international trading region, both import and export, by weight and value is Eastern Asia – and this trend is forecasted to continue into 2050 **(see Tables 4.14 and 4.17).**

International flows into California by weight are projected to grow from 111,093 kilotons in 2023 to 149,612 kilotons in 2050 **(Table 4.15)**. The value of international shipments arriving directly into California between 2023 and 2050 is projected to increase by 105 percent. As represented in **Table 4.16** (Flow 8), in 2023 and beyond, Texas, Washington, and Michigan lead the U.S. in transported weight of foreign commodities destined for California. Texas, Illinois, and Tennessee lead by value.

Table 4.16: Domestic Flows from MWRs, Through Other U.S. States to CA (Flow 8)

	2023		**2050**		**Change 2023 to 2050**	
Other U.S. States	**Weight (ktons)**	**Value (millions)**	**Weight (ktons)**	**Value (millions)**	**Weight (ktons)**	**Value (millions)**
Alabama	31.58	$853.46	65.96	$1,431.35	109%	68%
Alaska	19.17	$4,392.75	37.50	$10,509.31	96%	139%
Arizona	1,068.58	$2,169.56	2,169.84	$4,231.74	103%	95%
Arkansas	0.01	$3.98	0.01	$9.36	135%	135%

Colorado	0.35	$47.49	0.69	$95.26	94%	101%
Connecticut	0.05	$7.37	0.10	$14.40	98%	95%
Delaware	53.46	$116.13	77.51	$176.04	45%	52%
Florida	864.55	$7,009.27	1,747.61	$14,909.72	102%	113%
Georgia	383.49	$3,159.29	794.19	$7,044.38	107%	123%
Hawaii	38.65	$130.75	74.56	$267.85	93%	105%
Idaho	1,021.55	$359.37	1,745.42	$674.30	71%	88%
Illinois	682.72	$18,400.73	989.18	$37,057.57	45%	101%
Indiana	2.07	$22.82	4.02	$50.48	94%	121%
Iowa	0.00	$0.19	0.01	$0.40	116%	113%
Kansas	0.00	$0.08	0.00	$0.18	121%	125%
Kentucky	35.66	$9,502.21	72.07	$19,996.78	102%	110%
Louisiana	72.43	$160.21	131.03	$316.12	81%	97%
Maine	36.21	$699.31	73.65	$1,362.75	103%	95%
Maryland	196.72	$1,364.72	345.54	$2,477.85	76%	82%
Massachusetts	36.37	$293.71	68.12	$630.98	87%	115%
Michigan	1,829.95	$9,649.16	3,827.19	$21,640.73	109%	124%
Minnesota	0.41	$18.38	0.80	$36.58	94%	99%
Mississippi	6.08	$40.85	10.18	$68.26	67%	67%
Missouri	0.16	$7.46	0.32	$14.75	106%	98%
Montana	1,218.93	$830.84	2,509.38	$1,902.83	106%	129%
Nebraska	0.01	$1.52	0.03	$3.33	96%	120%
Nevada	0.58	$12.41	1.22	$27.46	109%	121%
New Hampshire	0.09	$14.59	0.17	$28.44	96%	95%
New Jersey	1,404.85	$9,140.40	2,821.63	$18,890.43	101%	107%
New Mexico	15.27	$51.57	26.53	$100.83	74%	96%
New York	592.75	$7,253.50	1,188.72	$15,840.94	101%	118%
North Carolina	111.80	$326.90	239.59	$715.77	114%	119%
North Dakota	306.48	$316.52	573.27	$577.14	87%	82%
Ohio	52.20	$668.22	97.24	$1,413.20	86%	111%
Oklahoma	0.04	$3.77	0.08	$8.23	103%	118%
Oregon	407.72	$4,175.77	793.43	$8,217.74	95%	97%
Pennsylvania	359.55	$1,037.36	596.21	$1,834.14	66%	77%
Rhode Island	-	-	-	-	-	-

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South Carolina	593.58	$1,907.62	1,227.18	$4,090.90	107%	114%
South Dakota	-	-	-	-	-	-
Tennessee	45.52	$10,403.56	92.77	$22,320.19	104%	115%
Texas	4,385.60	$25,620.62	8,035.19	$51,293.72	83%	100%
Utah	0.55	$52.62	1.12	$112.16	105%	113%
Vermont	2.28	$32.59	3.82	$78.18	68%	140%
Virginia	404.79	$1,236.43	844.22	$2,646.49	109%	114%
Washington	3,310.11	$4,000.31	4,906.77	$7,747.98	48%	94%
Washington DC	1.01	$77.05	2.10	$166.41	107%	116%
West Virginia	-	-	-	-	-	-
Wisconsin	0.46	$4.32	0.81	$7.89	76%	83%
Total	**19,594.39**	**$125,577.74**	**36,197.01**	**$261,041.56**	**85%**	**108%**
Included to the hundredths decimal place to capture the weight and value that did not display during rounding; Source: Freight Analysis Framework Data Tabulation Tool 5						

From California to MWRs (**Table 4.17**), Eastern Asia led other world regions in 2023 with $55.7 billion for approximately 29 percent of the total value followed distantly by Europe (22 percent) and Mexico (16 percent) by value. Total export flows are forecasted to increase by 2050 in value by 93 percent and weight by 94 percent.

Table 4.17: Total California Origin Flows to Major World Region (Flows 2 & 9)

	2023		**2050**		**Change 2023 to 2050**	
Major World Regions (International Destinations)	**Weight (ktons)**	**Value (millions)**	**Weight (ktons)**	**Value (millions)**	**Weight (ktons)**	**Value (millions)**
Africa	280	$1,191	497	$2,154	77%	81%
Canada	7,560	$20,756	14,201	$37,885	88%	83%
Eastern Asia	20,728	$55,665	32,984	$103,224	59%	85%
Europe	3,592	$41,484	6,283	$80,366	75%	94%
Mexico	11,709	$29,869	22,859	$61,628	95%	106%
Rest of Americas	6,572	$9,576	12,437	$18,730	89%	96%
South East Asia & Oceania	9,613	$19,847	23,441	$40,647	144%	105%
South West & Central Asia	5,193	$13,639	13,562	$26,648	161%	95%
Total	**65,247**	**$192,028**	**126,265**	**$371,281**	**94%**	**93%**

Export Modes (CA to MWRs)						
Air (include truck-air)	752	$90,596	1,436	$163,690	91%	81%
Multiple modes & mail	34	$215	66	$401	96%	86%
Other and unknown	1,455	$4,538	3,011	$9,355	107%	106%
Pipeline	10	$1	15	$1	53%	48%
Rail	3,661	$3,244	6,592	$6,521	80%	101%
Truck	11,414	$37,413	22,103	$73,261	94%	96%
Water	47,922	$56,021	93,043	$118,053	94%	111%
Total	**65,247**	**$192,028**	**126,265**	**$371,281**	**94%**	**93%**
Source: Freight Analysis Framework Data Tabulation Tool 5						

Regarding exports originating in California and exiting to foreign lands through other states (**Table 4.18**, Flow 9), most of the weight will continue to be transported through Michigan, Texas, and Washington. In 2023, Texas, Michigan, and New York were the leading states in value for this freight flow.

Table 4.18: Domestic Flows from CA, Through Other States, to MWRs (Flow 9)

	2023		**2050**		**Change 2023 to 2050**	
Other U.S. States	**Weight (ktons)**	**Value (millions)**	**Weight (ktons)**	**Value (millions)**	**Weight (ktons)**	**Value (millions)**
Alabama	28.60	$53.54	68.57	$93.03	140%	74%
Alaska	249.57	$1,765.11	427.12	$3,221.99	71%	83%
Arizona	393.70	$895.65	632.54	$1,685.70	61%	88%
Arkansas	-	-	-	-	-	-
Colorado	0.12	$11.22	0.25	$27.97	113%	149%
Connecticut	0.73	$0.43	1.15	$0.70	58%	62%
Delaware	3.26	$13.32	6.90	$25.15	112%	89%
Florida	125.31	$2,833.09	258.64	$5,664.43	106%	100%
Georgia	90.38	$898.60	152.04	$1,787.57	68%	99%
Hawaii	47.56	$2,166.95	122.71	$3,997.94	158%	84%
Idaho	0.61	$13.16	1.39	$27.11	129%	106%
Illinois	8.82	$418.89	15.11	$682.19	71%	63%
Indiana	0.90	$292.52	1.92	$466.44	113%	59%
Iowa	-	-	-	-	-	-

Kansas	0.00	$0.12	0.00	$0.20	68%	62%
Kentucky	34.65	$5,295.52	62.14	$8,535.47	79%	61%
Louisiana	423.86	$142.55	607.09	$210.95	43%	48%
Maine	9.69	$37.57	21.52	$73.92	122%	97%
Maryland	38.85	$620.54	119.78	$2,009.47	208%	224%
Massachusetts	2.65	$18.55	7.24	$38.08	173%	105%
Michigan	2,946.34	$8,204.31	5,552.19	$14,688.50	88%	79%
Minnesota	0.29	$28.34	0.57	$54.69	96%	93%
Mississippi	119.04	$91.46	199.11	$143.26	67%	57%
Missouri	0.00	$0.70	0.00	$1.28	82%	82%
Montana	783.05	$1,565.19	1,454.07	$2,953.28	86%	89%
Nebraska	-	-	-	-	-	-
Nevada	1.75	$167.11	3.66	$392.01	110%	135%
New Hampshire	0.12	$15.85	0.24	$29.78	94%	88%
New Jersey	34.38	$459.35	77.49	$882.38	125%	92%
New Mexico	79.28	$236.23	170.21	$516.32	115%	119%
New York	1,810.14	$7,437.48	3,499.64	$13,050.65	93%	75%
North Carolina	7.93	$82.27	12.30	$151.19	55%	84%
North Dakota	167.54	$295.82	325.31	$584.41	94%	98%
Ohio	38.98	$35.40	111.25	$83.98	185%	137%
Oklahoma	0.00	$0.01	0.00	$0.02	75%	62%
Oregon	21.17	$14.71	25.61	$20.82	21%	41%
Pennsylvania	11.26	$642.72	23.40	$1,259.11	108%	96%
Rhode Island	0.02	$0.03	0.02	$0.05	64%	64%
South Carolina	24.98	$155.13	42.57	$283.24	70%	83%
South Dakota	0.57	$37.64	1.14	$90.23	99%	140%
Tennessee	22.96	$4,420.27	46.88	$8,530.14	104%	93%
Texas	2,522.08	$9,795.72	4,770.90	$20,435.24	89%	109%
Utah	0.21	$13.19	0.38	$25.67	79%	95%
Vermont	38.75	$34.07	61.45	$72.08	59%	112%
Virginia	53.96	$227.59	77.78	$405.45	44%	78%
Washington	2,165.81	$3,846.74	3,970.60	$7,389.47	83%	92%
Washington DC	0.48	$81.41	0.91	$156.70	90%	92%
West Virginia	0.00	$ 0.02	0.00	$0.04	109%	109%

Wisconsin	0.00	$0.06	0.00	$0.10	45%	57%
Total	**12,310.33**	**$53,366.17**	**22,933.77**	**$100,748.40**	**86%**	**89%**
Included to the hundredths decimal place to capture the weight and value that did not display during rounding ****Undefined: percent increase from a base of 0 is expressed by infinity*** ***Source: Freight Analysis Framework Data Tabulation Tool 5***						

Forecasted international flows by weight into California (**Table 4.15,** Flows 1 and 8) in the domestic mode show around 47 percent more commodities imported into California than leaving the State for foreign destinations (**Table 4.17**, Flows 2 and 9) in 2050. The weight of California exports is expected to increase much faster than imports destined for California over the forecast period (94 percent versus around 42 percent). However, the value of these imports will increase to $884 billion, while exports will only reach $371 billion. Therefore, a large trade imbalance is forecast to remain in the future.

Exports and Imports Through, Not Destined for, California

This section provides information regarding international shipments that are either destined for or originate within the rest of the U.S. and are heading to or departing from the eight MWRs using California's ports of entry/exit (i.e., through shipments). To a large extent, this can be considered discretionary trade that could go to/from other states without traversing California. This trade is an important component of the California's freight sector as it supports thousands of jobs at seaport, railroad, trucking, transloading, and warehousing facilities. Although these shipments are not destined for California, some processing or repacking of freight containers may occur here. As displayed in **Table 4.19** (flow 3), shipments from MWRs, through California, to the other states are expected to increase in weight by 95 percent from 28,512 kilotons to 55,551 kilotons. Goods from MWRs destined for other states through California imports arriving in waterborne vessels (international modes) are 25,656 kilotons in 2023 and it is expected to climb to 49,739 kilotons by year 2050. It is important to note that some ports, such as the POLB and POLA, compute freight flows specific to their operations and may not be consistent with outputs from the FAF.

Table 4.19: Major World Region Flows Destined for Other U.S. States, Through California (Flow 3)

	2023		2050		Change 2023 to 2050	
Major World Regions (International Origins)	**Weight (ktons)**	**Value (millions)**	**Weight (ktons)**	**Value (millions)**	**Weight (ktons)**	**Value (millions)**
Africa	43	$219	67	$425	56%	94%
Canada	318	$1,390	543	$2,862	71%	106%
Eastern Asia	17,782	$123,561	35,386	$261,023	99%	111%
Europe	1,236	$7,883	2,506	$16,685	103%	112%
Mexico	3,552	$16,692	6,206	$34,848	75%	109%
Rest of Americas	1,416	$1,443	2,411	$2,363	70%	64%

South East Asia & Oceania	3,684	$22,196	7,432	$54,121	102%	144%
South West & Central Asia	481	$6,097	999	$11,149	108%	83%
Total	**28,512**	**$179,482**	**55,551**	**$383,475**	**95%**	**114%**
International Modes (MWRs to CA)						
Air (include truck-air)	251	$21,500	516	$45,312	106%	111%
Multiple modes & mail	462	$2,968	927	$6,142	101%	107%
Other and unknown	5	$129	10	$243	83%	88%
Rail	4	$1	8	$2	92%	97%
Truck	2,135	$13,219	4,351	$28,773	104%	118%
Water	25,656	$141,664	49,739	$303,003	94%	114%
Total	**28,512**	**$179,482**	**55,551**	**$383,475**	**95%**	**114%**
Domestic Modes (CA to Other U.S. States)						
Air (include truck-air)	237	$17,071	484	$35,872	104%	110%
Multiple modes & mail	7,976	$41,512	15,580	$89,033	95%	114%
Other and unknown	5	$129	10	$243	83%	88%
Rail	3,769	$13,867	6,547	$28,579	74%	106%
Truck	16,292	$106,704	32,717	$229,458	101%	115%
Water	233	$199	213	$290	-9%	46%
Total	**28,512**	**$179,482**	**55,551**	**$383,475**	**95%**	**114%**
Source: Freight Analysis Framework Data Tabulation Tool 5						

Exports from other states traveling through California to MWRs are estimated to increase by over 96 percent from 31,608 kilotons to 61,861 kilotons (**Table 4.20**, Flow 4). Value figures between 2023 and 2050 in the export direction are forecasted to increase by approximately 101 percent from around $86.9 billion to nearly $175.1 billion, while in the reverse direction (**Table 4.15**), an increase in import value of 114 percent from $179.5 billion to $383.5 billion has been forecasted. In terms of value, international movements traveling through California in transit for other states will be approximately 119 percent more than the export flows of other states traveling through California to MWRs by 2050.

Table 4.20: Exports from Other U.S. States, Through CA, to Major World Regions

	2023		**2050**		**Change 2023 to 2050**	
Domestic Modes (Other U.S. States to CA)	**Weight (ktons)**	**Value (millions)**	**Weight (ktons)**	**Value (millions)**	**Weight (ktons)**	**Value (millions)**

Air (include truck-air)	165	$19,468	319	$35,725	93%	84%
Multiple modes & mail	5,546	$13,064	10,906	$27,227	97%	108%
Other and unknown	1,200	$3,392	2,501	$7,091	108%	109%
Pipeline	424	$84	624	$123	47%	45%
Rail	8,492	$8,146	16,474	$17,036	94%	109%
Truck	15,693	$42,548	30,862	$87,300	97%	105%
Water	87	$246	174	$613	101%	149%
Total	**31,608**	**$86,949**	**61,861**	**$175,113**	**96%**	**101%**
International Mode (CA to MWRs)						
Air (include truck-air)	201	$24,816	396	$44,404	98%	79%
Multiple modes & mail	546	$1,689	1,246	$3,460	128%	105%
Other and unknown	1,200	$3,392	2,501	$7,091	108%	109%
Pipeline	424	$84	624	$123	47%	45%
Rail	1,212	$248	1,756	$377	45%	52%
Truck	1,352	$5,497	2,680	$11,262	98%	105%
Water	26,673	$51,222	52,657	$108,397	97%	112%
Total	**31,608**	**$86,949**	**61,861**	**$175,113**	**96%**	**101%**
Major World Regions (Destinations)						
Africa	128	$266	185	$465	45%	75%
Canada	595	$1,482	1,317	$3,091	121%	109%
Eastern Asia	17,978	$46,559	32,475	$93,630	81%	101%
Europe	856	$8,757	1,737	$15,606	103%	78%
Mexico	3,119	$6,925	5,290	$13,957	70%	102%
Rest of Americas	706	$1,597	1,196	$3,245	69%	103%
South East Asia & Oceania	7,330	$18,900	17,333	$40,202	136%	113%
South West & Central Asia	898	$2,463	2,329	$4,916	159%	100%
Total	**31,608**	**$86,949**	**61,861**	**$175,113**	**96%**	**101%**
Source: Freight Analysis Framework Data Tabulation Tool 5						

CONCLUSION

California's economy is freight transportation-dependent. Despite California's excellent rail, marine, highway, and air connections to national and international destinations, projected growth in freight, even with currently planned improvements, will strain the capacity of the transportation system and potentially increase community and environmental impacts. Investment in our transportation infrastructure is needed to remain competitive with other states and countries that are investing in their transportation networks and reducing impacts to California's environment and communities. Along with the system investments, mitigation, and implementation of best practices will be necessary.

The highway network is the largest component of California's freight network in terms of infrastructure, tonnage shipped, and value shipped. It provides first- and last-mile connections to other modes in addition to supporting California's key industries. Trucks are by far the single most-used mode (between air, train, marine, and pipelines) to move freight. The FAF freight data and forecasts strongly indicate that freight moved on trucks is expected to increase for the foreseeable future since tonnage for trucking is forecast to grow by 47 percent by 2050. The value of shipments is expected to grow over two times as fast as their weight; thus, the cost of trucks delayed by congestion will rise accordingly. Trucks unable to meet shipment schedules will directly affect regional and state economic development and competitiveness. On the other hand, it takes several thousand passenger vehicles passing over a given segment of roadway to do the same damage as one fully loaded, heavy-duty 5-axle truck. Understanding that there will be more truck trips on California highways will inform decision-makers of needed infrastructure improvements, such as strengthening pavement design standards, constructing dedicated truck facilities, shortening pavement maintenance schedules, and effecting modal shifts to avoid highway impacts. Transportation funds should be invested in key freight corridors to address anticipated growth of freight tonnage on California's highways.

Linking State and local transportation investments, especially in freight transportation infrastructure, to economic development is vital for the regional, local, and overall State economy, as well as for keeping businesses in and attracting them to California. Adequate transportation is one of several key factors considered in site location decisions (e.g., utilities, work-force skills, tax structure, equity considerations, environmental, and climate impacts). These factors affect an area's business costs, markets, and overall competitiveness for attracting business investment. All businesses need some level of transportation access to labor, materials, and customers to work and survive. As such, transportation is a factor that influences the ability of local and regional economic development agencies to increase their areas' business attractions, expansions, retentions, and startups. Investments in transportation services and infrastructure may contribute to the economic vibrancy of a region by:

- Reducing business operating costs and increasing business productivity;
- Expanding the size of labor markets;
- Increasing business access to needed labor, supplies, services, and materials; and
- Supporting a desirable and sustainable quality of life for all in the region.

5

Chapter 5: Environmental Challenges, Opportunities & Engagement

FREIGHT PLAN
California Freight Mobility Plan

5A. Environmental Impacts

The freight sector is an important part of California's economy; however, it can also cause significant negative public health and environmental impacts. This chapter will discuss the environmental impacts of freight movement on local air pollution, flooding and stormwater runoff as well as wildlife habitat loss and other environmental considerations. The freight industry is widely distributed within California along and near truck and rail corridors, rail yards, warehouse districts, seaports, airports, intermodal transfer facilities, agricultural processing plants, and industrial and manufacturing facilities. Freight vehicles and equipment (trucks, locomotives, ocean-going vessels, cargo handling equipment, transport refrigeration units, forklifts, and many other types of equipment) traditionally use diesel fuel. The emissions generated by diesel fuel consumption include diesel particulate matter (DPM), other particulate matter (PM), nitrogen oxides (NOx), sulfur oxides (SOx), and other air pollutants which can cause health and environmental challenges. The environmental impacts of goods movement is increased in the construction and operations of freight support facilities and can damage habitat as well as less evident environmental damages. While negative impacts of freight affect all Californians, children, the elderly, pregnant women, and those in poor health are particularly impacted.

Environmental Policies and Impacts

CLIMATE ACTION PLAN FOR TRANSPORTATION INFRASTRUCTURE (CAPTI)

The 2021 Climate Action Plan for Transportation Infrastructure (CAPTI) was driven by Executive Order N-19-19 and Executive Order N-79-20 to develop a collaborative framework for aligning state transportation investments to meet California's climate, health, and social equity goals[212]. CAPTI is a framework to align state transportation infrastructure investments with California's climate, health and social equity goals. This process will build off the Senate Bill 1 "Fix it First Approach" while also providing a framework of changes to transportation development approaches and activities that align with the CAPTI Investment Framework as seen in **Table 5.1.**

Table 5.1: CAPTI Investment Framework Guiding Principals

CAPTI Investment Framework	
Guiding Principles	**Action Details**
Building toward an integrated, statewide rail and transit network	Centered around the existing California State Rail Plan that leverages the California Integrated Travel Project to provide seamless, affordable, multimodal travel options in all contexts, including suburban and rural settings, to all users.
Investing in networks of safe and accessible bicycle and pedestrian infrastructure	by closing gaps on portions of the State Highway System that intersect local active transportation and transit networks or serve as small town or rural main streets, with a focus on investments in low-income and disadvantaged communities throughout the state.

Including investments in light, medium, and heavy-duty zero-emission vehicle (ZEV) infrastructure	Support the innovation in and development of the ZEV market and help ensure ZEVs are accessible to all, particularly to those in more rural or remote communities.
Strengthening our commitment to social and racial equity by reducing public health and economic harms and maximizing community benefits	to disproportionately impacted disadvantaged communities, low income communities, and Black, Indigenous, and People of Color (BIPOC) communities, in urbanized and rural regions, and involve these communities early in decision-making. Investments should also avoid placing new or exacerbating existing burdens on these communities, even if unintentional.
Making safety improvements to reduce fatalities and severe injuries of all users towards zero	on our roadways, railways, and transit systems by focusing on context appropriate speeds, prioritizing vulnerable user safety to support mode shift, designing roadways to accommodate for potential human error and injury tolerances, and ultimately implementing a safe systems approach.
Assessing physical climate risk	as standard practice for transportation infrastructure projects to enable informed decision making, especially in communities that are most vulnerable to climate-related health and safety risks.
Promoting projects that do not significantly increase passenger vehicle travel,	particularly in congested urbanized settings where other mobility options can be provided and where projects are shown to induce significant auto travel. These projects should generally aim to reduce VMT and not induce significant VMT growth. When addressing congestion, consider alternatives to highway capacity expansion, such as providing multimodal options in the corridor, employing pricing strategies, and using technology to optimize operations.
Promoting compact infill development while protecting residents and businesses from displacement	by funding transportation projects that support housing for low-income residents near job centers, provide walkable communities, and address affordability to reduce the housing-transportation cost burden and auto trips.
Developing a zero-emission freight transportation system	that avoids and mitigates environmental justice impacts, reduces criteria and toxic air pollutants, improves freight's economic competitiveness and efficiency, and integrates multimodal design and planning into infrastructure development on freight corridors.
Source: CAPTI Investment Framework- Guiding Principals	

GREENHOUSE GAS EMISSIONS

California has implemented legislation to reduce greenhouse gas emissions (GHG), including AB 32[213] and SB 350.[214] AB 32 established GHG emissions reduction target of 15 percent below 1990 levels by 2020. SB 350, SB 32[215] and Executive Order (EO) B-30-15[216] furthered the GHG reduction goal by setting a new target of 40 percent below 1990 levels by 2030.

In addition, EO N-19-19[217] leverages California's pension investments, transportation systems and purchasing power to strengthen and advance the State's climate leadership and resiliency, with the objective to reduce GHG emissions and mitigate the effects of climate change. Two important bills were also signed into law to strengthen emission standards for trucks, semis and other high-pollution vehicles. The first bill, SB 210 by Senator Connie Leyva (D-Chino) requires CARB to develop and implement a Heavy-Duty Inspection and Maintenance Program for non-gasoline, heavy-duty trucks.[218] This will be the first 'smog check' program of its kind in the nation. The second bill, SB 44 by Senator Nancy Skinner (D-Berkeley) requires CARB to create a comprehensive plan for reducing GHG emissions from medium and heavy-duty vehicles.[219]

In addition to the statewide targets, many regional air quality districts and local agencies have their own GHG emissions thresholds for environmental review, as well as GHG emissions targets. For the purposes of the CFMP, this section focuses only on the State targets [220] and specifically, on reducing carbon emitted from fossil fuels, as well as renewable natural gas. To meet the State's goals, CARB's strategies focus on transitioning to zero-emission equipment and operations.

In 2022 California Air resources Board (CARB) released the State Implementation Plan that demonstrate how the state will attain the standards by specific dates. CARB is collaborating with local air districts on development of regional SIPs and solicited stakeholder input on the development of the 2022 State SIP Strategy. This included workshops and participation in local air district outreach efforts. CARB staff finalized the 2022 State SIP Strategy and Environmental Analysis and the Board adopted on September 22, 2022. The measures (freight and non-freight) proposed in the 2022 SIP, in combination with ongoing implementation of current control programs, will reduce NOx emissions from mobile sources by at least 64 percent from today's levels Statewide by 2037, as well as reduce emissions of Reactive Organic Gases (ROG) by 58 percent. Of these Statewide reductions, a large portion will occur in and around communities near major roadways and freight facilities like ports, airports and warehouses, providing substantial health benefits. The expected emission reductions from new freight measures proposed in the 2022 State SIP Strategy are 149.6 tpd of NOx and 8.6 tpd of ROG in 2037 Statewide.[221]

Table 5.2: Statewide Expected Emission Reductions Freight Measures

Proposed Measure:	2037 NOx (tpd)	2037 ROG (tpd)
Advanced Clean Fleets Regulation	19.3	1.7
Zero-Emissions Truck Measure	14.3	1.3
TRU Part 2	15.2	2
CHC amendments	8.7	0.5
CHE Amendments	0.7	0.5
In-Use Locomotive Regulation	63.2	2.5
On-Road Heavy-Duty Vehicle Low-NOx Engine Standards	3.8	0.1
More Stringent NOx and PM Standards for OGVs	0.8	Not Quantified in 2022 SIP
Cleaner Fuel and Vessel Requirements for OGVs	23.6	Not Quantified in 2022 SIP
Total	**149.6**	**8.6**
Source: 2022 CARB State SIP Strategy (ca.gov)		

DISADVANTAGED COMMUNITIES

The California Department of Transportation (Caltrans) acknowledges that communities of color and under-served communities have experienced fewer benefits and a greater share of the burdens associated with California's transportation system. These disparities largely reflect a history of transportation decision-making, policy, processes, planning, design, and construction that has quite literally put-up barriers, divided communities, and amplified racial inequities, particularly in Black and Brown neighborhoods[222].

To operationalize Caltrans' commitments to equity, the department is developing the Caltrans Transportation Equity Index (EQI). The EQI is a screening and evaluation tool that utilizes multiple transportation-specific and socioeconomic indicators to identify transportation-based priority populations at the Census block level. Many tools exist to evaluate the impact of the built environment. Still, these tools typically consider a wide range of factors that are not explicitly focused on burdens caused or exacerbated by the transportation system. Caltrans aims to bridge this gap by creating an index to inform how the Department can best address and mitigate inequities exacerbated by the transportation system. The EQI is also designed in a manner to support partner agencies and other entities who may voluntarily use the EQI to analyze impacts and evaluate the effectiveness of various transportation projects and solutions.

Caltrans is a recipient of federal financial assistance and incorporates Title VI of the Civil Rights Act of 1964 (11 Title VI"), the Civil Rights Restoration Act of 1987, Section 162(a) of the Federal-Aid Highway Act of 1973, the Age Discrimination Act of 1975, Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990, and Executive Order 12898 into its programs, policies, procedures, activities, and services. Caltrans will not, on the grounds of (race, color, national origin) and related nondiscrimination law (sex, sexual orientation, gender identity, age, or disability) exclude from participation in, deny the benefits of, or otherwise subject any person to discrimination in any Caltrans program, policy, procedure, activity, or service.

Additionally, Caltrans incorporates Environmental Justice into its programs, policies, and activities to ensure there are no disproportionate adverse impacts, particularly on minority and low-income populations. The Department emphasizes the fair treatment and meaningful involvement of people of all races, cultures, and income levels, including minority and low-income populations, from the early stages of transportation planning and investment decision-making through construction, operations, and maintenance.

Community impacts from the freight industry, such as air pollution and noise, have been longstanding issues. Air pollution is the primary freight-related impact of concern for communities near freight facilities due to the potential for significant negative health impacts. Some of these impacts worsen asthma, cancer, hospitalizations, and even premature death related to heart and lung disease. Communities in close proximity to freight facilities disproportionately experience these harmful health effects. For a statewide approach to understanding how and the extent of these impacts, a combination of CalEnviroScreen evaluations of disadvantaged communities and air basin data was used since location specific data for freight related networks and facilities are not consistently available throughout the state.

Disadvantaged communities refer to the areas throughout California which disproportionally experience hardships relating to economic, health, and environmental equity. These areas have high poverty rates, high unemployment, suffer from air and water pollution as well as the presence of hazardous wastes, and the high rates of asthma and heart disease. Programs funded through proceeds from the State's Greenhouse Gas Reduction Fund (GGRF), use the definition of disadvantaged communities defined by the California Environmental Protection Agency (CalEPA) in accordance with SB 535[223] (De Leon Chapter 830, Statutes of 2012). CalEPA uses the CalEnviroScreen tool to assess areas that are disproportionately affected by multiple types of pollution and areas with vulnerable populations. CalEnviroScreen includes numerous indicators in two broad categories – "burden of pollution," which includes exposures and environmental effects, and "population characteristics," which includes sensitive populations and socioeconomic factors. Additional information regarding CalEnviroScreen for all census tracts, including those defined as SB 535 disadvantaged communities, can be found on the CalEPA website.

The CalEnviroScreen formula calculates a score based on the pollution burden and population characteristics. The Census Tracts in the top 25 percent of the CalEnviroScreen 4.0 score are considered disadvantaged **(Figure 5.2)**. CalEnviroScreen includes pollution and environmental effects that are less directly associated with freight and logistics including the following:

- Exposures
  - Pesticide Use
  - Drinking Water Contaminants
- Environmental Effects
  - Groundwater Threats
  - Cleanup Sites
  - Impaired Bodies of Water

To determine the disadvantaged communities with the highest rate of exposure to freight-related emissions, the top 25 percent of tracts were evaluated to determine how many are located within California air basins that are considered nonattainment areas and do not conform to State air quality standards for pollutants that have a known negative impact on human health. These pollutants include particulates (PM2.5 and PM10), carbon monoxide, NOx, and SOx. Because the transportation sector, inclusive of freight, is the primary emitter within these air basins, many of the disadvantaged communities within these air basins are affected by freight. As of June 2017, all California air basins are in attainment for carbon monoxide, NOx, SOx. However, many air basins are in nonattainment for ozone and particulate emissions. Nanoparticles (< PM2.5 or ultrafine) have been linked to lung damage and disease. **Table 5.3** provides a list of air basins that are in nonattainment for particulate emissions (PM2.5 and PM10). [224]

Table 5.3: CalEnviroScreen Top 25 Percent Disadvantaged Census Tracts by Air Basin

Air Basin	Number of Census Tracts
South Coast	1,326
San Joaquin Valley	410
San Francisco Bay Area	106
Sacramento Valley	54*
San Diego	37

Salton Sea	23
Mojave Desert	14
South Central Coast	8
North Central Coast	5
Total	1,983
Source: California Office of Environmental Health Hazard Assessment ****Sacramento Valley's attainment is mixed, meaning at least some of the counties within it are in nonattainment.***	

The majority of California's air basins are in nonattainment for PM2.5 and PM10, both of which are generated in large quantities by the freight industry. All of the CalEnviroScreen top 25 percent disadvantaged Census Tracts are located within a nonattainment air basin, and therefore are likely to experience some level of freight-related pollution burden.[225]

The following five counties have the largest share of top 25 percent disadvantaged Census Tracts based on CalEnviroScreen:

- Los Angeles (51 percent of Tracts)
- San Bernardino (8 percent of Tracts)
- Fresno (6 percent of Tracts)
- Riverside (5 percent of Tracts)
- San Joaquin (4 percent of Tracts)

These disadvantaged communities are affected by emissions from the transportation sector, inclusive of the freight network. These communities tend to have a greater share of households living in poverty, greater unemployment, lower educational attainment, more linguistic isolation, and more housing burdened than other communities in the state.

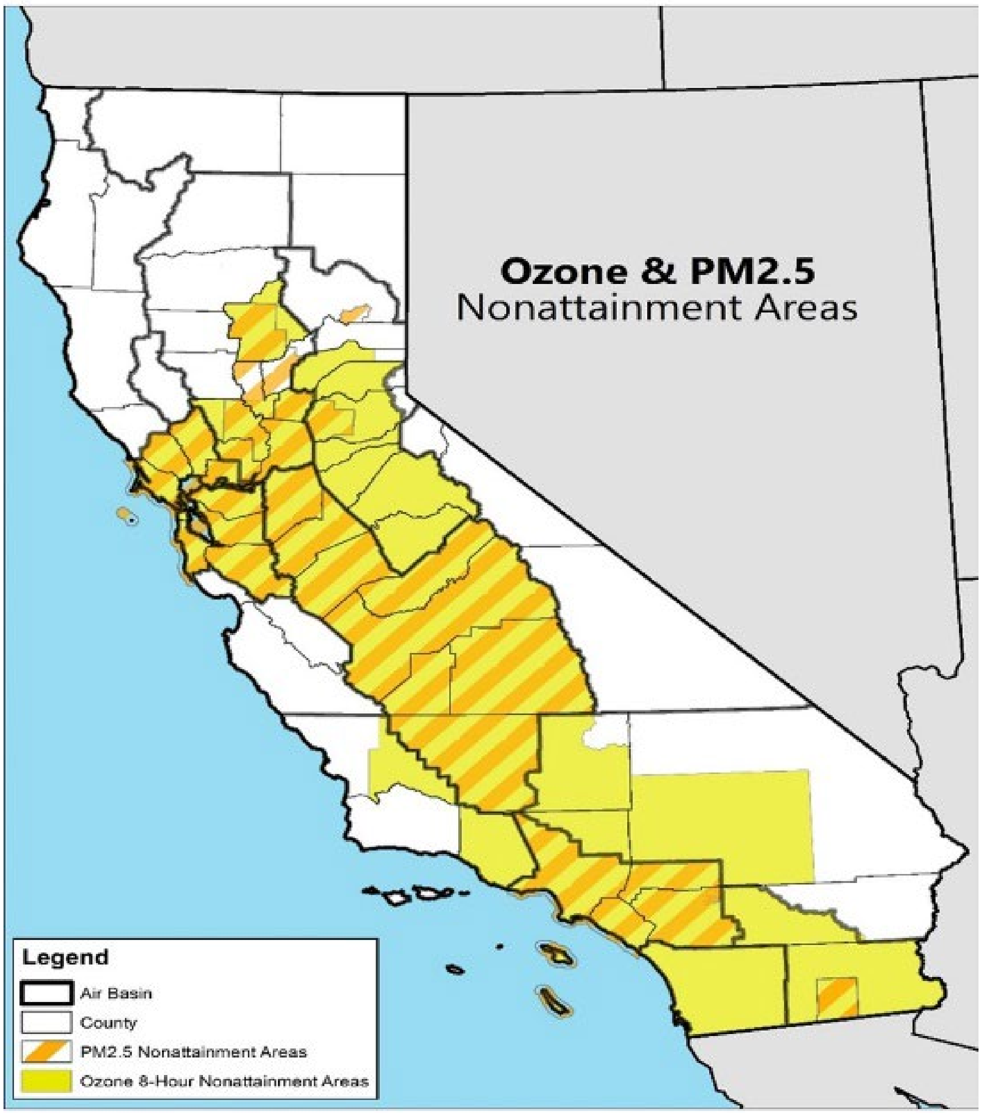

Figure 5.1: California OZONE and PM2.5 Emissions Nonattainment (Source: CARB State SIP Strategy)

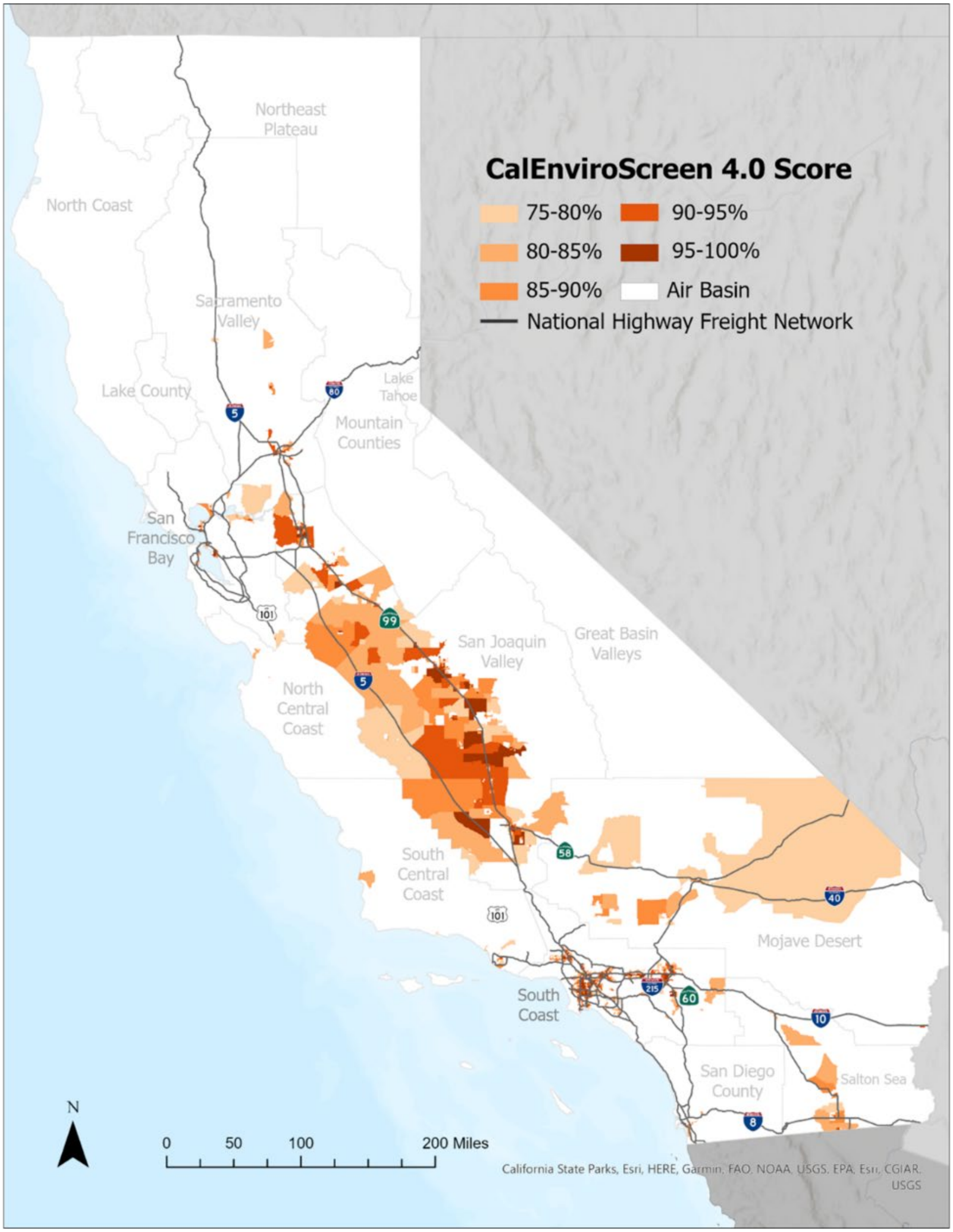

Figure 5.2: CalEnviroScreen 4.0 Top 25 Percent Disadvantaged Census Tracks (Source: CalEnviroScreen 4.0)

COVID-19 SUPPLY CHAIN CRISIS

During the Covid-19 pandemic, restrictions and increasing cargo volumes led to major supply chain disruption that impacted goods movement nationally and internationally. Ships began to pile up in the Pacific Ocean waiting to unload the cargo. This increased offshore idling due to port bottlenecks had resulted in increased emissions to coastal communities around ports. In 2021 a new queuing system was developed to eliminate the number of ships at anchor to keep cargo vessels further off the coast to reduce air quality impacts.

EXECUTIVE ORDER N-79-20

In 2020 Executive Order N-79-20 was signed to accelerate transition from fossil fuels by requiring new in state vehicle and equipment sales to be 100% zero-emission by 2035. For the Goods movement sector this includes all new commercial truck sales to be 100 % zero emission and transition to 100% zero emission of off-road vehicles, drayage trucks, and equipment by 2035 where feasible. It is a goal that 100% of medium and heavy-duty vehicles in the state to be zero-emission by 2045. N-79-20 is a strategy to reduce the harmful impacts of freight movement on air quality and social equity. The requirement targets for freight are summarized in **Table 5.4.**

Table 5.4: Zero-Emission Targets

Type	Description	Target/Metrics	Target Date
Transition to Zero-Emission Off Road Vehicles	Strategies, in coordination with other State agencies, U.S. Environmental Protection Agency and local air districts, to achieve 100 percent zero-emission from off-road vehicles and equipment operations in the State by 2035.	100% of new sales of Off-Road Vehicles and equipment by 2035	2035
Transition to Zero-Emission Drayage Trucks	All drayage trucks to be zero-emission by 2035.	100% of new sales of Drayage Trucks by 2035	2035
Transition to Zero-Emission Trucks	Medium- and heavy-duty vehicle regulations requiring increasing volumes of new zero-emission trucks and buses sold and operated in the State towards the target of 100 percent of the fleet transitioning to zero-emission vehicles by 2045.	100% of new sales of Medium and Heavy-Duty Vehicles by 2035	2045
Source: Executive Order N-79-20			

NOISE AND VIBRATION

Freight operations rely on multiple modes of transportation and a variety of cargo handling equipment (CHE) at seaports, airports, intermodal rail yards, warehouses, distribution centers, etc. These activities often generate noise and vibrations from diesel engines of trucks, CHE and locomotives, loading and unloading containers, coupling and de-coupling rail cars, etc. Both at the federal level and at the state level, noise and vibration impacts are identified during the project development process and mitigated to the extent possible. Under the National Environmental Policy Act (NEPA), the Federal Transit Administration established the guidelines for assessing noise for rail, Federal Aviation Administration for air, and Federal Highway

Administration for roadway activities. In addition to NEPA, major airports and seaports in California have established thresholds of significance pursuant to the California Environmental Quality Act (CEQA) aimed at minimizing community impacts.

The true impacts of noise vary, but the latest research shows that long-term impacts of noise can alter how the brain processes speech and increases difficulty in distinguishing speech sounds. In young children, this can impair cognitive development. Excessive noise can also create stress and reduce sleep resulting in hypertension, ischemic heart disease, and psychological disorders. Noise has also been linked to birth defects resulting from vasoconstriction in the mother that reduces oxygen and nutrition to the fetus. This research notes differences in intermittent noise and constant noise, low tones and high tones, as well as the times of day that noise occurs. Some freight-related noise impacts are intermittent, such as blowing train horns at at-grade rail/road crossings, coupling/de-coupling rail cars in rail yards located near residential neighborhoods and loading and unloading trucks at warehouses near residential neighborhoods.

These impacts can be reduced or mitigated by creating adequate separation between land uses when developing new communities, limiting hours of operations for existing freight facilities located near residential areas, and constructing grade separations to minimize the sounds of train horns.

STORM WATER RUNOFF

The Impacts of freight movement on Stormwater runoff share the same adverse effects as all vehicles that occupy the roads. Pollutants include hazardous waste movement, oil spills, fuel leaks, brake dust among other harmful pollutants to ground water and animal habitat. Caltrans Stormwater Management program maintains, reports, and develops tools to comply with the National Pollutant Discharge Elimination System[226]. The stormwater management program developed a Water Quality Planning tool to assist in the development and knowledge of storm water issues. Beyond the impacts of the vehicles that use the roadway, transportation infrastructure may also impact the flow and connections of water systems. In Southern California many highways cut through floodplains causing major damages when large storms flood or destroy California Infrastructure. The 2023 California State Highway System Management Plan (SHSMP) states that over the next 10 years $3,013,000,000 will be spent on storm water mitigation through SHOPP funding to meet state stewardship goals.[227] The goal of the storm water mitigation program is to address 12,186 Total Maximum Daily Loads acres including Areas of Special Biological Significance and 9,142 acres of Significant Trash Generating Areas by 2033.

IMPACTS OF FREIGHT ON WILDLIFE

California is an ecological hot spot with thousands of unique species of flora and fauna. The supply chain highways and railways directly impact road mortality, habitat fragmentation, and reduce wildlife connectivity. Major and secondary roads occur in 96% essential connectivity areas with impacts including roadkill, imbalance in predator/prey wildlife systems, and biological features essential for breeding, feeding and shelter. Beyond the visible effects of that roadways have on wildlife, noise and light created by construction also can alter wildlife activity patterns, increase stress, reduce reproductive success, and increase predation[228]. **Figure 5.3** shows where the California Truck Network intersects wildlife connectivity areas. Beyond roadways, the impacts of goods movement on wildlife can be seen in seaports, railways, and Air Cargo environments. In 2022 California approved AB-2344 Wildlife Connectivity: Transportation Projects bill that will require Caltrans to complete assessments of potential barriers to anadromous fish and identify potential wildlife connectivity barriers in coordination with the Department of Fish and Wildlife.

Figure 5.3: Regions where the California Truck Network Intersects with Essential Habitat Connectivity

Wildlife crossings are areas where animal movement is intercepted by roadways. The impacts of wildlife conflicts in the roadway are most often seen as roadkill, safety concerns to the public, but also have the potential to disrupt goods movement. Roadways will also create barriers to animal movement, dividing a population into more isolated population segments and developing negative ecological impacts. Environmental regulations will also guide transportation professionals to reduce or eliminate effects on special status species and habitats. Wildlife crossings have been implemented throughout the state to assist in mitigating the negative impacts of roadways on animals and habitat see **Figure 5.4**. To expand the protection on natural resources and ecosystems Caltrans strives to integrate advanced engineering and design methods into transportation projects to improve wildlife crossings and enhance aquatic and terrestrial habitat connectivity. **Figure 5.5** displays the wildlife crossings constructed in California to assist wildlife safely under or over roadways. To meet state goals on stewardship the California 2023 SHSHMP will require $890,000,000 in SHOPP funding on fish and wildlife connectivity.[229] The State goal is to improve 65.4% of wildlife connectivity locations to a state of good repair by 2033.

Figure 5.4: Example of Wildlife Crossing in California

Figure 5.5: California Wildlife Crossings and the California Truck Network

ANALYTICAL APPROACH TO FREIGHT FOCUSED ENVIRONMENTAL IMPACTS

This analysis is based on readily available data to allow for the ongoing monitoring of economic and environmental sustainability of the freight network and its effects on California communities. To understand the benefits and impacts geographically, three metrics have been calculated and mapped.

Metric 1 - Freight-Related Job Distribution
Data from the U.S. Census Bureau's County Business Patterns data for the following sectors are summarized by county and broken into sectors using North American Industry Classification System (NAICS) codes.[230] While the data captures most of the freight sector jobs and mostly excludes other non-freight industries, there is not a one-to-one correlation between NAICS sectors and freight-related jobs. The sectors used for this analysis that directly or indirectly use the freight network included the following (job data obtained for 2010 and 2015):

- Primary: NAICS Sectors 11 [Agriculture], 21 [Mining, Oil & Gas Extraction], 23 [Construction], 31-33 [Manufacturing], 44-45 [Retail Trade]
- Wholesale Trade: NAICS Sector 42
- Transportation & Utilities: NAICS Sectors 22 [Utilities], 48-49 [Transportation & Warehousing]

Metric 2 - Tons of Freight Related Emissions Per Day
Freight emissions data were obtained from CARB estimated annual average emissions estimates for stationary and mobile sources and are summarized by county. The following pollution source categories were selected, as they are either directly related to transportation or rely heavily on the freight network, which makes up a disproportionately large share of the total pollutant emissions from the transportation sector as a whole:

- Industrial Processes
    - Chemical
    - Electronics
    - Food and Agriculture
    - Glass and Related Product
    - Metal
    - Other Industrial
    - Wood and Paper
- On-Road Trucks
    - Light-Duty Trucks
    - Medium-Duty Trucks
    - Heavy-Duty Trucks

Emissions data were obtained for 2010 and 2015 and projected for 2035.

Metric 3 - Freight-Related Emissions per Freight-Related Jobs
Freight emissions per freight jobs were calculated by dividing tons of freight-related emissions per day by the number of freight related jobs in a county for 2010 and 2015. This metric links the economic benefit of freight (jobs) to the negative externalities (emissions) to investigate how benefits and externalities are distributed throughout the state.

FREIGHT-RELATED JOB DISTRIBUTION

Most (81 percent) freight and logistics-related jobs in California are located within counties that are in nonattainment for PM2.5 and have a substantial portion of the CalEnviroScreen disadvantaged communities. As part of the South Coast Air Basin, Los Angeles County contains 51 percent of the top 25 percent disadvantaged Census Tracts and more than a quarter of all freight related jobs in California – a greater portion than any other county. Given that the South Coast Air Basin is in nonattainment for PM2.5 and PM10, residents of Los Angeles County are exposed to a considerable amount of freight-related pollution.

Figure 5.7 illustrates the distribution of freight jobs by county for 2010, 2015, and the net change between the two years. The greatest freight employment concentration in 2015 was found in 11 counties that had 100,000 or more freight-related jobs. Much of the growth in freight-related jobs from 2010 to 2015 occurred outside of the top 11 counties, except for San Mateo County, which experienced a 40 percent increase in freight-related jobs over that period. Five counties that were not in the top 11 in 2015 experienced between 45 percent and 60 percent growth in freight employment from 2010 to 2015. Of those counties, only Madera County is currently in nonattainment for PM2.5 and PM10.

TONS OF FREIGHT RELATED EMISSIONS PER DAY

Freight-related emissions are mapped by county for 2010, 2015, and the net change between the years in **Figure 5.8**. The counties with the largest share of freight-related emissions are also those in nonattainment areas with larger shares of CalEnviroScreen disadvantaged communities. Los Angeles County has the highest freight-related emissions of any county in California. Unfortunately, geography and a pervasive inversion layer that traps ozone in California's valleys creates the perfect environment for the formation of smog. Given these conditions, achieving complete attainment conditions requires extensive and continuous effort.

FREIGHT-RELATED EMISSIONS PER FREIGHT-RELATED JOB

Pollution burden per freight job is another indicator of the balance between the benefits (jobs) of freight and logistics, and the negative impacts (emissions). Freight jobs are more likely to create negative impact in non-attainment areas than other places. However, it is possible to gain economic benefit from freight jobs without impacting communities. For example, a majority of the San Joaquin Valley is in PM and Ozone nonattainment areas. Although, the number of freight jobs within the region have been increasing, causing the reduction of emissions per freight job between 2010 and 2015, larger efforts are still needed to substantially decrease emissions from the freight sector including greater transition to cleaner and more efficient vehicles and equipment.

Figure 5.6: 710 Freeway, Los Angeles, California

Figure 5.7: Distribution of Freight Jobs by County, 2010-2015 (Source: Census Data, 2010-2015, California Statewide Freight Forecasting model data base. Fehr and Peers)

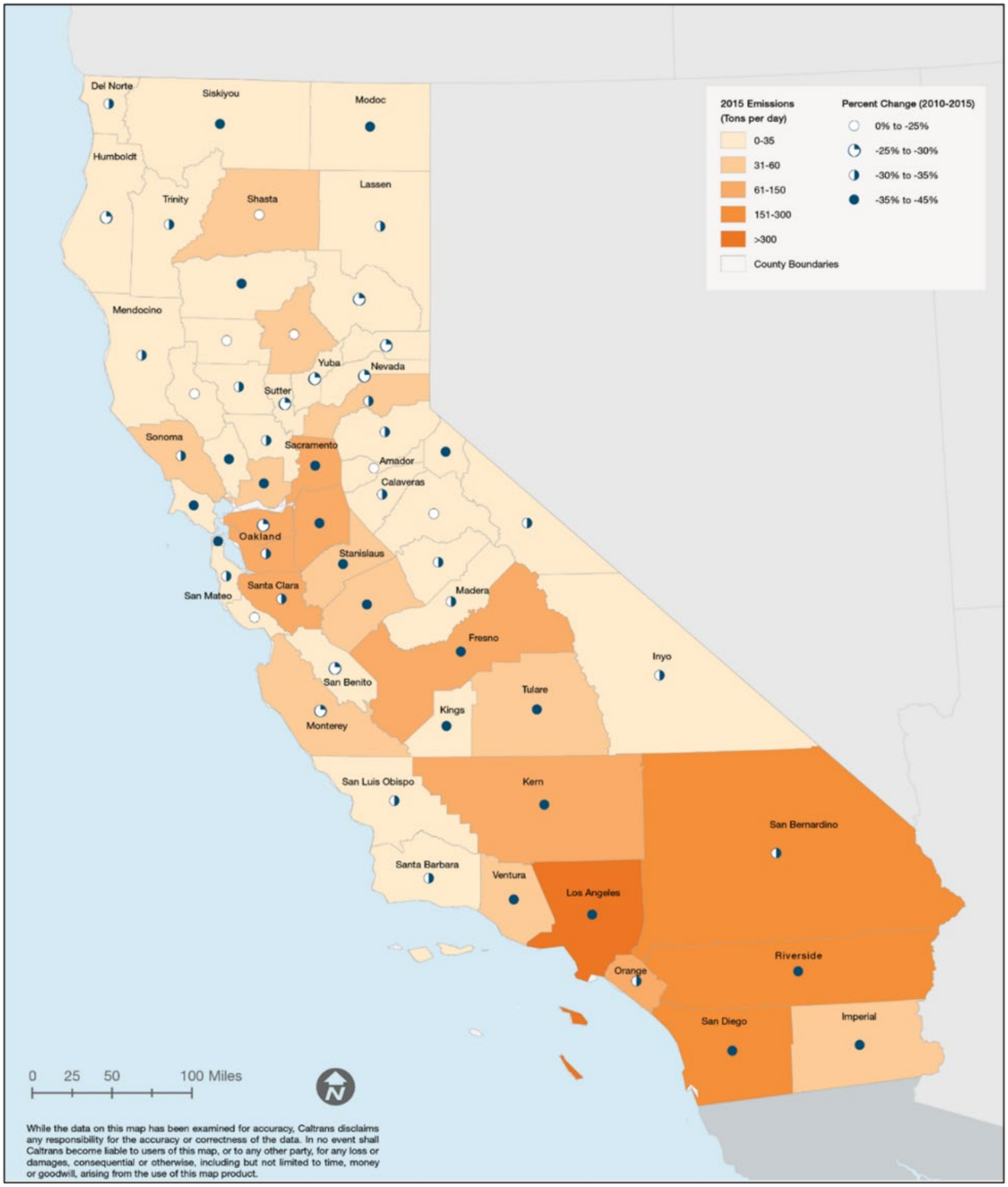

Figure 5.8: Freight-Related Emissions by County, 2010-2015 (Source: California Air Resource Board, EMFAC 2017, Analysis and summaries by Fehr & Peers)

Ongoing Progress for a Healthier California

CARB, various State, and regional agencies, in collaboration with freight partners and stakeholders, continue to implement broad air quality improvement programs through a combination of regulations, incentives, and policies designed to support the transformation of the freight system and reduce community impacts from freight operations in California. These ongoing freight sustainability initiatives focus on emissions reductions through a program of data collection, emissions monitoring, technology advancement, and technology replacement. The following describes some ongoing freight initiatives and key progress.

CAP AND TRADE PROGRAM

CARB oversees the California Cap and Trade program, a system designed to reduce the amount of GHG emissions that are released into the atmosphere by corporate operations (the "cap"). The "trade" part of the system allows companies to buy and sell their emissions allowances, which incentivizes companies to decrease emissions where possible and to sell the extra credits. Each year, the emissions cap is split into allowances that CARB distributes (one allowance equals to one ton of emissions) to companies for free or by auction. The cap total declines every year, which gives an incentive for companies to find ways to continue to decrease its emission totals.[231]

Since 2017, CARB has used Cap and Trade dollars to implement over $3 billion worth of projects spanning 60 programs. The programs vary from, focusing on the reduction of climate pollution, building affordable housing, to protecting communities from wildfires. Currently, over 60 percent of all investments fund projects that help low-income and communities disproportionately burdened by pollution.

CARB COMMUNITY AIR PROTECTION PROGRAM

In 2018, in support of AB 617 (Assembly Bill 617) (C. Garcia, Chapter 136, Statues of 2017), CARB created the Community Air Protection Program (CAPP) focused on reducing emissions exposure in communities most impacted by air pollution.[232] Communities around the State are working together to develop and implement new strategies to measure air pollution and reduce health impacts.

This first-of-its-kind statewide effort includes community air monitoring and community emissions reduction programs. In addition, the Legislature appropriated funding to support early actions to address localized air pollution through targeted incentive funding to deploy cleaner technologies in these communities, as well as grants to support community participation in the AB 617 process. AB 617 also includes new requirements for accelerated retrofit of pollution controls on industrial sources, increased penalty fees, and greater transparency and availability of air quality and emissions data, which will help advance air pollution control efforts throughout the State. This new effort provides an opportunity to continue to enhance our air quality planning efforts and better integrate community, regional, and State level programs to provide clean air for all Californians. **Table 5.5** shows the milestones listed on the program's webpage.[233]

Table 5.5: AB 617 Summary of Milestones

Summary of Milestones	
July 2017	AB 617 signed by Governor Edmund G Brown Jr.
September 2018	CARB Board approved the Community Air Protection Blueprint and selected the initial 10 communities for community air monitoring and/or community emissions reduction programs.
January 2019	Air Districts developed expedited schedules for implementing BARCT, which must be implemented by the end of 2023.
July 2019	Air districts deployed monitoring in 2018 communities selected for community air monitoring systems.
September 2019	Air districts adopted the 2018 community emissions reduction programs.
December 2019 & annually thereafter	The Board considers additional communities for air monitoring and community emissions reduction programs. The Board considers air districts community emissions reduction programs.
By October 2020 & annually thereafter	Air districts provide annual reports for communities selected for community emissions reduction programs.
By January 2021 & annually thereafter	Within one year after the selection of additional communities, air districts adopt community emissions reduction programs.
By September 2023	CARB updates the Statewide Strategy, which is required to be updated once every five years.
Source: CARB Community Air Protection Program	

CAPP's focus is to reduce exposure in communities most impacted by air pollution, including community air monitoring and community emissions reduction programs. There is appropriated incentive funding[234] to deploy cleaner technologies in these communities, as well as grants to support community participation in the AB 617 process. AB 617 also includes new requirements for accelerated retrofit of pollution controls on industrial sources, increased penalty fees, and greater transparency and availability of air quality and emissions data, which will help advance air pollution control efforts throughout the state.[235]

SAN PEDRO BAY PORTS CLEAN AIR ACTION PLAN

The San Pedro Bay Ports, comprised of both Ports of Long Beach (POLB) and Los Angeles (POLA), developed a Clean Air Action Plan (CAAP) which initiated a menu of strategies to reduce emissions generated by port activities. One of those strategies is an emissions reduction of select criteria pollutants. The CAAP set 2023 as the target year in which DPM, NOx, and SOx should fall compared to 2005 levels. Every year since 2006, the two ports have prepared an emissions inventory to monitor and measure annual progress towards the CAAP 2023 goals. **Table 5.6** summarizes the total reduction for each type of emissions and illustrates positive progress the ports are making to meeting the 2023 targets.

Table 5.6: San Pedro Bay Ports Emissions Reductions Compared to 2023 Goal

	Clean Air Action Plan (CAAP) 2023 Goal*	Overall Emissions Reductions (2021)*
DPM	77%	84%
NOx	59%	44%
SOx	93%	95%
*Source: San Pedro Bay 2021 Air Quality Report Card (CRS) *All changes shown compared to 2005 baseline levels*		

SAN PEDRO BAY PORTS TECHNOLOGY ADVANCEMENT PROGRAM (TAP)

The TAP, founded by POLB and POLA, in collaboration with SCAG, Metro, SCAQMD, and CARB, has provided support to original equipment manufacturers (OEM) for more than a decade. TAP has led to the deployment of cleaner equipment by providing funding, research, and testing support for over 30 projects spanning test cycle development, hybrid and alternative fuel technology demonstrations, and ZE equipment operation. Through these initiatives, major OEMs have invested in, and developed commercially available clean equipment, such as electric, hybrid, hydrogen and natural gas trucks, and CHE. San Pedro Bay Clean Trucks Program funding has been successful at getting transitioning on-road drayage trucks to Zero-emission and reducing over 90% of air pollution in 3 years[236].

POLB COMMUNITY GRANTS PROGRAM

The POLB Community Grants program, an unprecedented effort to lessen freight effects on local communities, began in 2009 with an investment of $17.4 million to fund three different program initiatives: Community Health, Facility Improvements, and Community Infrastructure. To date, the community-based grants have funded a variety of community betterments, such as asthma vans providing mobile medical services, tree planting, double-paned windows, and upgrades to heating ventilation/air conditioning filtration systems in sensitive areas, such as schools.

Over the next 12 to 15 years, POLB plans to invest an additional $46.4 million toward more of these projects that reduce impacts on air quality, traffic, noise, and water quality.

PORT OF OAKLAND

The Port of Oakland began collecting data and monitoring emissions generated by a variety of sources in 2005. Pursuant to reducing port-generated emissions, the Port is actively managing three key programs:

- Seaport Air Quality 2020 and Beyond Plan
- Comprehensive Truck Management Plan (CTMP)
- Port of Oakland Shore Power Program

The Seaport Air Quality 2020 and Beyond Plan envisions a zero-emissions operation for the Port of Oakland. Example of projects envisioned in the plan include converting the port's fleet vehicles and equipment to zero-emission, identifying cleaner fuels and renewable power sources, installing electric infrastructure at container terminals, and monitoring fuel consumption, operations, and performance. This is the successor to the Maritime Air Quality Improvement Plan (MAQIP) that was adopted prior to 2010.

Both the CTMP and the Shore to Ship Power program are key elements of the overall Seaport Air Quality and Beyond Plan 2020. These programs address the deep concerns of the community, including minimizing emissions from ocean-going vessels, the removal of trucks from residential areas for air quality reasons, and minimizing noise, improving safety, and mitigating roadway maintenance impacts. Port of San Diego

In 2021 the Maritime Clean Air Strategy (MCAS) was approved to identify future projects and initiatives to improve the health of the communities around the Port of San Diego. The MCAS establishes a goal of 100% of cargo trucks and cargo handling equipment at the port terminals to be Zero-Emission by 2030. The strategy also includes the implementation of an all-electric tugboat by June 30th, 2026. This electric tugboat will replace the diesel boat that consumes more than 30,000 gallons of diesel per year[237].

PORT OF HUENEME

The Port of Hueneme was the first port in California to become Green Marine Certified in in 2017. The Port is an active community partner committed to preserving and protecting the health and viability of the local and regional communities and economies alike. The Port of Hueneme made a commitment, via board resolution, to minimize, mitigate and eliminate the environmental impacts associated with trade operations on the surrounding community and local environment by implementing green initiatives through community and customer partnerships. As part of its commitment to being in full compliance with federal, state and local regulations, and to expand its environmental stewardship program, the Port of Hueneme has partnered with the Ventura County Air Pollution Control District to build a first-of-its-kind climate action plan called PHRESH (Port of Hueneme Reducing Emission, Supporting Health). From the initial conclusions drawn from the first community monitoring sensor, the Port recently made a video in Spanish.

TRUCK SALES REQUIREMENTS (ADVANCED CLEAN TRUCKS AND ADVANCED CLEAN FLEETS)

The approved Advanced Clean Truck Regulation is part of a holistic approach to accelerate a large-scale transition of ZE medium-and heavy-duty vehicles from Class 2B to Class 8. The Advanced Clean Trucks regulation is a manufacturers ZEV sales requirement and a one-time reporting requirement for large entities and fleets. The Advanced Clean Fleets (ACF) regulation is part of the California Air Resources Board's (CARB or Board) overall approach to accelerate a large-scale transition to zero-emission medium- and heavy-duty vehicles. This regulation works in conjunction with the Advanced Clean Trucks (ACT) regulation which includes Drayage fleets. Beginning January 1, 2024, trucks must be registered in the CARB Online System to conduct drayage activities in California. Non-zero-emission "legacy" drayage trucks may register in the CARB Online System through December 31, 2023. Legacy drayage trucks can continue to operate through their minimum useful life. Beginning January 1, 2024, only zero-emission drayage trucks may register in the CARB Online System. All drayage trucks entering seaports and intermodal railyards would be required to be zero-emission by 2035.

CARB adopted the Advanced Clean Fleets (ACF) rule in April 2023 to fully transition trucks that travel across the state to zero-emissions technology by 2045. In addition, CARB is exploring additional measures such as the Zero Emission Truck Measure which would seek to accelerate the number of zero-emission trucks beyond existing measures. Even after the implementation of the ACT and ACF regulations, about 480,000 heavy-duty combustion powered trucks will still be on the road. In this modified approach, CARB staff would seek to upgrade these remaining heavy-duty combustion trucks to new or used ZE trucks rather than to trucks with cleaner combustion engines. For this measure, CARB staff would implement regulatory strategies to achieve the goal of transitioning the remainder of the heavy-duty combustion fleet to ZE trucks.

OCEAN GOING VESSELS AT-BERTH

The California Air Resources Board approved in April 2020 a new regulation designed to further reduce pollution from ocean-going vessels while docked at California's busiest ports. The rule builds on progress achieved by the groundbreaking At-Berth Regulation adopted in 2007. That rule has achieved an 80 percent reduction in harmful emissions from more than 13,000 vessel visits since 2014. The updated rule adds new vessel categories which will be required to control pollution when they run auxiliary engines or auxiliary boilers (for most tanker vessels) while docked. These auxiliary engines power the electricity and other onboard operations during a vessel's visit, which can run from less than one day to several days.

TRUCK OMNIBUS

The Heavy-Duty Engine and Vehicle Omnibus Regulation (Omnibus Regulation) was adopted on September 9, 2021, and became effective on December 22, 2021, to drastically cut smog-forming nitrogen oxides (NOx) from conventional heavy-duty engines. The Omnibus Regulation will significantly increase the stringency of NOx emissions standards and will also lengthen the useful life and emissions warranty of heavy-duty diesel engines for use in vehicles with a gross vehicle weight rating (GVWR) greater than 10,000 pounds. The more stringent NOx emission standards begin with the 2024 model year engines and become more stringent with 2027 and subsequent model year engines. .[238]

Future Actions for Change

While California has some of the most vigorous environmental standards in the nation because of its shared values in protecting communities and natural resources, more efforts are needed.

California looks to new regulations to further improve environmental health. There are wide-ranging, upcoming regulations that can further contribute to cleaner air for Californians. These freight-focused regulations include ZE and cleaner combustion requirements across trucking, rail, and maritime freight industries. The following regulations are either currently proposed and will not be implemented until the CARB Board votes to approve the measures or are already starting implementation. .

LOCOMOTIVE

The California Air Resources Board (CARB) passed a new rule in April 2023 aimed at reducing emissions from locomotives when they operate within the state.

Under the In-Use Locomotive Regulation, operators will now be required to pay into a spending account, and the amount will be determined by the emissions they create while operating in California. Companies will be able to use the funds to upgrade to cleaner locomotive technologies. Locomotives also will have a 30-minute idling limit. Additionally, switch, industrial and passenger locomotives built in 2030 or after will be required to operate in zero-emissions configurations while in California, and in 2035 for freight line haul.

TRUCK INSPECTION AND MAINTENANCE

SB 210 (Levya, 2019) directed CARB to develop and implement a comprehensive heavy-duty vehicle inspection and maintenance (HD I/M) regulation requiring periodic vehicle emissions testing and reporting on nearly all heavy-duty vehicles operating in California. The Board approved the HD I/M regulation on December 9, 2021, with implementation to be phased in starting January 2023. Combining periodic vehicle testing with other emissions monitoring and expanded enforcement strategies, the HD I/M regulation will ensure that vehicles' emissions control systems are properly functioning when traveling on California's roadways. When fully implemented, the HD I/M regulation will provide significant reductions in smog-forming and carcinogenic toxic air pollution necessary to achieve federal air quality mandates and healthy air in California's communities.

CARGO HANDLING EQUIPMENT

The regulatory amendments would propose an implementation schedule for new equipment and facility infrastructure requirements, with effective dates beginning in 2026. In this potential action, all mobile equipment at ports and rail yards, including but not limited to, diesel, gasoline, natural gas, and propane-fueled equipment, would be subject to new requirements.

5B. Partnerships & Engagement

This section provides a summary of stakeholder input collected through an online survey, one-on-one interviews with freight industry representatives, outreach to focus groups, public workshops, and events, AB 617 Clean Air Communities. Native American Listening Sessions, and other stakeholders and entities. Among the biggest concerns of those contacted were economic competitiveness, emerging technologies, workforce recruitment and retention, environmental impacts, and new projects types the respondents could expect to see. Stakeholder contacts included the following:

- A targeted online survey.
- Industry focus groups attended by industry, trade association representatives and regional public agencies.
- Individual in-person or telephone interviews with representatives of ports, railroads, the trucking industry, and an industrial development firm.
- Break-out sessions and workshops at CFAC meetings throughout the development of the CFMP.
- Public workshops held in West Sacramento and Diamond Bar.
- Multiple Tribal Listening Sessions held in Northern, Central, and Southern California.
- Public outreach events held in various parts of the state at existing public events including communities identified under AB 617.
- Digital Outreach via Facebook (social media) that directed the public to an online survey.

Details of the stakeholder outreach and engagement process are provided in **Appendix H** along with more detailed descriptions of results. The conversations that occurred during the industry workshops, public meetings, and one-on-one meetings illuminated different areas of importance. Participating members of the industry focused on the economic viability to continue operating in California; residents and community members focused on environmental issues and congestion; and public agencies focused on infrastructure planning, policies, and programming. Our findings are categorized into these general topics:

- Competitiveness
- Technologies
- Workforce
- Environmental Impacts
- Projects
- Native American and Tribal Groups

Competitiveness

The following ideas were suggested through stakeholder outreach and do not represent an official position from the State at this time. California's economic competitiveness relies upon the expedient and reliable movement of goods, with no funding preference given to freight delivery modes via air, sea, or land. Although, California has a substantial share of the nation's market for shipping and logistics, the state could increase its competitiveness by better integrating its varying priorities. Many of the strategies to improve California's competitiveness also improve other facets of the freight industry. For information regarding California competitiveness, please refer to **Chapter 2** and **Appendix C.**

PARTNERSHIP

State agencies can work together to streamline CEQA compliance and offer grants or incentives for compliance with CARB regulations. Furthermore, cooperative efforts to lower the cost of living, primarily housing, can serve as an incentive to recruit and retain a workforce. In partnership with the public education system, private companies can recruit and train a qualified workforce. Furthermore, the State can explore ways to decrease speed differentials between commercial trucks and passenger vehicles and increase weight limits. Increased collaboration on statewide and regional economic development efforts has a ripple effect, inspiring implementation of more efficient and sustainable practices.

RELIABILITY

Reliable infrastructure is necessary for logistics facilities to function properly. The freight system relies on the State to provide adequate facilities for travel and rest as well as signage and travel time. The State can also ensure excellent roadway and highway pavement conditions with the goal of easing urban and highway congestion. This has the potential not only to increase the State's competitiveness by increasing productivity and reliability, but also improves conditions for the state's workforce.

One example of a multifaceted approach to increase California's competitiveness would be to implement more efficient technology to help lower costs. However, this would also likely require making changes to electric power rate structures to make predicting the cost of electricity feasible and reliable.

SEAPORTS

According to focus group participants, a focus on performance goals could help increase economic competitiveness of California's seaports. Electrification of port equipment and drayage tractors will require substantial investment in the electric power infrastructure. Although it reduces GHG emissions significantly, shore power infrastructure is costly to construct and operate. Finding ways to collaboratively design strategies between State regulations and privately held interests can help improve port competitiveness. Some such strategies include prioritizing and incentivizing industrial buildings near ports and markets through streamlined permitting and financial assistance for private industries who invest in ports, especially as they relate to ZEVs.

Technologies

Investing in new and innovative technologies can increase California's competitive edge within the freight sector by making travel times more reliable, decreasing fuel costs, and improving efficiency. New environmental beneficial technologies also have the potential to lessen the environmental impacts of the industry and make it a more desirable profession to the workforce. The State can play a significant role in providing or incentivizing infrastructure development, particularly electric power and alternative fuels infrastructure that is otherwise holding back technology adoption. The State can also lead research and development through special study contracts and create specific, internal programs to the effort. Moreover, the outcomes from research can inform the private industry on which technologies to adopt without needing to spend resources on technologies that may not pan out, therefore increasing competitiveness of California's private entities.

TRUCK PLATOONING AND AUTONOMOUS VEHICLES

Truck platooning and the use of autonomous vehicles have the potential to eliminate driver-caused errors, increase safety, decrease travel times, and decrease fuel usage. Despite this, many private sector stakeholders are hesitant to adopt platooning, expressing that the fuel savings benefits need to be studied further. This may be due to the possibility that platooning meets significant barriers in urban areas and last-mile deliveries. Smooth transitions between long-haul and shorter distance deliveries would need to be clearly defined and coordinated, as automobile and light-duty truck entrances and exits onto roadways may disrupt platoons. In addition to the obstacle posed by heavily urbanized areas, loss of communications in hilly or mountainous areas can affect performance so investments need to be made to increase service reliability.

Some regard the use of autonomous vehicles as a possible solution to the driver shortage. The following ideas were suggested through stakeholder outreach and do not represent an official position from the State at this time. The State of California is a major fleet operator and could use its state vehicle fleet to test new technologies. The potential for autonomous trucking may be limited to designated corridors, such as where dedicated lanes are provided.

INFORMATION TECHNOLOGIES

One critical item identified was the need for improved network cell phone connection and infrastructure. In the northern regions of California, for example, there is a lack of available cell reception, due to greater distances between cell phone towers and dispersed populations. Possible solutions include maintaining up-to-date and accurate information on navigation systems and social media feeds, promoting 1-800-427-ROAD (7623), developing mobile applications to help notify drivers of problems on the road, increasing broadband availability and ITS applications (such CMS), and developing maps specific to trucks for appropriate alternative route options during traffic incidents and road closures.

Caltrans has initiated several actions for enhancing broadband connectivity throughout the State that would help both the community and travelling public including:

- California Governor's Executive Order S-23-06 directed the establishment of the California Broadband Task Force to bring together public and private stakeholders to better facilitate broadband installation, identify opportunities for increased broadband adoption, and enable access to and deployment of new advanced communication technologies.
- California Governor's Executive Order N-73-20 aims to improve digital connectivity across the state through the establishment of a State Broadband Action Plan.
- California's "Broadband for All" Action Plan calls for the implementation of a Dig Smart policy to install conduit as part of any appropriate and feasible state-funded transportation project in strategic corridors, as an incentive for service buildouts for un- and under-connected communities.
- California's Middle-Mile Broadband Initiative (MMBI) is an open access, state-owned high-capacity fiber lines to carry large amounts of data at higher speeds over longer distances between local networks. It will connect to a last-mile broadband infrastructure that will connect homes and businesses with local networks.

Another need in the information technology sector is further development and refinement of terminal appointment systems, which have made positive differences at ports and receivers. This would greatly increase worker productivity and reduce emissions from idling vehicles.
Even though the industry relies on broad access to industry data, stakeholders typically do not share their proprietary information for competitive reasons. IT experts from private industry,

various ports, retailers, and cyber security firms should convene to develop a protocol for sharing data across networks, while also ensuring privacy of confidential data and proprietary information.

MANDATED TECHNOLOGY

The mandated use of Electronic Logging Devices (ELDs) was intended to increase safety by requiring truckers to stop and rest after a certain number of hours on the road. Mandated use of ELDs, in addition to adherence to company policies, sometimes cause drivers to operate during congested times or during incidents, meaning added delay on local and state roadway systems. For example, if a driver has driven for the maximum amount of time allowed by law, then they must stop and take a break to maintain in good standing with their company and the law. This can force drivers to stop against their better judgement, instead of allowing them to continue past a section of highway or city known for congestion. The driver, then at the end of the break period, will need to continue to their destination, regardless of traffic conditions. This causes added congestion onto the highways and delays for truckers. Drivers face harsh penalties for non-compliance with ELD mandates and to avoid fines, they may speed which impacts public safety. ELD mandates also decrease driver productivity because the clock, which counts towards total driving hours, cannot be stopped between non-driving activities, such as loading, unloading, or other responsibilities.

TECHNOLOGY GRANT PROGRAMS

To remain competitive, funding opportunities should be expanded and shared widely so more private businesses can take advantage of them. Although grant funding is sometimes the condition on which new technologies are implemented, many private organizations, especially smaller ones, do not have grant writers or grant administrators to help with the process.

New regulations that will require replacing older equipment with cleaner ones are attainable, but these regulations add business costs and uncertainties contributing to decisions to expand or relocate outside of California. Those who participated in focus groups felt the State should continue to encourage private investment in new and better chassis, global positioning systems (GPS), and related communications and dispatching technologies.

Technology research, development, and implementation play an important role in emissions compliance and environmental benefits. There is a push in the industry to reduce emissions through hybridization. For example, BNSF has obtained grant funding for a demonstration between Stockton and Fresno in which low-emissions or zero-emissions drayage equipment will be part of new terminal projects. Railroads will likely pursue some level of terminal equipment automation. Short line railroads have benefited from Carl Moyer grants and other funding for locomotive replacement, but more help is needed to meet technology needs.

IMPLEMENTATION OF NEW TECHNOLOGIES

Often, emerging technologies serve as the key to lessening the environmental impacts of freight activities. Even so, alternative fuel infrastructure often lags vehicle technology, creating a barrier to achieving GHG reduction targets. For example, while there may be an increase in the number of electric trucks, there are very few places to charge them. Increasing use of alternative fuels (natural gas, hydrogen, electric power) and creating more infrastructure to support its use could, in turn, reduce congestion and transit time. Additionally, less conventional approaches to improve efficiency, such as truck platooning, also have advantages that are often overlooked and would greatly lessen the environmental impacts of goods movement.

Workforce

There is a national shortage of qualified truck drivers. The truck driver shortage is a special workforce issue and a factor in all other categories– competitiveness, sustainability, and technology. This issue was raised in every outreach forum and survey. Although this problem is less prevalent in California than in other parts of the country, the outreach phase of the CFMP yielded a variety of solutions to increase the number of skilled drivers to meet the growing demand in our state.

BARRIERS TO ENTRY FOR POTENTIAL DRIVERS

The largest barrier to entry for new drivers entering the trucking profession is the cost of trucking school. Drivers must often go into debt to attend driver school. Furthermore, insurance companies require two years of experience before they will cover a driver, but a new driver is unable to gain any experience without first having insurance.

The State has already begun addressing this issue by building a connection between education and the private sector through training offered at public colleges and job placement services for graduates. For example, Long Beach City College offers a program to prepare students for a commercial driver's license (CDL) and place them with Harbor Trucking Association members. These efforts can be augmented by increasing the number of these programs available throughout the state and offering more grant and scholarship programs to incentivize students to choose trucking as a career. Private sector companies can increase participation in job training programs in partnership with universities and offer scholarship programs of their own. Additionally, the public secondary education system can emphasize the value of hands-on professions and trades, rather than solely focused on a four-year college.

WORKING CONDITIONS AND COMPENSATION

Another strategy for strengthening the trucking workforce focuses on driver retention. Trucking often requires long hours at night, early mornings, and time away from home for drivers. The private and/or public sector need to provide safe and legal options for truck parking, so drivers can take breaks between assignments and comply with the regulations for mandatory rest periods. Not only would an increase in truck parking make roads safer, but it also would reduce the number of drivers being ticketed or towed for taking breaks in prohibited areas.

Freight operations is an industry rife with intense competition that holds down rates and wages. Drivers often face a lack of competitive pay compared to other industries. One way the state can ease the financial pressure placed on drivers is to increase the amount of affordable housing options within California to help compensate for the competitive wages offered by the industry.

DRIVER PRODUCTIVITY

A third strategy for meeting demand for qualified drivers is to maximize productivity of the existing workforce. Driver productivity is often lost to urban traffic and highway congestion. Similarly, longer port turn times force drivers to sit idly while making little progress on their deliveries. Recently, there has been an adverse impact on driver productivity due to complexities of empty container and chassis returns, the limitations of current appointment systems, and the reduced opportunity to make dual moves (which have reportedly declined from 81 percent to 19 percent). By better coordinating deliveries with off-peak hours, tracking chassis and containers, and strengthening the appointment system, the capacity of the existing workforce can be better harnessed.

Environmental Impacts

Environmental responsibility is a crucial consideration and one that cuts across a range of other issues. Some stakeholders view a conflict between environmental responsibility and the need for employment and earnings security. However, there are many ways in which the State can marry environmental conservation efforts with other policies to implement the shared vision for a thriving transportation system.

FUNDING

Many freight industry stakeholders expressed concern about the cost of regulation compliance cutting into profit margins and losing business to other states with lower environmental standards. To maintain its current freight industry market share, the State can increase the number of grant and incentive programs to support ZE compliance. This could take the form of providing subsidies or incentives for state regulatory compliance, grants for the implementation of ZE technologies or assistance with the costs, or labor supply and costs of retraining. By better aligning the available funding and financing to what the industry needs, the State may more effectively work with trucking companies of all sizes to meet its goals.

Another key funding priority is increased railroad infrastructure. Short line rail lines have the ability to ease highway congestion through modal shift. However, short line railroads would benefit from increased local and state recognition and cooperation. Achieving the expected public benefits of modal shift will require public financial support, including a strong partnership with CARB.

Projects

Freight infrastructure improvements should focus on maintenance, safety, freight rates per mile, system continuity, system redundancy, and pavement condition improvements. To serve the interests of all users, freight stakeholders should use an integrated approach assessing the needs of the freight system and when developing multi-faceted projects that encourage cross-collaboration with public and private partners.

The best resource available to measure progress and rate achievements is the CFAC and its members. The CFAC should encourage the freight industry to actively participate in CFAC meetings and collaborate with its members to support and inform decisions that yield the highest returns.

TRUCKING PROJECTS

Often, the projects that have the largest, positive impact on freight are those which focus on bottleneck relief, such as truck climbing lanes, passing lanes on rural routes, interchange and entrance/exit geometry improvements, filling capacity gaps in major routes (e.g. SR 99), adding weigh stations and WIM scales, and improving connectivity of east-west connectors between U.S. 101, SR 99 and I-5.

As previously mentioned, California has a shortfall of truck parking, which is needed to operate a safe highway system for passenger vehicles, truckers and the environment. Many truck drivers resort to parking in non-sanctioned areas due to overcrowded, sparse truck parking. To alleviate this, the State should determine where truck parking, rest stops, and truck stops are needed and start a program to provide them by both private and public sectors. The State should also locate and mark safe stopping spots for mandated breaks and consider identifying, marking, and creating legal parking spots on Caltrans' right-of-way when private sector options are not available. For more information regarding truck parking please refer to Chapter 3 of the 2021 California Statewide Truck Parking Study. [239]

SEAPORT PROJECTS

Some members of the CFAC felt that one of the best strategies to ensure that California's seaports continue to be accessible and competitive would be by maintaining the channel depths. The CFAC members also mentioned providing more funding for wharfs, fendering, dredging, and wider turning basins to handle larger ships and the effects of climate change. Other important freight projects are port-rail projects that aid to shift truck trips from off-dock railyards to on-dock railyards.

Additionally, interagency efforts could find a way to streamline infrastructure projects that do not pose negative impacts on communities. The State should consider alternative growth projections that assess not only impacts of tariffs and trading partners, but also technological advancements. The push for ZEV and electrification entails a need for significant private investment. But this may not be supported by private companies due to uncertainty over future regulations, long lead times, and business conditions in California which discourages capital investment. Incentives or funding from the public sector, or a public-private partnership may be necessary to implement California's vision for port projects.

RAILROAD PROJECTS

The Class I railroads have built a strong relationship with Caltrans and other agencies on rail transportation within California. With the development of the California High-Speed Rail, additional freight capacity may be available as passenger rail shifts to dedicated passenger tracks, allowing for a higher volume of freight to move along non-passenger tracks. Reducing capital project costs, barriers, and delays that can increase time and decrease reliability for deliveries of goods as well as working with public groups and private enterprises to find common ground for projects that have merit in increasing competitiveness without sacrificing public good.

AB 617 Community Outreach

Significant outreach was conducted to communities identified under the AB 617 Clean Air Community Protection Program, which are communities disproportionally impacted from air pollution, including air pollution form the freight sector. More information on this program is described in **Chapter 5A**. In total, outreach was conducted at eight different Community Steering Committee events, listed below.

- Presentation and outreach to AB 617 Portside Environmental Justice Steering Committee Meeting in San Diego on September 24, 2019 (in person)

- Presentation and outreach to San Bernardino/Muscoy AB 617 Community Steering Committee, October 20th, 2022 (online)
- Presentation and outreach to South Los Angeles AB 617 Community Steering Committee, September 8th, 2022 (online)
- Presentation and outreach to East LA, Boyle Heights, and West Commerce AB 617 Community Steering Committee, August 18th, 2022 (online)
- Presentation and outreach to Southeast Los Angeles AB 617 Community Steering Committee, August 4th, 2022 (online)
- Presentation and outreach to Wilmington, Carson, West Long Beach AB 617 Community Steering Committee, August 25, 2022 (online)
- Presentation and outreach to Eastern Coachella Valley AB 617 Community Steering Committee, October 27, 2022 (online)
- Presentation and outreach to Shafter AB 617 Community Steering Committee, September 22, 2022. (online)

Of the eight engagements, one was conducted in person and seven were conducted online. Participants were presented a presentation that described the importance of freight to California and its communities, how Caltrans was creating the California Freight Mobility Plan 2023, and why participant input was important to the creation of the plan. Participants were then asked two questions:

1) Which of the following freight impacts do you experience in your community?
    a. Truck traffic congestion
    b. Truck parking on residential streets
    c. Air pollution
    d. Truck driver safety (sharing public roads)
    e. Damaged road/pavement caused by trucks
    f. Noise pollution
    g. Other?
2) What projects do you think should be a priority in your community?
    a. Rail crossing safety projects
    b. Air quality improvement
    c. Freight job creation/ job training programs
    d. Increase zero emission charging stations/ infrastructure
    e. Truck congestion relief
    f. Truck parking
    g. Other?

Participants provided answers to these questions that were aggregated by Caltrans staff. From these eight events, a number of themes were identified. In terms of the impacts from freight that participants experienced in their community, some of the most important to them were (in no particular order): 1) air pollution from freight, 2) traffic congestion on roads caused by freight, 3) a lack of maintenance on routes used by trucks – too many potholes, and not enough upkeep, 4) a lack of infrastructure – e.g. bridges not being expanded to accommodate increased freight, and finally 5) gaps in the bicycle and pedestrian networks. Participants also identified which improvements they would like to see, which included: 1) air quality improvements, 2) more zero emission charging infrastructure, 3) truck congestion relief, 4) more maintenance on routes used by trucks, and 5) more community engagement.

Engagement with AB 617 Community Air Protection Communities was essential to understanding public concerns regarding freight, and the improvements they would like to see in their communities. A robust public engagement effort is essential to understanding the concerns of communities that are disproportionally impacted by the freight sector and this outreach will continue during the implementation of the CFMP 2023 and into the next plan update.

Native American and Tribal Groups Freight Connections

California is home to more than 100 federally recognized Native American tribes and approximately 80 informal tribes and individuals. Many of the federally recognized tribes own tribal lands officially designated as reservations or Rancherias. As with all communities, Native American communities rely on the freight system to obtain goods and services and to export products. This chapter presents background information and connections between tribal lands and peoples and the California freight system.

TRIBAL LANDS AND PROXIMITY TO FREIGHT FACILITIES

Great expanses of California are regarded as Native American ancestral lands, which contain important locations of historical significance, including sacred burial grounds, traditional foods, materials, and cultural resources. Currently, federally recognized tribal land is fractioned throughout the state, but is most heavily concentrated in areas south and east of Los Angeles County and the Northern California Coast. San Diego County is home to 17 Tribal governments–the most in one county in the contiguous U.S. There are 16 federally recognized tribes located in Riverside and San Bernardino counties that are within the SCAG metropolitan planning region. Not all tribes have reservations or rancherias. In general, most tribal lands are in rural areas.

The SHS provides vital access and connectivity for tribal lands; however, given the rural location of most reservations and rancherias and the roadway geometric restrictions of some rural highways, some state highways and many local roads that provide access to tribal lands do not allow passage by full-size, fifty-three-foot truck trailers - the standard "big rig." Having to divide large truckloads of goods into smaller trucks can add cost and time to tribal shipment deliveries, resulting in increased business and consumer prices. Terminal access routes and last-mile freight connections are vital to tribal governments engaging in economic development.

Many tribal lands are within proximity of or intersect with the California SHS. Of the federally recognized tribes in California, 100 of these have trust land within five miles of the SHS. Seventy-eight percent of the recognized tribes on tribal land are within two miles of the SHS, and 35 percent of the tribal governments have trust land that intersects with the SHS.

Improving freight infrastructure access between State Highway thoroughfares and local tribal service roads is crucial. The handful of existing programs dedicated to tribal governments for accessibility projects are listed in the Federal and State Recognized Tribes. Continued partnerships with tribes, Caltrans, and local agencies will play a key role in enabling the necessary access and economic development to help alleviate high unemployment in tribal areas.

In its comments to the USDOT regarding the proposed National Primary Freight Network, CalSTA recommended that the federal freight planning guidance include roadway connections between trust lands and the federally designated freight network. Federal guidance regarding the designation of the rural and urban connectors has been issued. To be consistent with the pending federal designation process, Caltrans will engage in the designation of tribal freight connectors at the same time the rural and urban connectors are identified. In many cases, it is likely that the tribal and rural connectors will use the same routes.

As with many neighborhoods adjacent to any major truck route or rail line in North America, California tribes may also be negatively impacted by freight activity without benefitting from the movement of freight in their communities. However, through better consultation process, detrimental impacts may be avoided or mitigated.

TRIBAL CONSULTATION PROCESS AND GUIDANCE

As sovereign powers, the governments of federally recognized Tribes are entitled to consultation with the California State government on matters affecting their respective Tribal lands, cultural heritage sites, and other issues of significance to them as outlined through AB 52.[240] Caltrans Director's Policy (DP-19), "Working with Native American Communities," guides Caltrans' relationship with tribes, requiring the Department to "recognize and respect important California Native American rights, sites, traditions, and practices." Tribal consultation is a vital step in the transportation planning process.

As a part of the CFMP outreach efforts, Caltrans' staff participated in "tribal listening sessions" in various locations within California and received input from 40 Native American tribes at those sessions. The listening sessions were organized to engage with tribal representatives and others regarding several major plans in development by Caltrans, including the CFMP. The tribal representatives provided invaluable insight into transportation needs and tribal consultation protocol. During these sessions, participants expressed the desire for earlier and more substantive consultation. Some stated that tribal consultation should be a more open process. Participants generally agreed that further work should also be done to create partnerships between tribes and regional agencies on funding and project development.

Caltrans shall work to improve the consultation process and build stronger partnerships with Native American communities. This consultation process will emphasize two-way collaboration, communication, education, and timely notice. Prior to the listening sessions, two representatives from the Native American community were invited to serve as members of the CFAC. In addition, Caltrans freight planning staff regularly participates in Native American Advisory Committee (NAAC) meetings.

To further engage regional partners, regional and State agencies should include Native American tribal transportation needs, including a freight project list, in Regional Transportation Plans (RTP) and other planning documents. Nearby planned projects should involve consultation in the form of input to the planned freight project (including railroad crossings, bridge rehabilitation, and roadway expansion) location and design to minimize negative tribal impacts. Although the consultation process adds steps to project planning and development, it can ultimately result in greater benefits by leveraging local knowledge. These benefits include, but are not limited to, preservation of cultural sites, greater community input and buy-in, transportation efficiency improvements, and expansion of multimodal transportation services for tribes. Consultation with tribes is therefore not only an obligation, but an asset to Caltrans planning and project development efforts.

FREIGHT TRANSPORTATION PLANNING ACTIVITIES FOR TRIBAL NEEDS

Statewide Tribal freight needs typically encompass project coordination and financial assistance with mutually beneficial transportation endeavors, such as roadway access, operations, maintenance, and safety. The Caltrans Native American Liaison Branch, created in 1999, serves as intermediaries between Tribal governments and other third parties to promote government-to-government relations regarding Tribal transportation needs. Early in its development, it was identified that there was no formal access to data on tribal transportation facilities in California. This information is critical for Tribal governments to determine current and long-range transportation needs, and to secure resources needed to improve them.

Over the past 20 years, several achievements within the branch include establishment of proper framework to access more funding for roadside safety improvements, roadway access, operations and maintenance facility needs. The first collaborative effort involved 77 Tribal participants to document new roads and bridge inventory data that were proposed for inclusion into the federal inventory. A second effort was completed in 2010 to develop a Statewide Transportation Needs Assessment to determine Tribal employment conditions, issues, and concerns. An ongoing outreach effort has been made to provide technical assistance to Tribal governments in California through several public outreach activities and workshops conducted between 2008 and 2022.

Even through the concerted efforts to improve access to funding, it was noted that the 108 federally recognized tribes in California only received 1.88 percent of the available Indian Reservations Roads (IRR) funds. As a result, several actions are identified in the California Transportation Plan 2050, which combines efforts with the States goals for sustainability, inclusion of multimodal facilities, such as bike and pedestrian access, as well as the ability to remain economically competitive, among others. In 2019, Caltrans began a special research study to develop a Tribal Transportation Safety Assessments that identify vehicular traffic, pedestrian, and rural safety needs supported by the California Strategic Highway Safety Plan (SHSP). UC Berkeley SafeTREC conducted Tribal Transportation Safety Assessments (TTSA) for seven California Native American Tribes. The Tribal Transportation Safety Assessment (TTSA) - State Planning Research (SPR) was funded by the California Department of Transportation (Caltrans), Division of Transportation Planning (DOTP), and the Native American Liaison Branch (NALB). The TTSA provided California Native American Tribal Governments with expert, focused, and independent Tribal Transportation Safety Assessments (TTSAs). The goal of the TSSA-SPR project was to reduce injuries and fatalities on all roadways that serve California Native American reservations and Rancherias, as well as roadways accessing their lands, by conducting a TTSA for selected tribal governments. Each assessment consisted of a two-day site visit, including a public participation meeting and field audit conducted by SafeTREC experts. A technical report, consisting of an analysis and summary of findings and possible suggestions for improvements, and potential sources of funding considered for specific improvements, was submitted to each tribe. The technical assistance services and reports provided by this project can help Indian tribes identify potential sources of funding to make the improvements suggested in their reports and can help provide the justifications to use in future grant applications.

Tribal Transportation Planning is now a part of the Federal Statewide Transportation Improvement Program (FSTIP), involving the coordination of Metropolitan Planning Organizations (MPOs) to identify where investments are needed on or near reservations or rancherias. The outcomes of the TTSA effort will improve the written documentation and data collection that may help Tribal governments pursue further ongoing transportation funding. The overall coordination effort may help elevate Tribal transportation and offer new opportunities for state, MPO, and Tribal governments to identify innovative partnership opportunities.

Caltrans staff will work with Tribal consultants, applying appropriate Tribal consultation customs, to promote innovative projects such as alternative fuel infrastructure funding, roadside rest area and truck parking facilities, economic partnership developments, and etcetera. The completed safety assessments may lead to future freight funding projects that comply with Federal and State requirements and employ trained Tribal members, thereby increasing the access, efficiency, and economic viability of the SHS adjacent to Native American Tribal reservations and rancherias.

6

Chapter 6: Implementation

6A. Strategies and Objectives

The freight transportation system is the backbone of California's economy; however, its unintended societal and environmental consequences can be significant. As such, the implementation of the CFMP must focus on improving goods movement and the quality of life for Californians.

This chapter serves as the implementation portion of the CFMP. The beginning of this chapter outlines several programs, policies, and operational improvements to support and achieve the CFMP's seven goals and corresponding objectives identified in **Chapter 1**. Additionally, this chapter will review the freight investment strategy approach, which highlights region-based strategies that clearly articulate the funding priorities for the seven core regions in California.

As described in **Chapter 1**, the CFMP goals and objectives were created through a rigorous consensus-driven process with the CFAC, comprised of freight leaders and stakeholders from both the public and private sectors throughout the state. This chapter builds upon that effort and identifies several strategies to help the State reach these goals and objectives. Many of these strategies are in progress and are led by various public and private agencies and entities, while others have yet to begin.

These strategies will be a CFAC and freight-stakeholder starting point for discussing how and what to pursue to meet the seven CFMP goals. Identifying roles, responsibilities, performance metrics, and targets assigned to these strategies will be determined. Caltrans intends to explore the implementation of these strategies through present and future research. However, this future endeavor should be completed after FHWA's CFMP approval.

Goal 1 - Multimodal Mobility

Strategic investments to maintain, enhance, and modernize the multimodal freight transportation system to optimize integrated network efficiency, improve travel time reliability, and achieve congestion reduction.

OBJECTIVE MM-1: IDENTIFY CAUSES AND SOLUTIONS TO FREIGHT BOTTLENECKS

Objective also supports: Economic prosperity, environmental stewardship, safety and resiliency, and connectivity and accessibility

Strategy MM-1-A: Create a multimodal freight bottleneck list for priority corridors

- Eliminate bottlenecks along California's key multimodal trade corridors. It would begin with quantitatively identifying bottlenecks, regardless of mode. They could be prioritized based on factors including but not limited to congestion, reliability, and safety. The analysis would identify interconnected bottlenecks, which should be treated as one large bottleneck needing a solution.

FREIGHT PLAN
California Freight
Mobility Plan

Strategy MM-1-B: Conduct alternatives analysis – Determine if the highway build-out is the best solution

- When conducting freight corridor major investment studies, include an analysis of an alternative to a highway capacity project, such as the feasibility of a rail project, operational or ITS improvements, or another strategic investment. Include last mile connectivity to intermodal rail facilities in the analysis.

OBJECTIVE MM-2: INVEST STRATEGICALLY TO OPTIMIZE SYSTEM PERFORMANCE

Objective also supports: Economic prosperity, safety and resiliency, asset management, and connectivity and accessibility

Strategy MM-2-A: Identify the most congested freight corridors and facilities; prioritize for improvement

- Using a standard set of performance measures, identify the state's most congested freight corridors. Once the initial quantitative analysis is complete, this strategy could employ a GIS-driven Jenks Natural Breaks Classification to identify the most congested segments. When this process is completed, overlay the Caltrans freight project list and identify nearby freight facilities impacted by (or potentially causing) the congestion.

Strategy MM-2-B: Conduct a dedicated truck lane feasibility study

- Investigate the feasibility of developing dedicated freight lanes, including truck-only toll, alternative fuel corridors, or truck bypass lanes. Dedicated freight lanes may reduce congestion and bottlenecks, enhance access and mobility, improve reliability and efficiency, reduce environmental impacts, and facilitate intermodal integration. They may also improve safety by separating trucks from passenger cars, thereby reducing traffic conflicts and related congestion, and maximizing the efficiency of freight movement. Furthermore, separating trucks from automobile traffic may ease congestion, especially near border crossing areas. If tolls become a reliable funding source, the revenue could be systematically reinvested to improve transportation infrastructure facilities and mass transit systems to enhance traffic flows and minimize conflicts.

Strategy MM-2-C: Explore variable tolling for passenger vehicles and trucks to maximize peak capacity

- Conduct a feasibility study to determine the viability of the identified congested corridors (MM-2-A) and bottlenecks (MM-1-A) for a variable tolling pilot project, as well as overall economic impact analysis on cost of goods and services. Caltrans could use economics as a demand management tool by varying toll prices based on congestion levels, in addition to including considerations for equity and sustainability in the analysis. Effectively, tolls may allow passenger and/or freight vehicles to purchase travel reliability within the corridors.

OBJECTIVE MM-3: DEVELOP, MANAGE, AND OPERATE AN EFFICIENT, INTEGRATED FREIGHT SYSTEM

Objective also supports: Economic prosperity, environmental sustainability, safety and resiliency, and asset management

Strategy MM-3-A: Implement detection on priority corridors to identify problem areas across modes, particularly targeted to truck data

- Evaluate the existing ITS network, identify system gaps, determine priority improvements, and develop an implementation strategy. Roadside technology can provide valuable information regarding truck trips and techniques to improve freight efficiencies. Caltrans and its partners should support the deployment of truck trip planning software and technology such as real-time traveler information systems, marine terminal appointment and reservation systems, load matching at inland hubs, and truck stop reservation systems. By integrating ITS into rest areas, traffic information can be pushed to travelers by providing smart truck parking and/or reservation systems.

Strategy MM-3-B: Construct railroad grade separations at high-volume roadway crossings where feasible; prioritize crossings that facilitate the movement of trucks

- Develop a statewide inventory of priority grade separation locations, develop an implementation strategy, estimate the construction cost, identify, allocate, and leverage federal, state, regional, and local freight funds, identify the funding gap and advocate for additional private funding.

- Consider local agency and community's needs and priorities for access, connectivity, and land use development, updating grade crossing operations and safety policies for evaluating and demonstrating the need for freight rail grade separation projects, estimating construction and environmental risks besides costs, long-term operation and maintenance costs, and providing a project life-cycle benefit/cost analysis.

Strategy MM-3-C: Implement systems management approach and active traffic management (ATM) technologies to support efficient and safe freight operations

- Develop an ATM plan to improve the surface transportation system's trip reliability, safety, and throughput by deploying operational strategies that dynamically manage and control travel and available capacity based on prevailing and anticipated conditions. Examples of ATM technologies are adaptive ramp metering, adaptive traffic signal controls, dynamic lane reversals, shoulder lanes, and speed limits.

Strategy MM-3-D: Expand freight travel information availability

- Broadcast freight travel information widely to the trucking community, including the expanding Smart Truck Parking (STP) pilot along I-5. Similarly, Caltrans could develop a program to share real-time traffic data with carrier company dispatchers and increase the number of dynamic messaging signs statewide.

Strategy MM-3-E: Give priority in the freight plan to projects implementing state-of-the-art and demonstration technologies

- Increase the focus on pilot and demonstration projects to help mitigate the impacts of freight travel to communities. Such projects could entail supply chain digitization and its integration with freight ITS. Likewise, freight mobility challenges in the State are so significant that traditional improvements alone will not meet future challenges.

Strategy MM-3-F: Coordinate with other states and regions to improve multi-jurisdictional freight corridors to reduce delay, increase speed, improve reliability, and improve safety

- Develop a multi-state/multi-jurisdictional freight group under the Western Association of State Highway and Transportation Officials (WASHTO) umbrella. Other AASHTO regions have organized and regularly convened these groups to secure federal discretionary funding for multi-jurisdictional freight projects.

OBJECTIVE MM-4: IDENTIFY CAUSES AND SOLUTIONS TO REMOVE FREIGHT RAIL NETWORK BOTTLENECKS

Objective also supports: Economic prosperity, environmental stewardship, healthy communities, safety and resiliency, and connectivity and accessibility

Strategy MM-4-A: Identify freight rail projects and funding strategies that create freight rail efficiencies

- Work with seaports, terminal operators, rail carriers, shippers, regional agencies, and communities to support efforts to improve rail operational efficiency through practices such as technology improvements, facilitation of longer trains, and partnerships with Class I railroads to implement mainline improvements. This action will require investment leveraging and is suitable for public-private partnerships.

Strategy MM-4-B: Identify projects that reduce freight/passenger rail conflict

- Invest in shared rail corridor improvements to minimize delays to both freight and passengers. In most cases, the Class I corridors in California are owned by either the UPRR or BNSF. However, in some cases, the rail infrastructures are owned by public entities, such as the Alameda Corridor Transportation Authority (ACTA), Orange County Transportation Authority (OCTA), LA Metro, and Caltrain. Mutual solutions, such as double tracking in key areas, may create win-win scenarios. The focus should be on minimizing conflicts and delay in high-priority corridors. Further discussion of freight and passenger rail conflicts and opportunities is included in the California State Rail Plan.

OBJECTIVE MM-5: IDENTIFY FREIGHT RAIL NETWORK OPERATIONAL IMPROVEMENTS AND MODE SHIFT OPTIONS

Objective also supports: Economic prosperity, environmental stewardship, healthy communities, safety and resiliency, asset management, and connectivity and accessibility

Strategy MM-5-A: Support short line railroad improvements through infrastructure upgrades and advanced technologies

- Short line railroads and spurs are often overlooked as transport solutions. This strategy would develop a short line rail improvement plan to encourage track upgrades, industrial rail access improvements, advanced technologies, and clean alternative energy considerations to improve system efficiency (increase speeds, reduce emissions) and promote cost-effective truck shifts to rail. It would also assist shippers in obtaining access and improved services by developing new rail spurs.

Strategy MM-5-B: Support tax credits and/or loan programs for short line railroads

- California could consider a state tax credit or loan program to help offset short line railroad maintenance and expansion costs. These costs often exceed the financial capacity of short lines, and as a consequence over the long term, service degrades.

Goal 2 - Economic Prosperity

Grow the economic competitiveness of California's freight sector through increased system efficiency, productivity, and workforce preparation.

OBJECTIVE EP-1: PROMOTE ECONOMIC DEVELOPMENT BY INVESTING IN FREIGHT INFRASTRUCTURE PROJECTS AND OPERATIONAL IMPROVEMENTS

Objective also supports: Multimodal mobility, safety and resiliency, asset management, and connectivity and accessibility

Strategy EP-1-A: Reduce transportation costs by eliminating bottlenecks and recurrent delays, making operational improvements, and accelerating rapid incident response on priority freight corridors

- Enhance existing incident management program to clear incidents quickly and to re-route traffic when necessary. These tactics should be employed with new operational ATM improvements detailed in Strategy MM-3-C.

Strategy EP-1-B: Collaborate with the freight industry to identify critical projects and develop strategic investment strategies, including public-private partnerships

- Identify mega-projects critical to the State's economy but cannot be completed through existing funding streams because of cost or eligibility issues. Work with the CFAC to develop these projects and identify/position them for public-private partnerships.

Strategy EP-1-C: Measure the throughput of pass-through freight and identify friction points

- Undertake a commodity flow study to understand how pass-through cargo traverses the State. California's U.S. global gateway role has resulted in significant statewide freight movement and economic growth. To mitigate these impacts, Caltrans should undertake a commodity flow study to understand how pass-through cargo traverses the State. When this analysis is combined with freight congestion and bottleneck analysis, the cost of pass-through freight can be measured.

Strategy EP-1-D: Advocate for additional funding appropriations for freight infrastructure investments and operational improvements

- Actively engage and encourage Caltrans public and private sector partners to advocate for increased freight funding levels and project-level appropriations. When appropriate, Caltrans should actively participate and champion these efforts.

OBJECTIVE EP-2: PROMOTE FREIGHT PROJECTS THAT ENHANCE ECONOMIC ACTIVITY, FREIGHT MOBILITY, UNIQUE CAPABILITIES, RELIABILITY, SYSTEM RESILIENCY, AND GLOBAL COMPETITIVENESS

Objective also supports: Multimodal mobility, safety and resiliency, and connectivity and accessibility

Strategy EP-2-A: Encourage the creation of regional freight advisory committees at regional/county transportation agencies

- Encourage/support the development of regional Freight Advisory Committees designed to support each region's perspective freight issues and to feed issues to the CFAC.

Strategy EP-2-B: Support funding to completion and then funding and partnership with GOBiz to implement CSFAP Action Item 6.A. "Competitiveness Data Development and Utilization."

- There is a need for data and information to support the freight transportation system's competitiveness and to set the State's competitiveness target or targets. The type of information needed includes a suite of quantitative metrics to measure and track California's freight industry competitiveness, analyses of the costs and benefits of State actions, and an ongoing benchmarking of the State's freight industry.

OBJECTIVE EP-3: INCREASE WORKFORCE AVAILABILITY AND TRAINING

Objective also supports: Connectivity and accessibility

Strategy EP-3-A: Identify and actively advocate for workforce mobility, accessibility, and training needs and job training programs through collaboration with the freight industry and California's higher education system

- Facilitate an ongoing dialogue between the CFAC and the California Workforce Development Board. Creating a two-way dialogue among State agencies can help inform the future workforce development programs focused on the freight industry. Undertake a series of mobility studies to uncover gaps in workforce accessibility. This effort could be paired with travel demand management strategies to reduce the impact of passenger vehicles on freight flows near major logistics centers.
- Expand the availability of training programs or degrees at the community college and university level, including but not limited to logistics, global supply chain management, supply chain technology, and logistics management.
- Encourage technology transfer from California's world-class research universities to support freight technology development. Discoveries can be made by continuing to fund cutting-edge sustainable freight transportation research from California's talented, high-skilled knowledge base through programs such as UC-Davis STEPS and USC METRANS.

OBJECTIVE EP-4: PROMOTE THE STATE'S COMPETITIVE LOGISTICS ADVANTAGES

Objective also supports: Multimodal mobility, and connectivity and accessibility

Strategy EP-4-A: Identify incentives for the retention, expansion, and new development of logistics industry facilities (warehouses)

- Develop a comprehensive assessment of available State and local economic development incentives. The focus of this assessment should be to evaluate the current practices of Caltrans and how they fit within the bigger picture of economic development.

Strategy EP-4-B: Identify the needs and gaps of the agricultural goods movement system to improve the safe and efficient movement of agricultural goods to, from, and through California

- Partner with local and regional agencies in developing local and regional goods movement plans and studies.

Goal 3 - Environmental Stewardship

Support strategies that eliminate, reduce, avoid and/or mitigate adverse environmental and public health impacts of the freight transportation system while promoting and enhancing public health and ecological restoration in the planning process.

OBJECTIVE ES-1: CONTINUE TO INTEGRATE ENVIRONMENTAL HEALTH CONSIDERATIONS INTO FREIGHT PLANNING, DEVELOPMENT, IMPLEMENTATION, AND OPERATIONS OF PROJECTS AS FEASIBLE

Objective also supports: Economic prosperity, safety and resiliency, and connectivity and accessibility

Strategy ES-1-A: Promote the use of sustainable pavement types that enhance the movement of goods while reducing environmental impacts

- Wherever feasible, implement the use of sustainable pavement types that reduce impacts on the environment, re-charge the State's aquifers, mitigate the negative impacts of seasonal drought, and reduce runoff.

Strategy ES-1-B: Encourage freight mode shift to rail and water to reduce VMT and GHG emissions from roadway freight transport where and when viable

- Support the State Rail Plan by prioritizing projects that promote a mode shift to rail.
- Support intermodal facilities throughout the State per the State Rail Plan to create efficient mode transfer points and increase rail and marine freight transportation network access.
- Support the transition to clean locomotives and clean shipping vessels when transitioning from truck to rail and water modes.

OBJECTIVE ES-2: MINIMIZE AND, WHERE POSSIBLE, ELIMINATE TOXIC AIR CONTAMINANTS, CRITERIA POLLUTANTS, AND GHGS EMITTED FROM FREIGHT VEHICLES, EQUIPMENT, AND OPERATIONS

Objective also supports: Safety and resiliency and economic prosperity

Strategy ES-2-A: Develop a standardized performance-based metric used for monitoring and reducing GHG emissions and criteria pollutants of freight vehicles, equipment, and operations

- Freight fleets operating from public and private organizations use different approaches to measuring emission performance-based metrics. By standardizing this requirement, outcomes should remain consistent while reducing the costs incurred through labor-intensive corrections and regulatory fines.

Strategy ES-2-B: Standardize medium and heavy-duty vehicle and equipment charging standards and protocols

- Promote standardized near-zero and zero-emission technologies that promote operator and public safety and avoid costs and confusion associated with having numerous charging standards for all alternative fueling types. Standardized charging protocols and infrastructure can reduce costs related to the deployment of zero-emission vehicles and accelerate the deployment of vehicles. Consider lessons learned from the deployment of light-duty plug-in electric vehicles/plug-in hybrid electric vehicles.

Strategy ES-2-C: Decarbonize the commercial freight fleet

- Help establish proof of concept of zero-emission commercial freight vehicles by employing such technology where feasible within the State of California's fleet.
- While transitioning to a fully, renewable energy grid, facilitate access to low-carbon fuel options such as renewable diesel in the interim.

Strategy ES-2-D: Explore decarbonization of last-mile delivery to decrease the freight system's impact on air quality in dense urban environments

- Promote better curb space utilization by working with local governments to encourage strong parking pricing programs in the urban core to limit curbside commercial freight parking competition. This action intends to reduce VMT and emissions generated by "cruising for parking" and engine idling activities.
- Consider utilizing congestion or dynamic pricing in densely urbanized areas to create low-or zero-emission zones to manage demand for cleaner mile delivery.
- Support research and funding for emerging forms and infrastructure for low-carbon last-mile delivery, such as cargo bike delivery programs and drones.
- Support research on emerging efficient forms of last-mile delivery management, such as various distribution warehouse location models to reduce VMT and trips, off-hour deliveries, consolidation centers, and efficient siting of lockers and pick-up points. Create statewide development standards for urban areas to facilitate more efficient last-mile deliveries proactively. These standards would likely recommend that the developer consider the following: building a centralized delivery location, secure storage room, lockers, enforcement techniques, and a smart loading dock appointment system.

OBJECTIVE ES-3: PROMOTE LAND USE PLANNING PRACTICES THAT PRIORITIZE MITIGATING NEGATIVE FREIGHT PROJECT IMPACTS UPON THE ENVIRONMENT.

Objective also supports: Healthy communities

Strategy ES-3-A: Support freight technology development and fuels data collection and analysis

- Encourage better data collection methods and coordination efforts with partner agencies with robust resources dedicated to this effort, such as the California Energy Commission (CEC), California Air Resources Board (CARB), research institutes such as the University of California System, and the Transportation Research Board (TRB). This work could help uncover best practices and the pros and cons of various technologies to inform policymakers. Innovations in the freight industry are closely tied to the private sector and their protected data; thus, strong public-private and interagency collaboration are necessary to gain adequate insight into the industry's research and development of sustainable technologies and clean fuels.

Strategy ES-3-B: Promote the use of low-carbon renewable fuels development and support fuel efficiency and emissions reduction requirements for moving goods to support prosperity by sustainable means by decreasing GHG emissions while increasing goods movement

- Encourage the development and availability of renewable energy resources and low-carbon fuel to enhance low-emission diesel requirements for those in the goods movement sector.

Strategy ES-3-C: Promote land uses that are conducive to protecting the environment while supporting freight operations

- Work with local economic development and planning agencies to identify locations along rail spurs and inland waterway routes to create shovel-ready development opportunities for freight-intensive uses. When siting future freight uses in these areas, the focus should be on locating the highest and best use of these strategic locations.
- Collaborate with CARB to utilize their freight handbook document that identifies best practices for the siting, design, and operation of freight facilities that minimize exposure to air toxins, incorporate clean technologies and alternative fueling infrastructure, and maximize the capacity of transportation infrastructure.

Strategy ES-3-D: Create incentives to attract private investment in innovative, transformative, and new technological goods movement systems through pilot programs or major energy projects

- Advocate for incentive programs that position the State as a natural choice for private-sector transportation innovation projects, in particular for projects that support zero emission technologies that help the state achieve emission goals.

Strategy ES-3-E: Incentivize freight projects that minimize GHG, criteria pollutants, and other emissions

- Increase the importance of minimizing emissions as part of future freight project evaluation processes. This could be accomplished by putting more weight on performance measures that align with the air quality State Implementation Plan.

Goal 4 - Healthy Communities

Enhance community health and wellbeing by distributing the benefits of the goods movement system equitably across California's communities while making sure the environmental and public health costs of the system are not disproportionately borne by goods movement communities.

OBJECTIVE HC-1: PRIORITIZE SOCIAL EQUITY FOR FREIGHT-RELATED PROJECTS BY DEVELOPING ALTERNATIVE METHODS THAT AVOID OR MITIGATE NEGATIVE IMPACTS ON OR NEAR EXISTING COMMUNITIES ADJACENT TO HIGH-VOLUME FREIGHT ROUTES AND FACILITIES

Objective also supports: Environmental stewardship and economic prosperity

Strategy HC-1-A: Implement projects in freight corridors that are specifically targeted to avoiding, reducing, or mitigating freight impacts on the environment and communities

- Incorporate public health data sources when analyzing a freight project's potential impact. Direct Caltrans Local Development Review function to request and comment on this analysis when reviewing freight projects using a health equity lens.
- Prioritize projects that will facilitate a reduction in GHG emissions and criteria pollutants in communities disproportionately burdened by pollution, as identified using CalEnviroScreen.
- Strategically plan for and/or divert heavily used freight routes to alternative routes that are further removed from residential neighborhoods.
- Develop environmentally conscious and coordinated land use policies in conjunction with freight goods movement plans. Examples could include reducing conflicts by establishing buffers between industrial and sensitive land uses, influencing location and design decisions through zoning tools, preserving existing industrial land uses, and promoting context-sensitive site and building design solutions.
- Conduct comprehensive alternative route assessments to avoid bringing negative impacts to communities of newly proposed alternative routes, and be fully considerate of ecologically sensitive areas and habitats.

OBJECTIVE HC-2: CONDUCT MEANINGFUL OUTREACH AND COORDINATION EFFORTS WITH OTHER AGENCIES FOCUSED ON ENVIRONMENTAL JUSTICE COMMUNITIES DISPROPORTIONATELY BURDENED BY THE FREIGHT TRANSPORTATION SYSTEM IN URBAN AREAS AND RURAL AREAS BY IDENTIFYING AND DOCUMENTING THEIR NEEDS

Objective also supports: Environmental stewardship

Strategy HC-2-A: Partner with metropolitan planning agencies, tribal organizations, and community groups to identify conveniently located and accessible public facility venues and relevant times for hosting engaging public workshops

- Work with key community stakeholders to plan outreach opportunities that are convenient, accessible, and timely for stakeholders. Collaborate where possible with existing community events so that stakeholder time is respected.

- Contract with local community-based organizations to staff the outreach process when possible. Write contracts so that food and childcare services are offered to outreach attendees during the meeting to increase convenience for stakeholders to attend.
- Document conversations and feedback from public workshops to identify barriers and resulting recommendations for mitigation methods to reduce the adverse effects of freight-impacted communities.
- Implement findings in planning activities.

Strategy HC-2-B: Establish development standards to avoid and mitigate environmental and social impacts of freight on communities

- Work with State agencies and professional organizations such as the American Planning Association, Transportation Research Board, and/or the Urban Land Institute, and utilize existing plans and guides to develop a freight land use design guide. This guidebook would help local communities implement standards that minimize the environmental impacts of freight. These standards may include providing appropriate buffers, designating truck routes to avoid residential neighborhoods, implementing multimodal safety measures to reduce intermodal conflicts on roadways, and requiring cleaner trucks (the highest EPA standard available at the time of development approval), etc.

Strategy HC-2-C: Leverage partnerships to strengthen the outreach process

- Partner with community-based leaders of environmental justice communities to conduct and assess the economic, environmental, and social impacts of freight to these communities.
- Partner with private freight stakeholders to bring reliable service of goods to a spectrum of geographies and facilitate symbiotic relationships with affected communities, particularly those that may be disadvantaged and lacking in resources and/or employment opportunities.

OBJECTIVE HC-3: PROMOTE NOISE AND OTHER POLLUTION ABATEMENT STRATEGIES ASSOCIATED WITH THE MOVEMENT OF GOODS ALONGSIDE RESIDENTIAL AREAS AND SENSITIVE HABITATS NEAR FREIGHT CORRIDORS

Objective also supports: Environmental stewardship

Strategy HC-3-A: Promote abatement best practices in freight projects

- Work with local governments to encourage fixed, time-based vehicle size restrictions in their curbside parking. By prioritizing different modes or movements by the time of day, an urban core can strategically address curbside parking demand to, in turn, reduce VMT and emissions generated by "cruising for parking" and engine idling activities. In rural areas this includes identifying alternative truck routes that bypass disadvantaged communities and neighborhoods

Goal 5 - Safety and Resiliency

Eliminate freight-related deaths and serious injuries and improve system resilience by addressing infrastructure vulnerabilities associated with security threats, effects of climate change impacts, and natural disasters.

OBJECTIVE SR-1: REDUCE RATES OF INCIDENTS, COLLISIONS, FATALITIES, AND SERIOUS INJURIES ASSOCIATED WITH FREIGHT MOVEMENTS

Objective also supports: Multimodal mobility

Strategy SR-1-A: Expand the system of truck parking facilities

- Execute the 2020/21 California Truck Parking Study recommendations to expand existing public and private sector truck parking facilities and develop new parking facilities in strategic locations.

Strategy SR-1-B: Promote public-private partnership for the implementation of truck stop and shipping terminal vehicle charging or charge-in-motion

- Support ARB, PUC, and Energy Commission efforts to work with electric utilities, technology providers, truck stops (and NATSO), and freight terminals to employ electric charging terminals along crucial freight corridors. Likewise, Caltrans should continue to study inductive charging opportunities within its right-of-way.

Strategy SR-1-C: Develop design guidelines for truck routes that consider other modes

- Utilizing logistics land use guides, develop a context-sensitive roadway design document that supplements Caltrans' Complete Streets guidance.

Strategy SR-1-D: Prioritize projects that address high-crash and truck-involved locations

- Collaborate with California Highway Patrol and use standard performance measures to identify commercial vehicle crash hot spots statewide. Use this information to improve State and regional prioritization efforts and to focus safety-related funding efforts.

OBJECTIVE SR-2: UTILIZE TECHNOLOGY TO PROVIDE FOR THE RESILIENCE AND SECURITY OF THE FREIGHT TRANSPORTATION SYSTEM

Objective also supports: Multimodal mobility, economic prosperity, and asset management

Strategy SR-2-A: Expand the number and scope of cargo security screenings

- Work with State and Federal homeland security partners to ensure that future transportation design decisions near the sea, air, and land ports of entry account for future space requirements for cargo screening facilities.

Strategy SR-2-B: Ensure consistent and effective safety and security requirements at all California ports

- Strengthen the partnership between State, federal, and private stakeholders to ensure safe and secure access to goods moving to and from the State's sea, air, and land ports of entry.

Strategy SR-2-C: Identify alternate freight routes to maintain freight movement at times of disruption by disaster

- Conduct a Freight Resiliency study to ensure continuity of freight movement during and immediately following a disaster. This study would include bringing critical trade lanes online and ensuring relief materials reach California's residents and businesses. Existing evacuation routes and plans must be integrated into the proposed alternative routes study.

Strategy SR-2-D: Promote technology to support monitoring of truck parking locations and areas where rail traffic commonly stops

- Increase transportation security and decrease theft by placing cameras and other technologies in truck parking areas and near rail locations where intermodal trains frequently stop.

OBJECTIVE SR-3: DEVELOP A FREIGHT RESILIENCY STRATEGIC PLAN

Objective also supports: Economic prosperity and environmental stewardship

Strategy SR-3-A: Develop resiliency vision, goals, and objectives

- Work with agency partners to develop a vision for a resilient freight system. Goals and a series of objectives would support this vision. The Freight Resiliency Strategic Plan would focus on identifying future issues related to national disasters, sea-level rise, and the individual resiliency of significant trade lanes in California.
- Collaborate with State, regional, and local agencies to leverage funding opportunities for implementing climate resiliency work, adaptation plans, climate action plans, and/or master plans to increase the resiliency of assets against climate-related events.

Strategy SR-3-B: Identification of high-priority safety concerns, critical and vulnerable infrastructure, and aspects of the State's key supply chains that have resiliency concerns

- Increase the resiliency of California's key industry supply chains. Identify and prioritize improvements to improve safety and keep business moving – these improvements could include rebuilding, strengthening, or improving facilities.

Strategy SR-3-C: Incorporate resilience strategies contained in port plans prepared according to Coastal Commission guidelines

- Work with the State's port authorities to incorporate resiliency strategies as part of Caltrans roadway improvement plans – in particular, assist ports in preparing for increased sea levels.
- Collaborate with partners to develop Vehicle Grid Integration as a resiliency strategy. This capability allows battery-electric vehicles and other equipment to communicate

with the grid when charging, especially in places where trucks are likely to plug in for extended sessions, like truck parking sites. This technology could also promote resiliency for equipment like electric-powered Transport Refrigerator Units, particularly when shore powering at port terminals and warehouses.

Goal 6 - Asset Management

Maintain and preserve infrastructure assets using cost-beneficial treatment as indicated in the State Highway System Management Plan (SHSMP), per the federal FAST Act, Streets and Highway Code §164.6, and Caltrans Director's Policy 35 Transportation Asset Management (DP-35), and other applicable state and federal statutes and regulations.

OBJECTIVE AM-1: APPLY PREVENTIVE MAINTENANCE AND REHABILITATION STRATEGIES USING SUSTAINABLE BEST PRACTICES

Objective also supports: multimodal mobility, safety and resiliency, and connectivity and accessibility

Strategy AM-1-A: Ensure adequate and sustainable funding for the preservation and modernization of the freight system

- Conduct a study to explore the existing freight system's long-term maintenance and operational costs. The results of this study should be integrated into long-term planning and funding strategies for the State. Expand the scope of freight system rehabilitation projects to include facility modernization, where possible and merited, to increase the range of available funding sources.

Strategy AM-1-B: Identify maintenance and preservation needs on priority freight corridors

- The maintenance and operation study identified in Strategy AM-1-A should use the corridors established in Strategy MM-1-A to focus investment in high-priority trade lanes that support the California economy.

Strategy AM-1-C: Expand truck scale technology use: automated or technologically assisted weight enforcement (infrared cameras); expand weigh-in-motion (WIM) deployment

- Identify locations for new installations of WIM stations throughout the State and prioritize implementation. Caltrans uses advanced technology along highways to create freight movement efficiencies and fulfill federal traffic mandates. Weigh-in-motion devices electronically verify compliance with weight requirements without pulling trucks out of and back into traffic at truck scale locations. Delays occur as trucks queue at the scales for weighing and verification. Technologies allowing trucks to bypass additional stops create a more efficient system.
- Currently, WIM systems are lacking near many port locations and in some areas where new corridors are growing. Truck scale technology allows for the efficient use of static scales and enforcement personnel without affecting traffic flow. In addition to improving safety, the technology helps reduce overloading and subsequent pavement damage.

Strategy AM-1-D: Fortified bridges and pavement design standards to accommodate heavy freight travel

- Identify bridge rehabilitation and replacement needs and adapt the current bridge asset management program to focus on key freight corridors. All bridges along primary freight routes should be identified and separated by the various network categories for performance measurement. Assess freight bridge conditions and barriers to freight. The weight and dynamics of heavy-duty trucks, outdated design methods, poor-quality materials, and unsuitable construction and maintenance practices are known to reduce pavement longevity. Newer, longer-lasting materials and improved technologies are regularly being developed internally and externally. Pavement technological advances to increase durability and safety and minimize road noise and friction should improve system efficiencies, cost savings, and environmental impacts. Using new, better-performing materials could enhance the life of the transportation process. Identify that California has a lot of microclimates therefore, design requirements should be adopted according to those microclimate needs

Strategy AM-1-E: Preservation of unique freight corridors and passageways

- Identify system assets that provide unique capabilities to the freight system, such as the ability to move non-containerized cargo, HAZMAT cargo, oversized/overweight cargo, or cross-border freight. Prioritize projects to protect those assets, as long as they still serve a need or alternatives to replacements are too costly.

Goal 7 - Connectivity and Accessibility

Provide transportation choices and improve system connectivity for all freight modes.

OBJECTIVE CA-1: SUPPORT RESEARCH, DEMONSTRATION, DEVELOPMENT, AND DEPLOYMENT OF INNOVATIVE TECHNOLOGIES

Objective also supports: Multimodal mobility, economic prosperity, environmental stewardship, safety and resiliency, and asset management

Strategy CA-1-A: Freight plan priority for projects implementing state-of-the-art and demonstration technologies

- Increase the focus on prioritizing pilot and demonstration projects to help mitigate the impacts of freight travel on California's residents using baseline and projected data. Likewise, freight mobility challenges in the State are so significant that traditional improvements alone will not meet future challenges.

OBJECTIVE CA-2: PROMOTE INNOVATIVE TECHNOLOGIES AND PRACTICES UTILIZING REAL-TIME INFORMATION TO MOVE FREIGHT ON ALL MODES MORE EFFICIENTLY

Objective also supports: Multimodal mobility, economic prosperity, and safety and resiliency

Strategy CA-2-A: Research opportunities for freight technologies

- Develop a freight technology research center within a state agency or university to help incubate innovations needed to meet future demand. Future freight technologies will be vital to solving the significant freight challenges that await California in the future.

OBJECTIVE CA-3: COORDINATE WITH LOCAL AND REGIONAL PARTNERS ON FREIGHT FACILITIES, SITING, DESIGN, AND OPERATIONS

Objective also supports: Multimodal mobility, economic prosperity, environmental stewardship, safety and resiliency, asset management

Strategy CA-3-A: Freight transportation, transportation planning, and land use planning coordination

- Promote good project design that addresses community concerns and potentially contentious approval processes for new and expanded freight facilities. Work with local agencies to prevent incompatible land uses and transportation alternatives that conflict with existing or future freight facilities. Tools, including GIS, can assist with many facets of planning. With current, accurate information, layers of data superimposed on each other can provide a visual idea of current and future scenarios. Freight can negatively impact communities, and the development of incompatible land use near large freight generators can influence the efficient flow of goods.

OBJECTIVE CA-4: UTILIZE INLAND PORT FACILITY, SHORT-HAUL RAIL SHUTTLE, AND INLAND SEAPORTS TO LESSEN IMPACTS ON NEARBY COMMUNITIES

Objective also supports: Multimodal mobility, economic prosperity, environmental stewardship, safety and resiliency, and asset management

Strategy CA-4-A: Develop a competitive metric identifying the cost of transporting goods grown or manufactured in California to a common destination versus peer regions/states

- Create a goods movement competitiveness metric identifying a single product and comparing the transportation costs of the product from California to its most common destinations with those of competing states.

OBJECTIVE CA-5: IMPROVE TRUCK TRIP PLANNING, COORDINATION, OPERATIONS, AND MANAGEMENT

Objective also supports: Multimodal mobility, economic prosperity, environmental stewardship, safety and resiliency, and asset management

Strategy CA-5-A: Measure throughput of pass-through freight and identify externalities, such as impacts on communities and air quality

- Explore avoidance incentives or disincentives at highly impacted areas that aim to limit pass-through traffic, thus allowing local businesses to operate more efficiently and minimizing impacts on local communities. While California sees significant economic benefits (e.g., jobs, sales tax) by serving as the nation's global gateway, there is an associated cost exerted by the significant pass-through freight moving by truck and train on the State and its residents. The resulting increase in congestion levels and emissions can be mitigated by requiring clean truck and locomotive technologies and off-peak operations.

Strategy CA-5-B: Support off-hour delivery/pick-up strategy development

- Most urban truck traffic occurs during the day's busiest and most congested times. Shifting last-mile cargo pick-up and delivery to off-peak hours alleviates congestion within urban boundaries.

6B. Freight Investments

Understanding the context of a region helps assess how California should strategically invest in its freight system. California is one of the largest states in terms of land mass, spans several climate zones, and is host to various economic sectors. Therefore, the freight system is influenced by each region's unique attributes and competitive strengths. As such, the CFMP analyzes California's freight system from seven regional perspectives, highlighting each region's unique context and freight needs. The boundaries of the CFMP regions are conceptualized to align with California freight generally flows to best address the unique context of California's regional communities and economies.[241]

Table 6.1 describes how California's counties are divided among the seven CFMP regions, and **Figure 6.1** is a map that illustrates the borders of the CFMP regions. Each of the following perspectives comprises two sections: 1) a regional narrative; 2) policies and programs.

Table 6.1: The CFMP Freight Investment Strategy Regions by County

CFMP Region	County (CO)	Caltrans District or County
Northern California	Del Norte	All counties in District 1
	Humboldt	
	Lake	
	Mendocino	
	Lassen	All counties in District 2
	Modoc	
	Plumas	
	Shasta	
	Siskiyou	

	Tehama	
	Trinity	
	Butte	A portion of counties in District 3
	Colusa	
	Glenn	
	Nevada	
	Sierra	
	Yuba	
Central Sierra	El Dorado within Tahoe Regional Planning Agency (TRPA) boundary	A portion of counties in District 3
	Placer within the TRPA boundary	
	Inyo	All counties in District 9, except for the eastern portion of Kern County
	Mono	
	Alpine	A portion of counties in District 10
	Amador	
	Calaveras	
	Mariposa	
	Tuolumne	
Bay Area	Alameda	All counties in District 4
	Contra Costa	
	Marin	
	Napa	
	San Francisco	
	San Mateo	
	Santa Clara	
	Solano	
	Sonoma	
Central Valley	El Dorado (minus portion in TRPA boundary)	A portion of counties in District 3

	Placer (minus portion in TRPA boundary)	
	Sacramento	
	Sutter	
	Yolo	
	Fresno	All counties in District 6
	The western portion of Kern County	
	Kings	
	Madera	
	Tulare	
	The eastern portion of Kern County	A portion of District 9
	Merced	A portion of counties in District 10
	San Joaquin	
	Stanislaus	
Central Coast	Monterey	All counties in District 5
	San Benito	
	Santa Barbara	
	San Luis Obispo	
Los Angeles and Inland Empire	Santa Cruz	
	Los Angeles	All counties in District 7
	Ventura	
	Riverside	All counties in District 8
	San Bernardino	
	Orange	The county in District 12
San Diego Border	Imperial	All counties in District 11
	San Diego	

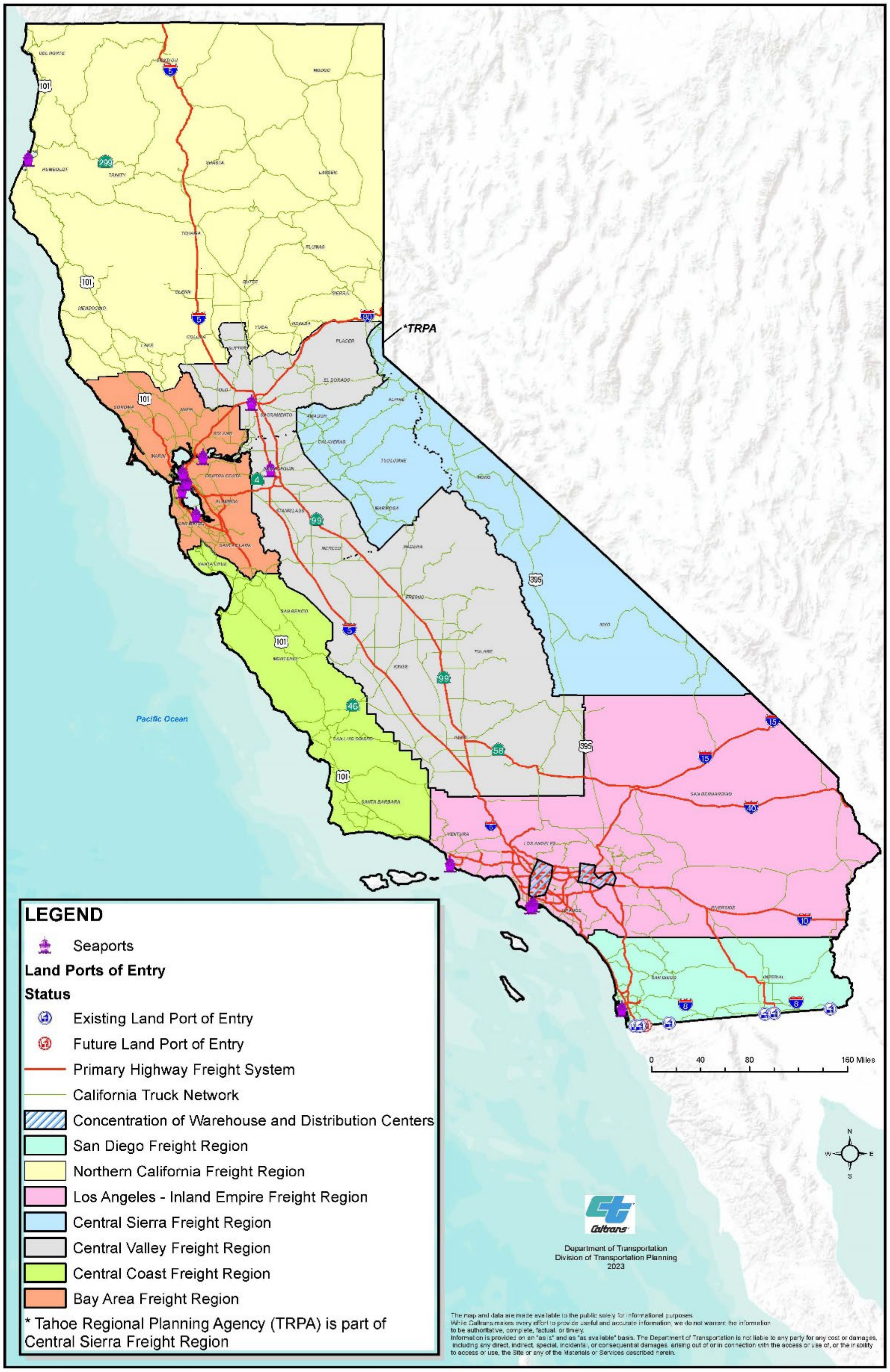

Figure 6.1: Freight Investment Strategy Regions relative to Key Freight Routes in California (Source: Caltrans, 2023)

State Investments and Performance Measures

In California, National Highway Freight Program (NHFP) funds are managed by the California Transportation Commission (CTC) through the Senate Bill 1 (SB1) Trade Corridor Enhancement Program (TCEP).[242] The purpose of TCEP is to provide funding for infrastructure improvements on federally designated Trade Corridors of National and Regional Significance, on California's portion of the National Highway Freight Network, as identified in California Freight Mobility Plan, and along other corridors that have a high volume of freight movement. TCEP supports the goals of the NHFP, the California Freight Mobility Plan (CFMP), and the guiding principles in the California Sustainable Freight Action Plan (CSFAP). In addition to the NHFP formula funds, TCEP includes state funds from the California Trade Corridor Enhancement Account.
Projects receiving TCEP funds address the program's evaluation criteria outlined in the guidelines, clearly describe freight benefits, and show benefits across multiple evaluation criteria. TCEP evaluation criteria includes:

- Freight System Factors: These factors include freight ***throughput***, ***velocity***, and ***reliability***. Projects need to enhance ***throughput*** by increasing the volume of freight through capacity expansion or operational efficiency along freight corridors and at freight gateways and hubs. Projects also need to increase freight ***velocity*** by increasing the safe and smooth flow of traffic moving in the goods movement network. Lastly, projects need to increase freight ***reliability*** by reducing the variability and unpredictability of travel time. If applicable, projects need to describe how these factors relate to the federal Transportation Performance Management (TPM) Third Performance Measure Rule (PM3).
- Transportation System Factors: These factors include freight ***safety***, ***congestion reduction/mitigation***, ***key transportation bottleneck relief***, ***multimodal strategy***, ***interregional benefits***, ***advanced technology***, and ***zero-emission infrastructure***. Projects should increase the ***safety*** of the public, industry workers, and traffic by embracing a Safe Systems Approach. In addition, projects should reduce ***congestion*** or provide ***mitigation strategies*** by reducing daily hours of delay on the system and improving access to freight facilities. Projects should also address federal goals of ***relieving key freight system bottlenecks*** where forecasts of freight traffic growth rates indicate infrastructure or system needs are inadequate to meet future demand; this includes bottlenecks on critical freight corridors and near California's borders. Projects should employ or support ***multimodal strategies*** to increase port and transportation system throughput while reducing truck vehicle miles/hour traveled (VMT/VHT) or truck idling times. Since the freight networks spans across jurisdictions, projects should link regions/corridors to serve statewide or national trade corridor needs and to improve the ***interregional transportation*** network. In addition, projects should employ ***advanced and innovative technology*** and integrate transformative ideas to increase the amplitude of benefits for the state's people, economy, and environment. Lastly, projects should support ***zero-emission freight infrastructure*** to meet various national and state goals.
- Community Impact Factors: These factors include ***air quality impacts***, ***community engagement***, and ***economic impacts***. Projects should reduce local and regional emissions of diesel particulate (PM 10 and PM 2.5), carbon monoxide, nitrogen oxides, greenhouse gases, and other pollutants to minimize ***air quality impacts*** and ensure the benefits of public health. In alignment with the CTC's Racial Equity Statement, projects are evaluated based on their ability to demonstrate meaningful and effective ***community engagement*** and public participation in decision making processes, particularly by disadvantaged or historically impacted and marginalized communities.

Lastly, projects should stimulate local economic activity, enhance trade value, preserve or create jobs, enhance California's freight competitiveness, and positively ***impact the national and state economies***.

The TCEP evaluation criteria assists the CTC in funding projects that provide significant freight benefits while meeting federal and state goals. TCEP-funded projects from the program's three existing cycles will include the following long-term benefits:[243]

- Increase truck throughput
- Increase rail volume
- Increase tons of cargo moved
- Operational efficiencies and travel time improvements
- Safety improvements
- Reduction of greenhouse gas emissions
- Creation of thousands of new jobs

TCEP stipulates a number of measures to foster program transparency and accountability. Projects awarded TCEP funds are required to submit progress, annual, and completion reports on the freight-related performance metrics included in **Table 6.2** below. The CTC has developed a guidance document outlining the process for reporting on all the required SB1 performance metrics.[244] This guidance document is incorporated into the TCEP program by reference in the TCEP guidelines. TTTR is an included optional metric in this reporting due to other modes (i.e. seaport, rail, airport, land ports) and non-NHS roadways being eligible for TCEP. Caltrans and the CTC will coordinate in the future to analyze how TCEP awarded projects are striving to meet our federal TPM performance measures.

Table 6.2: TCEP Performance Targets

	Program				Program Type				
Metric	**ATP**	**SCCP/ LPP**	**TCEP**	**All**	**Local Road**	**HWY Road**	**Transit**	**Rail**	**Port**
Change in Daily Vehicle Miles Travelled	X	X			X	X	X		
Person Hours of Travel Time Saved		X			X	X	X		
Peak Period Travel Time Reliability Index		X				X			
Level of Transit Delay		X					X		
Change in Daily Vehicle Hours of Delay			X		X	X			
Change in Daily Truck Hours of Delay			X		X	X			X
Change in Truck Volume (# of Trucks)			X		X	X			X
Change in Rail Volume			X					X	

FREIGHT PLAN California Freight Mobility Plan

Truck Travel Time Reliability Index			X			X			
Velocity			X		X	X		X	X
Number of Fatalities and Rate of Serious Injuries	X	X	X	X	X	X	X		X
Rates of Fatalities and Rate of Serious Injuries	X	X	X	X	X	X	X		X
Air Quality	X	X	X	X	X	X	X	X	X
Cost Effectiveness (Benefit Cost Ratio)	X	X	X	X	X	X	X	X	X
Jobs Created	X	X	X	X	X	X	X	X	X

Source: ***TCEP Program/SB1 Performance Targets, California Transportation Commission***.

Caltrans is an eligible applicant for TCEP funds and uses its own internal framework for prioritizing project nominations. When prioritizing projects, Caltrans is in a significant leadership role to carry out meaningful measures that advance state's goals and priorities. One of the tools that Caltrans uses for this decision-making process is the Caltrans System Investment Strategy (CSIS). The CSIS is envisioned to be an investment framework through a data- and performance-driven approach that guides transportation investments and decisions. This framework includes methodologies and processes for how Caltrans should invest billions of dollars of highly competitive federal and state fund programs that will address transportation deficiencies while also achieving California's CAPTI Guiding Principles. The CAPTI Guiding Principle specific to freight strives to develop "a zero-emission freight transportation system that avoids and mitigates environmental justice impacts, reduces criteria and toxic air pollutants, improves freight's economic competitiveness and efficiency, and integrates multimodal design and planning into infrastructure development on freight corridors."

Caltrans is currently revising the CSIS and is considering freight-specific metrics that reflect the goals from the NHFP, CFMP, CSFAP, and CAPTI. Caltrans is working on the latest CSIS version and will include its regional and local freight partners, including the California Freight Advisory Committee members, in the CSIS development process to build a transparent framework that will help prioritize the state's investment decisions. This will ensure that California will continue to align its freight-related investments with federal and state freight goals and performance metrics.

Another tool that the CTC and Caltrans use to encourage performance measures supporting investment decisions is the RTP development process. Currently, the CTC and Caltrans are in the process of developing new RTP guidelines for California's regional partners.[245] RTPs are prepared by regional agencies to identify a 20-year vision for transportation priorities and investments consistent with federal and state goals and requirements. The latest draft RTP guidelines note that regional agencies should ensure that their RTPs are making progress toward the federal TPM goals established by the State. The federal TPM goal focused on freight is included in the PM3 measure and is discussed in more detail in Chapter 3B. In addition to considering national and state freight goals, RTPs should therefore demonstrate how each region's network of projects is aiming to meet the California's Truck Travel Time Reliability target established under PM3. This motivates regions to invest in projects that increase freight reliability while decreasing freight congestion. After the adoption of the RTP, these regional freight projects are often considered for state sponsorship on federal or state discretionary funding opportunities. It is crucial for Caltrans to have a screening tool, such as the CSIS, when prioritizing these potential sponsorships to ensure that these freight projects meet federal and state performance goals and metrics during the investment decision process.

Caltrans also utilizes the System Planning process as a tool for performance measures to inform investment decisions. Consistent with federal law and State policy, Caltrans develops corridor plans through its System Planning process to assess how corridors are performing currently and how they may perform in the future, explore why they are performing this way, and propose projects and strategies that achieve corridor goals and objectives. These corridor plans are one tool for Caltrans to meet federal law requiring that a congestion management process shall be developed, established, and implemented as part of the planning process. The Congestion Management Process (CMP) is a systematic approach, collaboratively developed and implemented throughout a region, providing for the safe and effective management and operation of new and existing transportation facilities using demand reduction and operational management strategies. The Caltrans System Planning process is necessary for the CMP approach to be successful, which includes development of performance measures, assessment/evaluation of potential projects and improvement strategies, and performance monitoring. In addition, one key element in the development of corridor plans is the continuous reassessment of performance measures and assumptions to determine if an update of the plan is needed due to changing conditions regarding the infrastructure, funding availability, and policies. While Caltrans corridor plans build upon projects listed in RTPs, they also inform future RTPs with new projects and strategies as shown in **Figure 6.2** below. The performance measures included in Caltrans corridor plans therefore inform future investments.

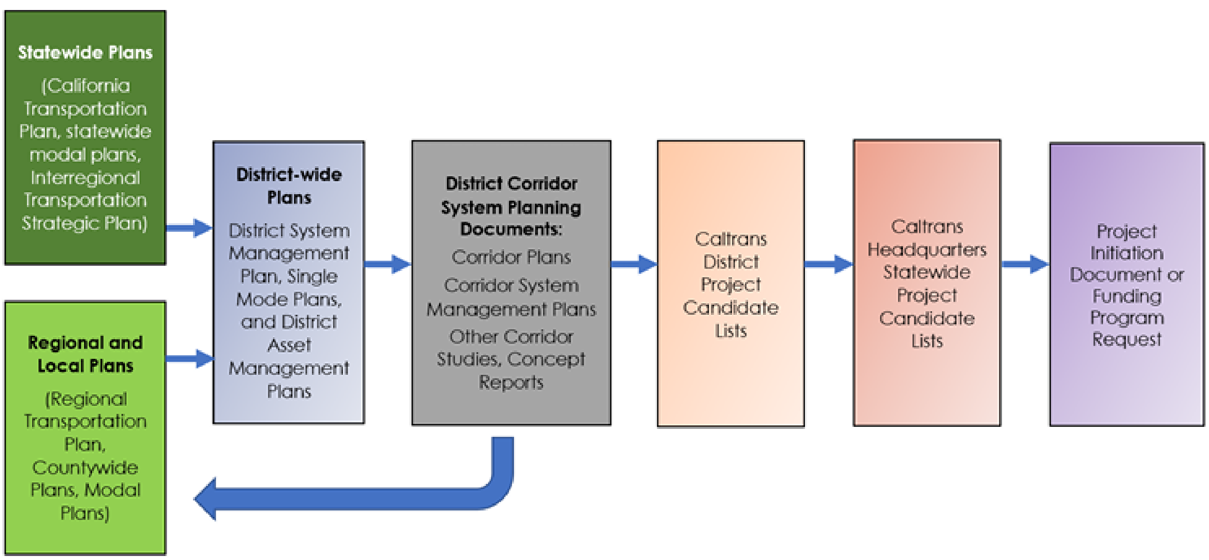

Figure 6.2: Caltrans District System Planning Process

FREIGHT PLAN California Freight Mobility Plan

Freight analysis is one component in Caltrans corridor plans, and TTTR is provided as an example freight metric in the "Caltrans Corridor Planning Process Guide." Caltrans Headquarters is currently developing a "Freight Emphasis Area Guide" that will be a supplemental tool for Caltrans staff to utilize when developing a corridor plan. This freight-specific guide will assist Caltrans districts in addressing federal and state freight goals along with PM3.

State Overview and Themes

Home to nearly 40 million people, California is one of the largest economies in the world. As the population grows and businesses continue to thrive, the demand for goods will continue to stretch and challenge the built environment, the natural environment, and our communities. Future freight investments in California should aim to accomplish all the seven goals highlighted throughout the CFMP through solid partnerships among private and public stakeholders, businesses, and advocacy groups.

While most regional freight investment strategies identified in this chapter are authored by the regions and identify the most critical freight priorities in alignment with regional policies, context, and needs, many of those projects of regional importance also align closely with State policies. From the high-level State perspective, development of freight projects is a collaborative effort with our communities, local, regional, and federal partners. As a leader in sustainable freight activities, California strives to evolve and grow its freight industry while simultaneously strengthening communities and reducing any negative externalities that could exacerbate climate change impacts. The State's most critical freight investments should be consistent and aligned with at least one of the following four themes to mitigate our most significant freight challenges.

IMPROVING PORT ACCESS RELIABILITY

Imports from the Pacific Rim are a significant economic engine for California. Logically, some of the busiest maritime port complexes in the nation are located within the state. California hosts one of the nation's largest warehouse and distribution center concentrations, so its transportation network must be reliable, efficient, and cost-effective for operators to ensure continued competitiveness. This is especially critical for California's export-dependent industries. As one of the world's largest exporters of high-value electronic and agricultural goods, California's economic competitiveness depends on the intricate and interdependent roles of the public and private sectors working cohesively to move goods to, through, and from the ports.

BORDER EFFICIENCY

Mexico is California's largest trading partner, and trade will continue to grow as manufacturers' supply chains integrate the unique workforce skillsets, economies, and resources from both sides of the border. This continued growth will also affect the border's infrastructure. Capacity expansion, existing system integration, and efficiency activities must address how they will mitigate impacts on and enhance the surrounding environment and communities.

INTER- AND INTRA-STATE FREIGHT MOVEMENT AND RESILIENCY

California is a large and diverse state and serves as a gateway for goods entering the nation. In addition to California markets, goods traveling within the state make their way on the intra-state transportation network to the rest of the country, Mexico, and Canada. Improving the inter- and intra-state freight network is critical to increasing the state's economic competitiveness. As shown in **Figure 6.1**, critical freight corridors, such as I-5, I-10, I-15, I-80, SR 99, US 101, US 395, and others, connect the largest metropolitan areas within the state and serve as the pillars supporting goods movement between regions and other states. Improvements to these pillars will increase travel reliability, reduce congestion, and enable more volume and value of goods to move into and through the state. With the continued increase in severity and frequency of climate change-related events, California must plan for efficient and cost-effective routes to ensure the resilience of the freight system in the face of such disastrous climate events.

Sustainability and Innovations

As the world's innovation epicenter, California has been at the forefront in numerous sectors to deliver ideas, products, and services that have a tremendous global impact. Innovative practices and technologies continue to be developed within California's freight sector. The California Sustainable Freight Action Plan (CSFAP), Executive Order EO N-19-19, Executive Order EO N-79-20, climate change resilience initiatives, and local and regional policies enhance all aspects of freight and advance the state's people, natural environment, and economy Initiatives such as workforce and community development, environment improvement programs, freight intelligent transportation systems, renewable energy infrastructure, and smart land use decisions are the first of many new norms that complement the State's thriving freight sector. As freight investments continue, each investment decision should strongly consider how a project may integrate transformative ideas to increase the amplitude of benefits for the state's people, economy, and environment; "transformative" meaning of having a quality that catalyzes change in the freight system to make it more sustainable. In alignment with this principle, the following projects may provide added benefits to the freight transportation system and enhance California's economic competitiveness while protecting its community and environmental assets.

ALTERNATIVE FUEL CORRIDORS TO SUPPORT ZERO- AND NEAR-ZERO EMISSION (ZE/NZE) FREIGHT VEHICLES, EQUIPMENT, AND INFRASTRUCTURE

Clean Truck Corridors – Investments in corridor infrastructure that supports corridor deployment of ZE/NZE freight vehicles, specifically for medium- and heavy-duty vehicles, including managed lanes or tolling systems to prioritize "clean" heavy-duty trucks. These corridors should also have adequate access to alternative refueling stations for battery- and hydrogen-power medium- and heavy-duty vehicles.

Los Angeles (LA) County is actively involved in initiatives to promote Clean Truck Corridors and reduce emissions in the goods movement sector. Two notable programs in this regard are Metro's I-710 Zero Emission Truck Program and the ongoing outreach and development of the I-710 Project.

The I-710 Zero Emission Truck Program, led by Metro (the Los Angeles County Metropolitan Transportation Authority), aims to transition the trucking industry towards zero-emission technologies. The program focuses on deploying and testing electric and hydrogen fuel cell trucks along the I-710 corridor, which is a major goods movement route in LA County.

In addition to Metro's efforts, the Mobile Source Air Pollution Reduction Review Committee (MSRC) has been actively involved in promoting zero-emission goods movement infrastructure. The MSRC is a committee made up of various stakeholders, including government agencies, industry representatives, and environmental organizations, working towards reducing air pollution from mobile sources in the LA region.

Marine Highways - Move goods along waterways between ports and terminals along the Pacific Coast (M-5) and to inland ports (M-580). Modal shift to marine highways can provide VMT reduction benefits. Marine highway efforts should also be paired with zero or low-emission vessels and cargo handling equipment to maximize emissions reductions and take full advantage of the modal shift.

Port Infrastructure and Equipment – Deploy ZE/NZE vehicles, cargo handling equipment, and infrastructure at the ports that help meet State and port emission reduction goals.

Short Line and Other ZE/NZE Rail Projects - Move goods to and from ports and freight facilities to nearby locations or to further inland Class I railroads. Rail projects can help reduce VMT, improve the efficiency of the freight system, and reduce emissions, primarily if ZE/NZE locomotives, cargo handling equipment, and other infrastructure are used.

Truck Parking ZE/NZE Infrastructure – Install ZE/NZE charging and/or plug-in infrastructure at facilities where trucks are parked. Safety Roadside Rest Areas and truck stops may be prime areas for infrastructure investment since it already accommodates geometrics and design standards for Class VIII trucks. These locations are also where drivers tend to park for long periods to meet Hours of Service (HOS) regulations and could plug in or charge their vehicles, making these locations ideal for Vehicle Grid Integration charging technology.

INTELLIGENT TRANSPORTATION SYSTEMS (ITS) AND SOFTWARE SOLUTIONS THAT SUPPORT EFFICIENT FREIGHT MOVEMENT

Border Wait Times – ITS projects near the USA/Mexico border that provide real-time border crossing wait time information to drivers to help make better routing decisions and reduce idling time.

Vehicle and Container Location and Condition Monitoring Systems – These systems provide real-time information about the position of vehicles via location-enabled smart devices and truck OEM onboard hardware. Information can be accessed on the web. Sensors on the vehicle can also provide real-time information about the condition of the cargo shipment, container door-lock status, and adherence to the planned route. U.S. Customs service providers can estimate vehicle arrival times and prepare documentation prior to arrival, thus decreasing truck waiting times. Port gate operators can send estimated arrival updates to trucks in the case of cargo ship delays.

Eco Routing - Dynamic software may assist in determining the eco-friendliest route for truck drivers and fleet operation managers. Routes may be optimized based on minimizing emissions or fuel consumption and can adapt based on real-time, historical, and predicted traffic and environmental data.

Freight Signal Priority (FSP) – ITS technology may enable freight vehicles to receive priority for green lights at signalized intersections under appropriate traffic conditions, which can help reduce emissions and increase throughput. An example of FSP is the San Diego Port Tenants Association's implementation of FSP at roadway intersections near the port, funded by CEC.

Truck Parking Information and Reservation Systems – Traveler information that provides real-time parking availability to truck drivers to reduce time searching for parking and help drivers locate safe parking alternatives. These systems may also be used to reserve truck parking spaces for a specific vehicle at a specific time and to reserve a time to load or unload the freight. These systems contribute to efficiency by maximizing truck loading dock spaces in dense urban areas where parking spaces are limited. These systems also allow truck drivers to find safe parking zones and avoid unsafe or unauthorized zones. This information can be broadcast on dynamic message signs, mobile phone applications, or in-cab. Systems with an application program interface helps to ensure data is easily accessible and allows drivers to make more informed decisions.

Truck Platooning – As mentioned earlier, truck platooning refers to linking two or more trucks in a convoy using technology to link and automate the acceleration and deceleration of the connected trucks. The technology automatically sets and maintains a close distance between each vehicle, allowing fuel savings and increased safety. California has been a leader in platooning deployment and demonstration projects.

Traffic Control and Monitoring Systems - Systems that control and manage traffic flow by providing information to traffic authorities and logistics service providers regarding collisions, congestion, traffic flow speed, and vehicles. Technologies such as "smart" traffic lights, license plate recognition cameras, and speed cameras are included. Such systems can send updates about vehicle arrival time and delays, improving the efficiency of truck, port, terminal, and warehouse operations. The environmental performance of transportation operations is increased by decreasing transport time and vehicle idling.

Weigh-in-Motion (WIM) Systems - Systems that ensure vehicles are not overloaded beyond maximum allowable weights. They are used to determine vehicle weight as they move past sensors. Removing overweight vehicles from roadways increases safety and decreases damage to pavement and structures. WIM systems also improve highway system performance by eliminating or reducing truck stop times at static weight-controlling stations. WIM systems can help reduce the risk of accidents by identifying overweight vehicles and flagging them for enforcement action. Broad application of WIM monitoring can provide a wealth of traffic operations data across a wide area or along an extended corridor.

Railroad Management and Operations - ITS train applications that benefit protection controls for interstate and state networks and improve network capacity, operational flexibility, service availability, travel times, safety, system reliability, and security. Control and dispatch centers can schedule more trains on the same area of track and 'fleet trains' heading in the same direction by spacing them more closely while still providing safe stopping distances. Developments in this area highlight the need for interoperability with road-based ITS technology, particularly at railway crossings.

Rail Crossing Safety Systems - Systems that expand the use of ITS to improve rail crossing safety, including low-cost solutions that augment more traditional treatments for crossings, such as signs, flashing lights, and boom gates. Short-range communications between oncoming trains and vehicles or roadside installations to warn motor vehicle drivers will likely require integration with other auto and truck-based ITS technologies.

Northern California

SECTION 1. REGIONAL OVERVIEW

The Northern California Region (NCR) abuts Oregon's southern border and northwestern Nevada. The region follows the northern boundaries of the Sacramento Valley and Bay Area Regions and follows the western edge of the North Pacific coastline. The NCR includes Del Norte, Humboldt, Lake, Mendocino (Caltrans District 1), Lassen, Modoc, Plumas, Shasta, Siskiyou, Tehama, Trinity (Caltrans District 2), and Colusa, Butte, Glenn, Nevada, Sierra, Yuba Counties (Caltrans District 3), and is comprised of approximately 28 percent of the state's total land area.[246] Much of the land is publicly owned by the Federal and State government.
The NCR supports national, State, and regional economies and the quality of life of the people living there. The dense forests that cover Northern California are national, State, and regional assets that draw tourists to the region, provide the timber needed for construction and add dollars to the economies. California's top five timber producers--Humboldt, Mendocino, Shasta, Siskiyou, and Del Norte Counties--are all located within this region. Together in 2020, these five counties produced 750.4 million board feet of timber valued at $210.6 million.[247] Even though the region is still the State's largest timber producer, logging has decreased significantly from peak production several decades ago. This area also produces wine, grapes, orchard fruits, dairy, and cattle for feeding the global population.

Tourism is a significant economic generator for the NCR. Travel spending benefits this region through direct impacts (employment and earnings linked to travel expenses made by the traveler at the establishment), indirect impacts (employment and earnings linked with the industries that supply goods and services (e.g., hotels, car rentals, ski resorts), and induced impacts (employment and earnings linked to the purchase of food, lodging, and transportation for the travelers and the travel industry employees). It is important to note that the direct travel impacts of recreation and tourism in the NCR benefit the state and local economies. During the summer season, traffic volumes climb nearly 25 to 50 percent on many regional highways, impacting trucking on rural freight highways. National and international travelers to the state partake in the natural beauty of the federal and state parks in the region to swim, hike, camp, and engage in a multitude of winter-related outdoor activities. These attractions create additional traffic (e.g., trailers, recreational vehicles) that can impede freight trucks on priority freight routes.

Table 6.3: Northern California Regional Overview

Counties (CO)	Distinguishing Characteristics
Butte (BUT)	According to the Butte County General Plan 2030, the county generates most of its economic vitality through agriculture directly through crop revenue and indirectly through industrial, manufacturing, transportation, warehousing, and on-to-sale sector jobs like construction, wholesale, and retail. The county produces rice, walnuts, prunes and plums. According to the USDA, the 2017 Census of Agriculture, BUT CO is one of the largest producers of walnuts, almonds, and plums in the nation.

Colusa (COL)	Agriculture (ranching and farming) and recreation are primary economic drivers, and rice and almonds are the main crops. The county's transportation network provides access to camping, fishing, boating, and bird watching at East Park Reservoir. It also provides access to the Mendocino Off-Highway Vehicle (OHV) Corridor that connects Fouts Springs/ Davis Flat OHV Staging Area and the Middle Creek OHV Staging Area. Many visitors en route to Mendocino National Forest travel through the county.
Del Norte (DN)	DN Co's primary economic drivers are commercial fishing, tourism, agriculture, and the Pelican Bay State Prison. Cattle, milk, and nursery products are the county's primary commodities. Crescent City is the county's only incorporated city and is home to the Crescent City Harbor. The county's topography comprises a coastline, rugged mountainous terrain, and redwood forests. Two major rivers, the Smith and the Kamath, flow through the county and empty into the Pacific Ocean. The Yurok Tribe, Resighini Rancheria, Tolowa Dee-ni' Nation, and Elk Valley Rancheria are the four federally recognized tribes in the area. Four Native American Reservations and Rancherias reside in the county: Elk Valley Rancheria, Resighini Rancheria, Smith River Rancheria and the Yurok Tribe.
Glenn	Glenn County, located approximately 75 miles north of Sacramento, is one of the smallest California counties. The Grindstone Indian Rancheria, the county's only federally recognized Tribal government, is located southwest near the city of Orland. Travel in the county is primarily automobile-oriented due to the rural nature of the local communities, low development densities, and limited options for using non-auto modes of travel. The county's largest industries are agriculture, forestry, fishing and hunting, retail trade, health care, and social assistance.
Humboldt (HUM)	HUM CO's mild summer and proximity to the Pacific Ocean, redwood forests, and hiking and biking trails make it an ideal tourist location--especially for those trying to escape the summer heat. The county has the longest California coastline and is home to the Port of Humboldt Bay. Natural resources industries, including lumber, forestry products, and agriculture, are vital to the county's economy. This county is the state's largest timber supplier, producing 227 million board feet valued at $77 million, equating to 21.8 percent of the county's agricultural value and 24.2 percent of the state's total timber value in 2020[248]. Other top commodities include cattle and calves, milk products, and nursery products. Commercial fishing is another industry that supports the regional economy. Eureka has over 200 commercial fishing vessels listed as the home port, approximately 130 commercial fishing boats are berthed at the Eureka Public Marina, and annually over 500 ships from other West Coast ports utilize the harbor.[249] Eight Native American Reservations and Rancherias reside in the county: Bear River Band of Rohnerville Rancheria, Big Lagoon Rancheria, Blue Lake Rancheria, Hoopa Valley Tribe, Karuk Tribe, Trinidad Rancheria, Wiyot Tribe, and the Yurok Tribe. The nearest designated metropolitan area is located more than 150 miles away. All goods traveling through the county moves by trucks utilizing the SHS and local roads.
Lake (LAK)	LAK CO is situated within the Pacific Coastal Mountain Range between Mendocino and Sonoma Counties to the west and Glenn, Colusa, Yolo, and Napa Counties to the east and south. The county consists mainly of mountainous terrain, Clear Lake (the state's largest freshwater lake), and resource lands (surrounding the lake). LAK CO hosts the world's largest complex of geothermal power plants and has the state's cleanest air. Agriculture plays a significant role in its economy, as Lake is California's largest supplier of premium fresh pears. Other commodities include wine grapes, wine, English walnuts, cattle, and calves. Six Native American Reservations and Rancherias reside in the county: Big Valley Rancheria, Lower Lake Rancheria, Middletown Rancheria, Elem Rancheria, Habematolel Pomo of Upper lake and Robinson Rancheria.
Lassen (LAS)	Government agencies manage approximately 63 percent of the county's land. Diverse natural settings include Lassen Volcanic National Park, Lassen National Forest, Sierra Nevada mountains, high desert areas, and several lakes. Eagle Lake is the second-largest natural lake in California. Hay (primarily alfalfa) and livestock have long been the principal agricultural commodities, while some logging operations remain.
Mendocino (MEN)	MEN CO is known for its distinctive coastline and forest lands. Its primary commodities are wine, grapes, timber (44 percent of the county's agricultural value), Bartlett pears, cattle,

	and calves. In 2020, the county ranked second in the State for timber production producing 114 million board feet valued at $48 million.[250] The county consistently maintained a median household income of roughly $20,000 less than the State's rate, and the county's poverty rate consistently remained higher than the statewide average between 2016 and 2020.[251] Ten Native American Reservations and Rancherias reside in the county: Hopland Reservation, Cahto Tribe-Laytonville Rancheria, Manchester-Point Arena Rancheria, Coyote Valley Rancheria, Pinoleville Reservation, Potter Valley Rancheria, Redwood Valley Rancheria, Round Valley Rancheria, Scotts Valley Rancheria and Sherwood Valley Rancheria.
Nevada (NEV)	NEV CO is located in the Sierra Nevada foothills and is known for its rich gold mining history and cultural, agricultural, recreational, and tourist activities. The balance of technology, manufacturing, agriculture, tourism, timber, education, healthcare, construction, retail, and many other sectors work together to create a thriving economy. Western NEV CO represents one of the four most highly regarded Digital Media technology clusters in the U.S., along with Portland, Seattle, and Boston. NEV CO is the only one located in a rural area.SR 20 and 49 are the county's key interregional corridors and are used to transport fruit and vegetables, field crops, nursery products, livestock, apiary, honey, wool products, high-tech and manufactured products, and timber. They connect to I-80, SR 70, SR 99, and U.S. 101.
Modoc (MOD)	Approximately 90 percent of the land in Modoc is National Forest and wilderness. This county has a combination of high desert terrain, spectacular mountain ranges, green fertile valleys, wetlands, crystal clear lakes and streams, the Warner Mountain Wilderness area, and Lava Beds National Monument. The principal crop is alfalfa hay.
Plumas (PLU)	PLU CO boasts 100-plus lakes, over 1,000 miles of rivers and streams, and over a million acres of National Forest, providing outdoor adventure opportunities year-round. Top commodities include timber (44 percent of the county's agriculture value), livestock, alfalfa, and meadow hay. The county is the state's second-largest timber producer. In 2021, it produced 220.7 million board feet of timber valued at $22 million.
Sierra (SIE)	Divided by the Pacific Crest, this rural county's most prominent industries involve construction and wood products. Crops grown in this county include alfalfa hay, barley, Christmas trees, forestry, timber, hay, grass hay, meadow oats, and rye.
Shasta (SHA)	Recreation is SHA CO's primary economic activity, with the top tourist attractions being Shasta Lake, Lassen Volcanic National Park, Whiskeytown National Recreation Area, and the Sundial Bridge. Main commerce includes timber (33 percent of the county's agriculture value), cattle, hay, nursery stock, and wild rice. In 2021, the county was ranked sixth in the state for timber production and produced 141.6 million board feet valued at $30 million.[252]
Siskiyou (SIS)	SIS CO is located in the Shasta Cascade Region and is home to Mount Shasta (the 5th highest peak in the State). Federal and state agencies manage more than 60 percent of the land. Tourism plays a significant role in the county's economy and employment. "The SIS CO Visitors Bureau estimates that the county provides opportunities and services for nearly 400,000 people annually."[253] The county's agriculture consists primarily of grazing livestock and field crops. Strawberry plants are its top commodity, followed by timber, hay, steers and heifers, raspberry plants, and wheat. In the Butte Valley, additional crops such as garlic, carrots, potatoes, and mint are grown; in the Shasta Valley, orchard fruit such as apples and peaches are also found. In 2021, the county ranked fourth in the state for timber production and produced 184.6 million board feet valued at $37 million.[254]
Tehama (TEH)	I-5 and the Sacramento River bisect TEH CO. Walnuts, by far, are the primary commodity, followed by olive products, almonds, and prunes. Other regional commodities include honey and bee products, milk, timber, and livestock. Many of this area's goods are shipped internationally to over 50 countries.
Trinity (TRI)	TRI CO's rugged topography is comprised of the Trinity Alps, South Fork Mountain, and other ridges of the Klamath Mountains and Coastal Range. The county is carved by the deep canyons and valleys of the Trinity, Van Duzen, and Eel Rivers. This county is extraordinarily rural and has no incorporated cities or towns. Most people, goods, and commodities that enter and leave the county utilize the SHS. The county's economy and employment rely on natural resources, mining, construction, manufacturing, trade, transportation, and utilities.

	The top commodities include forest products as well as cattle and calves. Over 70 percent of the land in Trinity County is owned by the Federal government and is not subject to property taxes.
Yuba (YUB)	Home to Beale Air Force Base, YUB CO's leading industries involves steel and wood product manufacturing and publications. Agricultural production for the county includes walnuts, almonds, timber, fruit, nuts, cattle, calves, and milk. Rice has the highest crop value, followed by walnuts.

Primary Truck Routes

Interstate Routes (I)

I-5

Interstate-5 is a principal north-south freight corridor that spans the West Coast, originating at the nation's busiest international border crossing at San Ysidro (San Diego, CA), and culminating at Blaine, Washington, near the Canadian border. This critical interstate is designated as part of the federal nation network, National Highway System (NHS), Interstate System, Surface Transportation Assistance Act (STAA), National Scenic Byway, Intermodal Corridor of Economic Significance, and the California Freeway and Expressway System. Furthermore, I-5 connects major population centers of the western United States (e.g., Cities of San Diego, Santa Ana, Anaheim, Los Angeles, Sacramento, Portland, and Seattle) and serves as a nexus of international trade with the Pacific Rim, North America, and Latin America. I-5 also plays a significant role in the NCR as it is the region's only interstate route and provides critical access to the NCR rural freight highways (SRs 3, 20, 32, 36, 44, 89, 96, 97, 99, 151, 162, 263, 265, 273, and 299).

United States Highways (U.S.)

U.S. 97

United States Highway 97 is a major north-south interregional corridor that begins at its junction with I-5 (near the City of Weed, CA) and proceeds north through central Oregon, Washington, and the Canadian Province of British Columbia. At the British Columbia/Yukon Territory Border, U.S. 97 becomes SR 1 and terminates in Anchorage, Alaska. Truckers utilize this corridor as an alternative to I-5 (especially when I-5 is closed due to weather events) due to fewer grades, which allow trucks to consume less fuel and achieve faster travel times to many destinations in Oregon. Trucks represent 11 percent of the total Annual Average Daily Traffic (AADT) at the southern end of the route and 28 percent at its northern end. Total truck volumes in 2017 ranged from 989 to 1166 trucks daily, with the majority being larger (5+ axle) trucks.

U.S. 101

United States Highway 101 is a major north-south national, inter-/intra-regional freight corridor linking California's North Coast, Oregon, Washington, and all of California's coastal cities. Its proximity to two of the nation's largest metropolitan areas (Los Angeles and the Bay Area) makes it an essential corridor for national and international goods movement, commerce, trade, and other critical industrial activities. This route is part of the NHS and the California Freeway and Expressway System. It is the primary interregional corridor for goods movement between the NCR and the Bay Area. This corridor is a vital lifeline for rural Northern California communities because it serves as the region's primary freight, recreation, and emergency evacuation route. U.S. 101 serves the Port of Humboldt (via SR 255) and trucking operations that serve residents and businesses. It is utilized to transport agriculture, lumber, and other goods produced in the corridor to market or the Port of Humboldt for shipment out of the region. Except for a five-mile gap (HUM/MEN County line to Richardson Grove State Park), U.S. 101 is a National Network (STAA) route that provides accessorily for industry-standard STAA trucks. Because of this gap, truckers must unload their cargo in the Bay Area (approximately 150 miles south of Eureka) and transfer it from the single industry-standard freight trucks to multiple California legal trucks to move cargo into and through the NCR. A project is currently being assessed to see if this gap can be closed.

U.S. 199

United States Highway 199 is a critical east-west rural highway for the interregional movement of goods (primarily forest-related products), recreational travel, and the interstate movement of goods between California (U.S. 101 north of Crescent City) and Oregon (I-5 at Grants Pass). This corridor traverses the Jedediah Smith Redwoods State Park, is part of the Redwood National and State Park System and follows the wild and scenic Smith River. U.S. 199 is designated as a Forest Service Scenic Byway through the Smith River National Recreational Area (most of the length of this route).

U.S. 395

United States Highway 395 is a principal north-south freight corridor that originates in San Bernardino County and continues to the California/Oregon State Line. U.S. 395 is a critical Northern California freight connector between SR 36 in Susanville and Reno, NV. It is part of the SR 299/44/36/U.S. 97 corridor between the Pacific Coast (Port of Humboldt) and Reno, NV. U.S.395, south of Susanville, provides access to the Sierra Army Depot, the nation's largest military storage facility.

State Routes (SR)

SR 20 Corridor (SR 29/53/49/I-80)

The State Route 20 Corridor is a critical east-west interregional freight corridor, beginning at the Pacific Coast near Fort Bragg, continuing eastward across the northern Central Valley, and connecting with I-80 in the Sierras. This route connects four important interregional corridors; I-5 (upper Central Valley), U.S. 101 (California's North Coast), SR 99 (entire Central Valley), and SR 70 (western Sierra). This critical corridor also serves recreational travel from the Sierra Nevada Mountains to the North Coast, and it is the "crossroads" or "hub" for agricultural and goods movement in the North Central Valley and through the Yuba City/ Marysville urbanized areas (for connections to SR 99 and 70). The route also serves as a main street through various communities, including Marysville, Yuba City, Colusa, and others, and an interregional route for forcing the agricultural goods movement. It is also an essential regional corridor serving Mendocino and Lake Counties' rural communities. Its closest east-west strategic interregional corridor is 100 miles north on I-5 (SR 44 in Redding) or 50 miles south (I-80 in Sacramento).

SR 44

State Route 44 traverses northcentral California through the northern Sacramento Valley. It begins at the junctions of SRs 273 and 299, serves as a major east-west connector through the city of Redding, connects to SR 89 near the Sierra Nevada Mountain Range (SNMR), and ends at SR 36 (LAS CO). SR 44 is a part of the SR 299/44/36/U.S. 395 corridor between the Pacific Coast (Port of Humboldt) and Reno, NV.

SR 45

State Route 45 is a north-south route. It originates at SR 113 in Yolo and spans north to SR 32 in Glenn County. SR 45 is a main street in the communities of Grimes and Princeton and intersects with SR 20 through Colusa. While most of SR 45 is designated California Legal Truck Route, the segment between SR 20 and the community of Princeton is a Terminal Access STAA route.

SR 49

State Route 49 is a north-south interregional route that serves many historic California Gold Rush mining communities. This rural highway begins at Oakhurst (Madera County). It continues northwest through Tuolumne, Calaveras, Amador, El Dorado, Placer, Nevada, Yuba, Sierra, and Plumas Counties, where it ends at its junction with SR 70 (in Vinton). The route is a main street throughout the Sierra Nevada Foothills and is an essential last-mile connector for local goods movement. SR 49 is a federally designated Critical Rural Freight Corridor (23 U.S.C. 167(g)) and is vital to the state, regional, and local economies. It is estimated, on average, between $5.5 to $7.6 million worth of commerce annually travels over the Donner Pass every hour[255]. Both SR 20 and SR 49 are designated to handle STAA oversize and CA Legal Trucks. They are the only "Emergency Detour Routes" when I-80, between Emigrant Gap and Colfax, is closed due to major collisions, wildfires, and construction. The emergency events significantly increased the truck freight traffic on SR 20/SR 49. Caltrans District 3 Traffic Management Center reports that between 2004 and 2021, there were 218 closures of I-80, where truck traffic and passenger vehicles were rerouted onto SR 20 and SR 49.

SR 70

State Route 70 is a rural minor arterial highway that originates at SR 99 (Sutter County near Catlett Road in Marysville) and ends at U.S. 395 (Hallelujah Junction). This route crosses SR 49, 89, 149, 191, 284, and U.S. 395 and serves the long-distance movement of people and goods. It is also the primary east-west route over the SNMR when Interstate 80 is closed. Sections of SR 70 also are main streets through Marysville and Yuba City.

SR 89

State Route 89 is a north-south interregional mountain highway beginning at I-5 (Mount Shasta) and ending at U.S. 395 (near Coleville). This 243-mile-long corridor provides access, a major thoroughfare for many small communities in northeastern California, and access to tourists and service providers (hotels, resorts, parks, restaurants) to major recreational attractions and resource areas. Tahoe Basin industries depend on this route to provide access for the delivery of goods and services. This corridor provides lifeline access to Sierra and Alpine Counties and linkages between I-5 and SR 36, 44, 70, and 299. Portions of SR 89 in Siskiyou and Shasta Counties are an essential detour when I-5 is closed through the Sacramento River Canyon.

SR 99

State Route 99 is a critical north-south interregional freight corridor and a vital highway for California's economy. This corridor serves as a significant farm-to-market route for most agricultural products from the Central Valley. Most of the commercial and personal travel between the cities within the Central Valley uses SR 99. This route also serves as the main access route for smaller urban areas to urban services available in the larger urbanized areas.

SR 149

State Route 149 is an essential connector between SR 70 and SR 99 in BUT CO and is a designated Terminal Access STAA route.

SR 197

State Route 197 is a north-south two-lane minor arterial that serves regional and interregional traffic and provides for local access and the movement of goods between the U.S. 101 (at Fort Dick) and U.S. 199 (near Hiouchi). This route allows for the movement of extra-legal loads and is ultimately expected to be designated as an STAA truck route between U.S. 101 and the SR 197/ U.S. 199 junction.

SR 255 (Arcata to Samoa Peninsula)

State Route 255 is a vital intermodal route that connects the Port of Humboldt Bay to U.S. 101.

SR 267

State Route 267 is a north-south route that begins at I-80 in the town of Truckee and continues south into the Tahoe Basin and intersects with SR 28. Only the portion of from I-80 to the Nevada/Placer County line is within the NCR. SR 267 is a California Legal truck route.

SR 299

State Route 299 is a major east-west interregional freight corridor connecting the Port of Humboldt (via SR 255 and U.S. 101) and other Northern California industries to two major north-south corridors (U.S. 101 and I-5). It is also part of the corridor that connects the Pacific Coast to Reno, NV (via SR 299/44/36/U.S. 395). The route serves a variety of traffic, including local (intra-regional), recreational, commuter, and commercial. It is classified as a National Forest Scenic Byway and part of the California Freeway and Expressway System (U.S. 101 to I-5). It is heavily utilized for recreational access to and along the Trinity River. This critical freight corridor provides for the interregional movement of goods (commerce, timber, nursery, greenhouse products, dairy products, cattle, hay, pasture and range, wine grapes, forest products, colony of bees, strawberries, rice, alfalfa, livestock, potatoes, and vegetables). It links rural communities and small urban areas across the northern part of the state to national and international markets.

Freight Rail

Class I Railroads

Two Class I railroads, UPRR and BNSF, provide freight rail services within the NCR. The main UPRR route runs north and south through Caltrans District 2 and the center of Redding, paralleling the I-5 corridor. It connects service with east-west corridors in Seattle, Portland, Oakland, and Los Angeles. It also operates multiple rail lines that converge on the Sacramento area in District 3. These rail lines include connections to locations outside the District 3 boundaries, some of which include Redding, Keddie, Truckee, Stockton, and San Francisco.

BNSF has a route (using some UPRR-trackage rights) in District 2 that serves as a primary unit and manifests (mixed car/cargo) freight. Major regional commodities moved by rail include tomato products, olives, rice, cheese, frozen foods, beer, wine, wheat, some stone, petroleum products, lumber products, and chemicals.

Short Line Railroads

The North Coast Railroad Authority (NCRA) owns the Northwestern Pacific (NWP) Railroad short line (which partially parallels U.S. 101) from Korbel (Humboldt County) to Healdsburg (Sonoma County). It has an operating easement from Healdsburg to Lombard (Napa County). Senate Bill 1029 (2018) began the process of transferring the southern operating easement to the Sonoma-Marin Area Rail Transit; and railbanking of the northern portion of the right-of-way. A proposal for an east-west connection from the Port of Humboldt Bay to the national rail system is being considered. Other rail services in the region include:

- Service in Tehama County, provided by the California Northern Railroad (CFNR) and UPRR, is focused on heavy or bulky freight materials produced locally and shipped regionally.
- Rail tracks from Lassen County transport lumber products and perlite to Oregon.
- Several rail spurs in Shasta County exist for freight loading/unloading.
- Central Oregon and Pacific Railroad (CORP) is a Class II railroad out of Eugene, Oregon, that interfaces with the UPRR at Black Butte and Montague in California. Lumber and related products are its primary carload business.
- Although the Skunk Train between Fort Bragg and Willits is exclusively passenger service, it could resume freight service in the future. There is also discussion of the railroad being replaced by a recreational trail instead.
- The California Northern Railroad has short line rail lines connecting West Sacramento and Woodland and the Port of West Sacramento to counties north.
- Sierra Northern Railway operates within the Sacramento/Yolo County region.
- The Sacramento Valley Railroad operates within the Sacramento region.

Seaports

Maritime facilities exist in all three coastal counties of Del Norte, Humboldt, and Mendocino. The once-bustling Port of Humboldt Bay is California's northernmost deep-water shipping port and the only port between San Francisco (225 nautical miles south) and Coos Bay, Oregon (156 nautical miles north). Over the years, logging restrictions, natural events, and competition have dramatically lowered the port's activity levels. Canada and China are the Port's main trading partners.

Marine transport is constrained due to channel depths in the North Bay Channel of Humboldt Bay, which affects the navigability of the Bay for deep-draft vessels common on the Pacific Ocean shipping lanes. Harbor deepening projects will allow the Port to accommodate large Panamax vessels. Forest products dominate exports and imports, but petroleum products are also imported. Approximately 90 percent of Humboldt County's gasoline and diesel, as well as about 70 percent used by Del Norte, Trinity, and Mendocino Counties, is imported into Humboldt Bay, and over half of the fresh oysters consumed in California are grown in the bay. The Port also serves cruise ships, Navy vessels, the U.S. Coast Guard, and commercial fishing. The long-term economic well-being of the Port of Humboldt depends to a considerable extent upon market competitiveness and efficient connections to inland areas by truck transportation. The challenge of a drastically-reduced timber industry, competition from other seaports, continued expense of dredging, and deteriorating infrastructure makes it difficult for Humboldt Bay to reclaim a thriving status. Businesses that entice imports and create wanted exports will increase demand for port services. Truck and port rail access will also need attention if these businesses are revived.

In Del Norte County, the City of Crescent City owns and maintains a harbor with a commercial fishing fleet and public-access docks. The Crescent City Harbor cannot accommodate large container ships, but it is the only "harbor of refuge" between Humboldt Bay and Coos Bay. Surges destroyed most docks at Crescent City Harbor from the 2011 Japan tsunami. A tidal gauge was installed in the Crescent City boat basin in 1934. Since its installation, Crescent City has been hit by 34 tsunamis, large and small. In Mendocino County, maritime services for commercial fishing, the U.S. Coast Guard, and private vessels are provided by Noyo and Point Arena Harbors.

Air Cargo

Fifty public-use airports are spread throughout the NCR, but only three are scheduled for commercial airports – Redding Regional Airport, Jack McNamara, and Arcata. The closest international airports are Sacramento International Airport in California, Rogue Valley International-Medford Airport in Oregon, and the Reno-Tahoe International Airport in Nevada. Virtually all airports move light cargo and/or serve as delivery transfer locations. The NCR airports play an essential role by handling cargo like mail and parcels for remote rural communities. Rural airports connect smaller communities to larger global markets and perform vital functions, especially in emergencies (e.g., critical medicine, organ transport, and disaster response).

Airports

Redding Regional Airport handles most of the regional cargo and is at the center of airfreight and package movement activity. Federal Express (FedEx), United Parcel Service (UPS), and United States Postal Service (USPS) serve this airport using heavy and light trucks, air freight, and charter air services. Jack McNamara Field/Del Norte County Airport is served by FedEx and SkyWest, making it a vital cargo hub for the area.

Humboldt County Public Works runs Murray Field and Redwood Coast Airports. In 2013, Murray Field, Humboldt County's main cargo airport and sole base of FedEx air cargo operations, transported over 860 metric tons of cargo. The Redwood Coast (formerly known as the Arcata-Eureka Airport) is classified by FAA as a primary commercial service airport and designated as an international Port of Entry. This airport captures only cargo transported on passenger airline flights. Total air cargo handled at Murray Field and California Redwood Coast-Humboldt County Airport is down by 32 percent in the last decade – a loss of an average of 1,599 pounds of cargo a day. Air cargo at the airports peaked in 2007, with an average of 5,100 pounds per day. By 2016 that number had fallen to an average of 3,400 pounds per day.[256]

Ukiah Airport provides recreational flying, pilot training, charter, fuel, maintenance, corporate, small business, air freight (scheduled FedEx and UPS flights), and courier services.

SECTION 2. POLICIES, PROGRAMS, AND MAJOR FREIGHT INFRASTRUCTURE INVESTMENTS

The seventeen NCR counties have common transportation, growth, and land use issues and can benefit from well-formulated and unified strategies. Trucks are the primary freight mode, and small communities are scattered across large expanses, undeveloped forests, foothills, mountains, and coastal lands. Haulers must travel further distances, consume more fuel, and incur higher transport costs to move goods into or out of this region. Further, truckers have difficulty finding parking and other services as many of these rural communities are separated by 100 miles or more, and many do not offer any services.

State highways connect California's communities to each other and to major population centers. Therefore, it is common for a single state highway to serve as a community's primary freight route, main street, and emergency evacuation route. However, many of these freight corridors do not have parallel and connecting routes that can serve as alternative passages for trucking. Many alternate options are local roads and highways that cannot carry larger vehicles. In 1982, Congress passed the STAA of 1982 that established national standards for truck widths and lengths and linked those standards to the designation of the National Network. However, many rural freight corridors either have not been updated to meet the national standards or have segments (network gaps) that have not been upgraded. Ensuring that all main freight highways are upgraded to national standards, allowing access to industry-standard freight trucks, will enhance regional livelihood and increase the NCR's competitiveness. The non-STAA highways and highway segments cause chokepoints, preventing freight industry-standard trucks from accessing the region. Truckers must make more trips using smaller California Legal trucks not equipped with clean technologies to move the same amount of goods. Simply put, with STAA access, manufacturers and industries could transport more goods and utilize clean technologies while making fewer trips (reducing VMT).

The NCR is also an essential thoroughfare for freight, with trucks being the primary mode due to their flexibility and ability to serve as the "first and last mile" for other modes. Finding stable funding to maintain roadways that handle heavy trucks and equipment is critical. Several projects to ease horizontal and vertical roadway alignments--allowing for STAA access--and expanded trade opportunities within and beyond the state are planned or underway.

Like many regions in California, the NCR is heavily impacted by wildfires. In addition to supporting freight movement, the rural freight highways act as regional and local evacuation routes and access routes for CalFire and Forest Service trucks to quickly reach areas to combat wildfires and stage firefighter camps. With new State regulations, controlled burns will be more frequent, requiring more CalFire and Forest Service access. Prescribed forest thinning will likely increase logging activity and associated logging vehicle traffic within this region. Power and water utility trucks also require rapid access to their facilities during the fire season. It is anticipated that climate change will result in longer fire seasons, requiring larger firefighting equipment to use outdated rural highways that may be unable to accommodate.

To support the region's freight vision, below is a list of strategies that the region is working to implement:

- Focus freight planning and funding efforts on the critical freight backbone network for the region (e.g., SR 99 Tehama Expressway, Lake Britton Bridge (SR 89), Pit River Bridge (I-5 over Shasta Lake), Whiskey Creek Rehab (includes Shasta Divide Climbing and Bike Lane), Strategic Interregional Corridor Opening to STAA (299-44-36-395) projects).
- Fund near-term projects and develop actions to support those longer-term priority projects that are characterized as not fitting the short-term criteria but are highly important to this region and cannot be funded under traditional funding programs.
- Encourage regional partners to pursue Project Approval and Environmental Document (PAED) on priority projects in preparation for competitive funding programs.

- Improve passing opportunities (e.g., truck climbing lanes) or physical restrictions like narrow and winding roadways, substandard vertical and horizontal road alignments, freight bottlenecks, and weight restrictions where feasible and practical.
- Address significant conflicts between local and interregional travel ("Main Streets" as highways).
- Asset Management.
- Improve deteriorated roadways.
- Improve truck parking and service opportunities.
- Complete the California Freeway and Expressway System on critical rural freight routes.
- Upgrade key supporting routes that serve as alternatives or redundant options to the State Freight Network by bringing them to the facility concept.
- Develop strategies at select locations to allow the passage of industry-standard STAA trucks, thereby opening the entire priority interregional corridor for STAA access (e.g., U.S. 101 Corridor, SR 20 through Marysville, SR 44 Corridor (SR 299/44/36/U.S. 395)).
- Identify and provide improved detours that can be utilized during road closures and inclement weather (e.g., detours around the Siskiyou Mountains and Sacramento River Canyon, I-80 to SR 20/49).
- Remove gaps in the transportation system (e.g., complete I-5 to 6-lanes within the Redding/Anderson area) to accommodate freight flows.
- Expand the use of Intelligent Transportation Systems (ITS) to enhance early warning and real-time information for pre-trip and in-route traveling.
- Encourage truck climbing lanes were feasible and practical.
- Improve the freight transportation system to accommodate emergency response vehicles.
- Incorporate wider shoulders on key freight routes for added cyclist and pedestrian safety.

Central Sierra Region

SECTION 1. REGIONAL OVERVIEW

The Central Sierra Region (CSR) is comprised of the TRPA boundaries within Placer and El Dorado (Caltrans District 3), Inyo and Mono Counties (District 9), and Alpine, Amador, Calaveras, Mariposa, and Tuolumne Counties (District 10).

The Sierra Nevada's western slope encompasses some of California's oldest transportation routes. Many highway alignments follow corridors developed during the Gold Rush that were subsequently developed as private toll roads until the establishment of the SHS in the early twentieth century. Many of these original routes provided access to markets for the various primary extractive industries in the region—mining and quarrying, logging, and to a lesser extent, farming and ranching. After World War I, trucking displaced rail as the primary transport mode of these goods. With time, the region shifted from a shipper of goods to a receiver. Although some extractive mineral operations remain in operation, gold mining essentially ceased with the executive order to close the mines during World War II. Logging declined as global markets expanded in the 1980s. Although farming and ranching continued, there has been little impetus or opportunity to increase or preserve market share relative to other agricultural regions. During the period following the 1970s, population growth in the region increased primarily due to migration from other areas, which may contribute to the region's above-average median age compared to the State's.

Tourism and recreation were components of the local economy as far back as the nineteenth century. Yosemite Valley businesses aligned with tourism have boomed since World War II. The CSR's travel industry comprises of retail and services, including lodging establishments, gas stations, retail stores, restaurants, and other businesses supporting recreation and tourism. Income from tourism benefits the region directly (employment and earnings linked to spending from travelers at establishments), indirect impacts (employment and earnings linked with the industries that supply goods and services (e.g., hotels, car rentals, ski resorts), and induced impacts (employment and earnings linked to the purchase of food, lodging, and transportation for the travelers and the travel industry employees). It is important to note that the direct travel impacts of recreation and tourism in CSR benefit the state and local economies. For example, in 2018, approximately $357 million in state and local taxes were generated by direct travel spending (e.g., fuel, food, services, and lodging). Please see **Table 6.4** for direct travel impacts by county in 2018.

Table 6.4: Direct Travel Impacts by County (2018)

		Spending			Tax Revenue	
County	**Total**	**Destination ($Millions)**	**Employment (Jobs)**	**Local (Mil, USD)**	**State**	**Total**
Alpine	35	35	271	1	1	2
Amador	150	143	2,137	5	7	12
Calaveras	205	196	2,752	5	9	15
El Dorado *	1,040	986	12,392	44	46	90
Inyo	246	242	2,462	10	9	19
Mariposa	473	470	4,122	21	14	35
Mono	608	605	5,608	36	19	55
Placer *	1,413	1,328	14,487	44	64	109
Tuolumne	264	254	2,396	9	12	20
Total	4,434	4,259	46,627	175	181	357

**Represents the entire county*
Source: Dean Runyan Associates, Inc. (2019). 2010-2018 California Travel Impacts, Sacramento, CA: State of California

The travel industry relies on freight moved by trucks along the SHS to provide fuel to the gas stations, produce to the stores, and supplies to the hotels. A reliable and connected freight transportation system is critical to supporting this region.

While tourism is a significant economic generator, it has also shaped regional land use and demographics over the decades. Travelers captivated by the region's beauty perceive this area to be more affordable and offer a better quality of life for the elderly than the highly populated urban areas. Affluent city dwellers relocate to the CSR with the expectation that they will have the same access to goods and services that they had in urban areas. They usually discover that access to medical services and other goods and services are significantly diminished in these rural areas – forcing these often-elderly drivers to maneuver local rural highways for lengthy trips to access critical services.

Table 6.5 below describes the distinguishing characteristics of each county in the Central Sierra region.

Table 6.5: Central Sierra Regional Overview

County	Distinguishing Characteristics
Tahoe Basin (Basin) Counties	The Basin is located in the SNMR, along the eastern portion of California in ED and PLA Counties and is centered by Lake Tahoe. It comprises 71 shoreline miles (42 miles in CA and 29 in Nevada). The Basin relies heavily on tourism, which often peaks in the summer and winter due to the large number of resorts and outdoor activities in the area. Planning and land use operations are handled jointly by the State of California, the State of Nevada, TRPA, the Tahoe Transportation District (TTD), and other special interest groups focusing on watershed protection and environmental and animal preservation.
Alpine (ALP)	ALP CO is located in the Sierra Nevada Mountains in eastern California. It is approximately 30 miles south of South Lake Tahoe, 85 miles south of Reno, Nevada, and 120 miles east of Sacramento. Recreation and tourism comprise a large part of the economy and employment. The County's rugged terrain and remote location make it an ideal recreational space. Roughly 95% of the County's land is publicly owned and designated wilderness areas or open spaces, making it a prime location for fishing, skiing, hiking, hunting, and bicycling.[257] However, the harsh winter weather and heavy snowfall often result in winter road closures.
Amador (AMA)	AMA CO is located approximately 35 miles southeast of Sacramento on the western slope of the SNMR. The county has a diverse topography with elevations in the Foothills at around 250 feet to approximately 9,000 feet above sea level in the mountainous regions. Amador's economy was hit hard by the last economic recession, resulting in about 3.5% of its population (1,350 residents) moving out of the county between 2010 and 2013.[258] Like Alpine County, Amador's economy relies heavily on recreation and tourism. Amador's economy is also supported by the Mule State Prison, wineries in the Shenandoah Valley, and mineral resources industries near Ione.
Calaveras (CAL)	Tourist attractions in the CAL CO include gold-panning, wine tasting, skiing, camping, hiking, fishing, cavern-exploring, and bicycling. According to the Calaveras Visitors Bureau, over a million visitors visit the county annually, and tourism supports 2,400 jobs in the county and contributes nearly $6 million in state and local taxes[259]. Future employment growth is expected to occur in sectors such as construction, leisure and hospitality, education and healthcare, and government services.
Mariposa (MPA)	MPA CO's primary industries include recreation associated with Yosemite National Park and government services. The leisure and government sectors employ nearly 4,000 people, and more than half work in or around Yosemite, either maintaining the park or serving the millions of tourists annually.
Tuolumne (TUO)	TUO CO is a destination for tourism. Most travelers use the state highways to access the county. State Park destinations include Columbia State Park, Railtown 189, and Yosemite National Park. "According to Yosemite National Park, in 2015, approximately 1.2 million visitors were using the Big Oak Flat Entrance to Yosemite along SR 120. The TUO CO's Visitors Bureau estimates that county visitors added approximately $205 million to the local economy in 2014[260]."
Inyo (INY)	INY CO, located in the easternmost portion of central California, spans the southeastern length of the SNMR between Bishop and north of Walker Pass. It borders the State of Nevada (east), Mono (north), and San Bernardino and Kern Counties (south). It comprises the low

	desert of Death Valley, the high desert of the Owens Valley, and the dramatic escarpment of the eastern High Sierra, including Mt. Whitney (14,495 feet). The City of Bishop is the only incorporated city. Other major communities within the county include Big Pine, Independence, Lone Pine, and Shoshone.[261] Domestic and international tourism is the major economic activity. The region hosts over 13 million visitors annually. Although development is limited since much of the land is publicly owned (2 percent private ownership), in 2018, agriculture production was $21,499,000. Other natural resource-related industries, including renewable energy and mining, depend on the highway system for production and maintenance access.
Mono (MNO)	In 2007, MNO CO's estimated population was 13,985 persons (7,650 persons (54 percent) in Mammoth Lakes and 6,425 persons (46 percent) in the unincorporated portion of the County).[262] MNO CO is home to the Mammoth Mountain Ski Area, which attracts hundreds of thousands of visitors annually. The county is also a popular destination for summer recreation destinations including the eastern entrance to Yosemite National Park, Inyo National Forest, and Mono Lake. Development is limited due to much of the land being public (7 percent private ownership). In 2018, agriculture production was $32,347,000. Other natural resource-related industries, including renewable energy and mining, also rely on the highway system for production and maintenance access.
Source: Caltrans, 2019	

TRUCK ROUTES

United States Highway (U.S.)

U.S. 6

United States Highway 6 is an interregional route that links California with other economic hubs in the western U.S. It provides access to commercial, residential, agricultural, and recreational lands and is the main street for the communities of Chalfant and Benton. This route is part of the Strategic Highway Corridor Network (STRAHNET), a network of highways providing the military with continuity and emergency capabilities for defense. Most freight on U.S. 6 flows between Southern California, northern Nevada, and Idaho. The Eastern Sierra Corridor Freight Study (2019) estimates that the AADTT traffic will grow from 37% to 58% by 2040. During inclement weather conditions, U.S. 6 serves as a detour for U.S. 395.

U.S. 50

United States Highway 50 is an east-west highway from its junction with I-80 (Yolo County) through Sacramento County and into the State of Nevada (via El Dorado County). Within the Tahoe Basin, US 50 serves as the main commercial thoroughfare for South Lake Tahoe and Meyers communities. The route is heavily congested during the summer and winter peak tourism months. Tahoe Basin industries depend on this route to provide access for the delivery of goods and services.

U.S. 395

United States Highway 395 is a principal north-south freight corridor beginning in San Bernardino County and continues to the California/Oregon State Line. This corridor consistently provides a high level of service and lifeline accessibility for rural communities and interregional and interstate movement of people, goods, and recreational travel along the eastern slope of the SNMR in both INY and MNO Counties. Approximately 60 percent of the AADT is attributed to recreational activities, and 20 percent is attributed to goods movement. The Eastern Sierra Corridor Freight Study (2019) estimates that the AADT for truck and five or more axle truck categories to grow from 37% - 59% by 2040. U.S. 395 is also the main street for many rural communities in the Eastern Sierra, including Lone Pine, Bishop, and Bridgeport. It also provides critical links to U.S. 6 and I-80 to the north and SR 14 to the south.

State Routes (SR)

SR 49

State Route 49 is a north-south interregional route that serves historic California Gold Rush mining communities. This rural highway begins at Oakhurst (MAD CO) and generally continues northwest through the counties of TUO, CAL, AMA, ED, PLA, NEV, YUB, SIE, and PLU before ending at its junction with SR 70 in Vinton. SR 49 is the main street through the Sierra Nevada foothills and is an important "last mile" connector for the local goods movement.

SR 88

State Route 88 is an east-west Trans-Sierra route connecting Stockton, CA, to the State of Nevada. It is an essential route for importing alfalfa from Nevada to California dairies. The route is the southernmost year-round highway until SR 58 over Tehachapi Pass in Kern County. Although SR 88 is an STAA route to the City of Jackson, it is an alternative route during intermittent winter closures of I-80 and U.S. 50.

SR 89

State Route 89 is a north-south interregional mountain highway that begins at I-5 in Mount Shasta and ends at U.S. 395 near Coleville (MNO CO). This 243-mile-long corridor provides access and serves as a major thoroughfare for many small communities in northeastern California and provides access to major recreational attractions and resource areas. Tahoe Basin industries are dependent on this route to provide access for the delivery of goods and services. This route provides lifeline access to Sierra and Alpine Counties and provides a linkage between I-5 and routes SR 36, 44, 70, and 299. During the winter, portions of SR 89 are closed between Lassen National Park and Monitor Pass.

SR 120

State Route 120 is an east-west highway that connects I-5 east of the Bay Area to U.S. 6 north of Bishop. This route was the first highway to connect to Yosemite National Park, and it is one of the original state highways constructed prior to World War I. Although it is a critical truck freight route into TUO CO, the park restricts freight crossing Tioga Pass.

SR 267

State Route 267 is an east-west, 11-mile-long, undivided two-lane mountain highway that connects I-80 in Truckee (NEV CO) to the North Shore of Lake Tahoe in Kings Beach (PLA CO). This corridor provides access to recreational, residential, commercial, and industrial uses. Recreational sites include the Northstar California ski and year-round resort and the Martis Creek Lake recreation area. Facilities along the SR 267 corridor include the Truckee Tahoe Airport and the town's primary administrative offices.

Freight Rail

Historically, there were several logging railroads in Mother Lode. Currently, one Class III short line serves Tuolumne County from Stanislaus County, paralleling the Stanislaus River. The Sierra Railroad provides recreational and freight services between Oakdale and Standard irregularly.

Air Cargo

Bishop Eastern Sierra Regional Airport received commercial designation in Fall 2020 and provides commercial service both in the summer and winter.

SECTION 2. CORRIDOR STRATEGIES

In the state's densely populated urbanized areas, manufacturers and industries are located near large highways and interstates, and freight providers have modal choices (shipping, rail, air cargo). However, rural CSR communities are isolated from each other and the rest of the state by miles and mountains, rely heavily on trucks for moving freight, and do not have direct connections to major freeways, interstates, or major population centers. For example, of the seven counties (Alpine, Amador, Calaveras, Inyo, Mariposa, Mono, Tuolumne) and partial counties of Tahoe Basin (El Dorado and Placer) that comprise this region, only Placer County has direct access to an interstate route (I-80).

Furthermore, many CSR highways were constructed decades ago, during the interwar period (1918 to 1939), and have rarely been upgraded to current design standards. Subsequently, these routes have truck weight and length restrictions because they have not been upgraded to accommodate STAA freight industry standard trucks. These restrictions limit accessibility to this region to smaller non-standard trucks and result in more freight trips, vehicle miles traveled, increased emissions, and greater transportation and product costs. Highways with STAA segment gaps have choke points that prevent freight industry standard tucks from accessing the region. As a result, truckers must make more trips using smaller California Legal trucks not equipped with clean technologies to move the same amount of goods. Simply put, with complete STAA access, manufacturers and industries could move more goods and utilize clean technologies with fewer trips while decreasing VMT.

A vital transportation system consideration is providing an efficient modern truck connection between the cities and towns of the region with the larger freight hubs and providing a continuous STAA route and a connection for last-mile service. A secondary consideration is to develop an interconnected network by providing a north-south connection along SR 49 consistent with its inclusion in the National Highway System.

For the routes that may have zero-emission or near-zero-emission trucks, accessibility to charging stations remains a challenge. Millions of visitors are drawn to the CSR to view the beauty of the rugged mountains, hike mountain trails, and fish rivers and lakes. The same geographic features that make this area a tourist favorite make it difficult to move freight and maintain the transportation system. The steep and unpredictable terrain creates challenges for developing surface roads, which often follow narrow, winding, steep river valleys and mountain passes unsuitable for large truck transport. During winter, these mountainous highways are susceptible to closures due to landslides, slippages, flooding, and snow cutting off rural communities from the rest of the state. Truck drivers that serve this region must travel further distances, consume more fuel, and incur greater transport costs. Truck drivers have difficulty finding parking due to narrow highway shoulders, few turnouts, and lack or limited services offered by these isolated communities.

The CSR is heavily impacted by wildfires, which requires regional highways to support freight movement, act as evacuation routes, and provide access to CalFire and Forest Service so they can combat wildfires and stage firefighter camps quickly. Prescribed forest thinning will likely increase logging activity in the Central Sierra with associated logging vehicle traffic. Power and water utility trucks also require rapid access to their facilities during fire season. With climate change, fire seasons are getting longer, causing more frequent demand for larger firefighting equipment. The increased demand makes highway improvements for freight traffic even more critical.

Trucking Strategies

To support the region's freight vision, below is a list of strategies that the region is working to implement:

- Improve passing opportunities or physical restrictions on narrow, winding roadways and substandard vertical and horizontal road alignments.
- Address significant conflicts between local and interregional travel ("Main Streets" as highways).
- Implement or update Intelligent Transportation Systems (ITS).
- Improve deteriorated roadways.
- Improve truck parking and service opportunities.
- Upgrade freight corridors to accommodate STAA trucks.
- Complete the California Freeway and Expressway System.
- Upgrade highways to four-lanes where feasible and practical.
- Encourage truck climbing lanes were feasible and practical.
- Improve the freight transportation system to accommodate emergency response vehicles and evacuation routes.

Bay Area

SECTION 1. REGIONAL OVERVIEW

The San Francisco Bay Area Region (Bay Area) is home to approximately 7.8 million people. A significant share of the regional economy is associated with goods movement-dependent industries. This includes industries that produce goods for sale or for whom transportation access to markets is a critical aspect of their business operations, such as the construction industry. The regional goods movement infrastructure includes the nation's ninth busiest container port (PofOAK) and several specialized seaports, two of the Western U.S.'s most active air cargo airports (SFO and OAK), major rail lines and rail terminals, and highways that carry some of the highest volumes of trucks in California.

Economics of Goods Movement in the Bay Area

In the Bay Area, goods movement-dependent industries account for $487 billion in total output (50 percent of total regional output) and provide almost 1.1 million jobs (32 percent of total regional employment).[263] The significant difference between the shares of industrial output and shares of the employment supplied by goods movement-dependent industries in the region is that manufacturing is increasingly shifting toward high-value products that do not use labor-intensive production processes, such as biotechnology products and that many high-tech product manufacturers have shifted their production activities offshore but have kept their value-added design and development activities in the Bay Area.

The Port of Oakland has three core businesses: 1) operation and management of the seaport, 2) OAK (airport), and 3) commercial real estate along the waterfront (Jack London Square). The PofOAK maintains the highest export ratio of any West Coast port and generally retains a 50/50 balance of import and export container volume throughput. In 2017, the PofOAK commissioned an economic study that revealed the port and its partners supported 84,144 jobs, including 42,401 direct jobs, in the region and was tied to nearly 1,010,697 jobs nationwide through direct, indirect, and induced employment. An Oakland resident holds approximately one in five direct jobs created by the port. The PofOAK generated over $698 million in state and local taxes in 2017, and $117.6 billion of economic activity in California was associated with the imports and exports moving through the seaport and airport.[264]

Local Goods Movement System

The Bay Area goods movement system consists of interconnected infrastructure components, including highways, rail lines and terminals, airports, seaports, warehouses, and distribution facilities. While the system is often described in terms of its modal components, it must function as an integrated whole with efficient intermodal connections.

Global Gateways

Bay Area global gateways include the major maritime facilities at the Port of Oakland, the smaller ports of Richmond, Benicia, San Francisco, and Redwood City, and the San Francisco, Oakland, and San Jose international airports, which handle international as well as domestic air cargo.

The PofOAK expects continued growth in exports. On the import side, the PofOAK faces significant obstacles to growth and landside challenges that must be addressed, including impacts on nearby neighborhoods. While the PofOAK is "Big Ship Ready," the sudden surge in larger post-Panamax ships may create unintended consequences for portside and landside operations.

OAK and SFO currently do not face significant capacity constraints or issues, though local access routes can be improved. One of the critical needs at OAK is building a dike in the airport area that is used for air cargo movements to prevent runway flooding, which could grow more critical in the future due to climate change impacts. Likewise, SFO faces vulnerabilities from sea level rise. Norman Y. Mineta San Jose International Airport (SJC) does not face present capacity constraints but is locked into a limited land footprint without expansion opportunities, should the need arise. The most significant immediate need facing the region's airports is improved roadway access. All three airports experience significant peak-hour congestion and reliability issues on the major truck routes leading to the airports (U.S. 101 and I-880) and on local access routes. The Bay Area also features numerous General Aviation airport facilities that significantly contribute to the region's economic well-being.

Interregional and Intraregional Corridors

The inter- and intraregional corridors consist of primary highways and rail lines that serve to connect the global gateways of the central Bay Area to the rest of the State and other domestic markets. This network provides primary access to major facilities, such as the PofOAK and the international airports of San Francisco, Oakland, and San Jose, rail yards, distribution centers, and warehouse/industrial districts. Key interregional and intraregional truck corridors in the Bay Area include I-80, 580, 880, 38, and 680, U.S. 101, and limited segments of SR 92 (San Mateo Bridge), 152, 4, 12, and 37. Most of these corridors carry between 5,000 and 15,000 trucks per day on average, performing both long-haul and short-haul truck moves. However, on average, key segments of I-880 and I-580/238 connecting the PofOAK to the San Joaquin Valley carry between 15,000 and 37,000 trucks per day.

Traffic congestion is one of the most prominent issues in the Bay Area. Truck delays increase the costs of goods movement and can result in increased truck emissions. Congestion is particularly problematic for truckers because it impacts on-time performance, and, in some cases, shippers may be penalized for the poor reliability of service. Freeway interchange, auxiliary lanes, corridor capacity enhancement, and operations improvement projects have been identified in these major freight corridors to help address these issues.

Two Class I rail carriers, UPRR and BNSF Railway, operate in the region. The UPRR maintains and manages the Martinez, Niles, Coast, Oakland, Warm Springs, and Tracy Subdivisions. At the same time, BNSF operates the Stockton Subdivision. Many passenger rail services also operate on these lines, including Amtrak (Capitol Corridor, San Joaquin, California Zephyr, and Coast Starlight), Caltrain, and the Altamont Commuter Express.

Local Streets and Roads

The local freight system is vital to regional and local goods movement. Local streets are last-mile connectors that provide critical connections between major freight facilities and interregional and intraregional corridors. They are increasingly important with the growing use of e-commerce and the shift towards a knowledge-based economy. Major arterial truck routes often are used as alternatives to congested freeways for city-to-city truck movements. Farm-to-market roads in the region's rural parts are also vital to the local goods movement system and serve critical economic functions. The key issues with local streets and roads include connectivity gaps, modal conflicts, land use conflicts, and truck parking issues.

Environmental and Community Issues

Port of Oakland

Queuing and congestion lead to many air quality and health impacts for neighborhoods nearby the Port. Emissions, noise, and light from port operations can adversely affect the health and wellbeing of residents. The PofOAK contributed about 29 percent of the pollution to the West Oakland community, with the rest being contributed by other local sources in and around West Oakland. This suggests that solutions that address local pollution sources and port-related emission reduction strategies will be important to implement. In addition, the operational and grade crossing issues discussed previously also generate a variety of secondary issues for the Port and the nearby West Oakland community. Over the past decade, through the PofOAK's Seaport Air Quality 2020 and Beyond Plan (the successor to the Maritime Air Quality Improvement Program), diesel particulate matter has been reduced by 81 percent. Truck diesel emissions are down 98 percent, and ship emissions dropped 78 percent. Further, AB 617 (2017) directs air regulators to identify communities with a high cumulative pollution exposure burden and to work with communities to develop solutions. The Bay Area Air Quality Management District (BAAQMD) prepared the West Oakland Community Action Plan[265] in 2019, which lays out a series of measures to be implemented over the next five years by state, regional, and local agencies to reduce pollution in the community.

Rail System

The rail system also has a significant impact on communities. At-grade crossings introduce safety concerns (risk of derailment, emergency response time) and traffic delay issues to the overall transportation system. Crossing safety and traffic delay (including buses) are related to roadway traffic volumes and the number of trains using the route. Train horn regulation also creates noise impacts on adjacent communities. Targeted safety improvements have been identified, such as grade crossing improvements at Jack London Square in Oakland, Emeryville, and Berkeley, the establishment of Railroad Quiet Zones in Fremont, and the quiet zone exploration in Richmond to mitigate these impacts.

Major Trends Influencing Goods Movement in the Bay Area

In recent years the Bay Area has planned for compact development in Priority Development Areas adjacent to transit. This can create redevelopment pressure in older industrial centers, leading to conflicts between goods movement and passenger transportation modes on congested roadways and rail lines. As land values have risen, much of the region's distribution network for serving consumer demands has moved to the northern San Joaquin Valley and northern Nevada. This is exacerbating congestion and safety conditions on the region's interregional highways.

Along with the region's concern over housing affordability comes an overarching concern about equity in land use and transportation decisions. Within the region, there is a need to address environmental justice issues while reducing pollutant emissions. The region's major goods movement corridors and facilities tend to be concentrated in close proximity to communities that are disproportionally low-income and/or communities of color and where environmental justice concerns are significant. Continued investment in goods movement in these corridors must minimize impacts on these communities. At a broader level, the region continues to pursue strategies to address climate change and environmental sustainability goals as a core component of its transportation plans. This will require new approaches and new technologies for goods movement.

SECTION 2. POLICIES, PROGRAMS, AND MAJOR FREIGHT INFRASTRUCTURE INVESTMENTS

Goods Movement Planning in the Bay Area

In 2016, MTC adopted the San Francisco Bay Area Goods Movement Plan, which identifies five key goals:

- Reduce environmental and community impacts and improve the quality of life in communities most affected by goods movement.
- Provide safe, reliable, efficient, and well-maintained freight movement facilities.
- Promote innovative technology strategies to improve efficiency.
- Preserve and strengthen a multi-modal system that supports freight movement and coordinates with passenger transportation systems and local land use decisions.
- Increase economic growth and prosperity.

MTC adopted a near-term (10 year) goods movement investment strategy to implement the plan in 2018. The investment strategy identified three main focus areas to achieve regional goods movement goals: Roadways, Railways, and Community Protection. The investment strategy was designed to help the region in the following ways:

1. **Deliver projects that can improve mobility and economic vitality**. The strategy will help implement projects and programs crucial to achieving the performance targets in MTC's Regional Transportation Plan/Sustainable Communities Strategy, Plan Bay Area 2050, including reducing delays on the regional freight network, increasing middle-wage jobs, and reducing per capita GHG emissions.

2. **Address community and environmental concerns of freight**. This strategy also sets forth a commitment to reduce the impacts of pollution on communities, mitigate emissions from existing technologies, and adopt cleaner technologies. The BAAQMD would lead these efforts in coordination with MTC, Alameda County Transportation Commission (ACTC), PofOAK, and public health and environmental groups.

3. **Enable the region to coordinate and compete for state and federal fund sources**. Over the past couple of years, three new major state and federal funding programs with a direct nexus to freight have been initiated. These include the NHFP, Nationally Significant Multimodal Freight and Highway Project (INFRA), and the SB 1 TCEP. Staff estimates that the region may receive over $1 billion in funding over the next ten years from these funding sources alone.

MTC is in the process of developing an updated goods movement investment strategy, which will incorporate new fund sources such as the Port and Freight Infrastructure Program.

Example Freight Infrastructure Investments

Port of Oakland

Access to and from the Port presents significant challenges. The most significant constraint, aside from long wait times at container terminal gates, is the impact of at-grade railroad crossings in the Port, specifically on Maritime Street, where both at-grade crossings can simultaneously be blocked by one train and result in significant truck queues. The Global Opportunities at the Port of Oakland (GoPort) program of projects will reduce emissions from idling trucks, increase port operational efficiency, and provide significantly improved truck and rail access. The proposed grade separation and roadway reconfiguration of 7th Street from Maritime Street to Navy Roadway would eliminate the at-grade crossing of Maritime Street near 7th Street and improve operations. A third gateway to the Port, Adeline Street, features a structurally obsolete bridge with grades that are not safe for trucks to traverse. Further, expanded intermodal rail terminal capacity and improvements on the rail mainlines accessing the Port, increased nearby transload warehousing capacity, and other improvements are proposed as part of the Oakland Army Base Redevelopment Project that still needs additional funding.

Equipment and non-equipment-based emission reduction projects have been identified for the PofOAK. The projects include upgrades to ZE/NZE equipment, port electrical grid improvements, facility upgrades, emission reductions, and extended gate hours/days. The Green Power Microgrid (GPMG) project would enable the PofOAK to support a high number of electric vehicles by increasing the renewable energy mix available to the Port and surrounding communities. By increasing the current ZEV capacity at Port from 50 pieces of equipment to approximately 1,000, this would optimize the grid through load shifting and demand management, as well as distributing power during periods of excess solar generation, providing back-up renewable shore power, modernizing grid connections, and significantly increasing the ability to support grid-connected refrigerated containers, while improving air quality and health outcomes in neighboring communities.

Mainline Rail

The region's most constrained segment is the UPRR Martinez Subdivision between Richmond and Oakland. Adding more trains to this network segment may result in unstable operating conditions, seriously degrading Amtrak’s Capitol Corridor’s on-time performance and intermodal and unit trains moving to and from the PofOAK. In Solano County, there are several locations where switching operations that are necessary to access industrial customers have to take place on the mainline due to insufficient industrial spurs and leads. This has the effect of reducing capacity and increasing travel times for both passenger and freight trains.

The Industrial Parkway, Shinn, and new wye connections at Lathrop and Stockton junctions are all expected to improve system connectivity. Likewise, targeted operational improvements such as the City of Hercules Third Track, upgrade of the waterside drill track to 3 mainlines between Port and Bancroft, and track improvements to the Coast Subdivision will improve system capacity and operations.

Central Valley

The Sacramento-San Joaquin River Valley and its networks of surrounding gateway passes and connecting routes make up the Central Valley Corridor (Valley), which has long been acknowledged as a critical goods movement corridor in California. This vast corridor is served by portions of Caltrans Districts 3, 6, 9, and 10. The region includes over half the State’s geography (33 of 58 counties), is the fastest growing (twice the state average rate), and in 2019 became the second most populous region in California, surpassing the San Francisco Bay Area.[266] Past planning efforts created a logical, cohesive, integrated goods movement system in the Central Valley.

There are three general types of freight movements in the region, the global export of agricultural goods and products, the regional import of finished goods from major urban and manufacturing centers into the cities and towns, and the interstate and international transport from other regions through the Valley. Although the dominant transport modes are trucking, rail, maritime, and air transport, all have their roles within the region. The pattern is further complicated by the relocation of warehousing and distribution centers from the urban areas along the Coast into the Valley to take advantage of lower property values and wages, and by the local freight movements from farms to processing centers and local markets.

I-5, SR 99, and BNSF/UPRR rail mainlines provide the backbone for goods movement to major gateways in Southern California, the Bay Area, and out of the state. In addition, the region features an extensive cross-valley connector system, including routes such as SR 20, I-80, SR 120, SR 4, I-205, SR 165, SR 198, SR 41, SR 46, SR 58, SR 132, SR 108, and others, as well as a system of inland waterway/ports and short-haul rail. The Central and Southern Valley reported that goods movement-dependent industries (including agriculture/dairy/ranching/forestry, food processing, construction, energy production, and transportation/logistics) accounted for more than 564,000 jobs and $56 billion in economic output in 2010, with over 463 million tons of goods moved into, out of, and within the region. This is expected to grow to more than 800 million tons by 2040. The corridor includes the three largest agriculture-producing counties in the nation the region is becoming a significant logistics hub with expanding mega-distribution centers and new manufacturing/processing facilities.[267]

Projects to enhance goods movement in the Central Valley Corridor may also benefit regions outside the Central Valley. Approximately half of all 5-axle plus trucks moving through the Valley on I-5 (approximately 6,000 daily) originate from or travel to destinations outside the region.[268] Although heavy trucks comprise about 11 percent of volumes on I-5, many gateway and cross-valley connector routes have greater than 30 percent of truck volumes.[269]

Sustainable technologies, programs, and policies in the Central Valley Corridor have the most significant potential to advance a number of targets in the CSFAP:

- Improve system efficiency, i.e., truck platooning, load matching, increase diversion of freight from truck to more efficient modes such as rail, shorter routes, etc.
- Transition to low- and zero-emission technology, i.e., hydrogen, electric, etc.
- Increase competitiveness and economic growth, lower export shipping costs for agriculture and other products to improve the state economy while improving disadvantaged communities' jobs/housing balance.

The Central Valley region Freight Investment Strategy is comprised of two parts due to the large size of its geographical area — 1) the Northern Central Valley and then 2) the Mid and Southern Central Valley. Each part has two sections — 1) a regional overview narrative and 2) a description of policies, programs, and major freight infrastructure investments.

SECTION 1. REGIONAL OVERVIEW

North Central Valley (Sacramento Region)

The Sacramento Region is a crossroads for freight moving into and out of California. The Northern Central Valley region includes the interior coastal range to the west, flat agricultural land across the valley, foothills, river canyons, and the Sierra Nevada Mountains. The region, located north of

San Joaquin County and northeast of the Bay Area, covers the counties of El Dorado, Placer, Sacramento, Sutter, and Yolo. The region has a diverse range of industrial uses, with distribution and warehousing representing nearly 80 percent of the total industrial inventory between the Bay Area, Monterey, and San Joaquin regions. The region is also home to the J.R. Davis Rail Yard in Roseville, the largest intermodal rail facility on the West Coast. Like San Joaquin County, I-5 and SR 99 are the critical north-south truck routes throughout the SACOG region. I-80 is the key east-west truck route between the bay area and interstate freight to the east.

Highways

Trucks are the primary mode, hauling approximately 68 percent of all regional commodity tons moving through the region and over 95 percent of all goods with an origin or a destination within the region.

The region is home to the northernmost freeway hub for freight movement within the State within the Sacramento region, where corridors such as I-5, I-80, US 50, SR 51, and SR 99 intersect. Within District 3, priority freight corridors include I-5, I-80, SR 49, US 50, and SR 70 that provide interregional and intraregional routes. Additionally, the following corridors are part of the truck network within Caltrans District 3. Routes include SR 12, SR 16, SR 20, SR 29, SR 45, SR 49, US 50, SR 51, SR 65, SR 70, I-80, SR 84, SR 89, SR 99, SR 104, SR 113, SR 128, SR 153, SR 160, SR 174, SR 193, SR 220, SR 244, SR 267, SR 275, and I-505. These corridors vary from Main Streets, highways, and freeways that have direct or indirect impacts to communities and movement of people and goods.

During the winter months, approximately $5.5 to $7.6 million-dollar value per ton per hour are lost when trucks are delayed on I-80 from passing over Donner Pass between Sacramento and Reno.[270]

SACOG's Rural-Urban Connection Strategy (RUCS) effort also noted that agricultural commodity processing is largely performed by large-scale processors in the San Joaquin Valley, and these commodities travel almost exclusively by truck. The lack of processing capacity requires small and medium-sized farming and ranching operations to drive longer distances to markets and has been identified by SACOG as an issue that affects local growers' ability to offer a greater diversity of products in the marketplace. Developing a new infrastructure of processing facilities to serve the region's local marketplace has been recommended by SACOG as a strategy that could increase and extend the market viability of these value-added products and reduce truck VMT.

The 2015 Caltrans District 3 Goods Movement Study found that bottlenecks are concentrated around the U.S. 50/SR 99 Interchange in East Sacramento, on I-5 in downtown Sacramento, on I-5 south of I-80, at the junction of U.S. 50 and SR 16, at the junction of I-80 and SR 99, and along SR 99 in Elk Grove.[271] These bottleneck locations are all within a 15-mile radius of downtown Sacramento.

California Trucking Association and other outreach participants in the Goods Movement Study indicated that interchanges at I-80/Mace, I-80/U.S.50, and I-80/SR 51 are the worst freight bottleneck locations in the Sacramento area.

Building upon analysis from the Caltrans District 3 Goods Movement Study, the 2020 Placer Sacramento Gateway Plan (PSGP) further identified congestion and bottleneck locations on sections of US 50, SR 51, I-80, Business 80, and SR 65 in the Sacramento/Placer County regions. The PSGP highlighted bottleneck areas along the study area where travelers can experience up to 15 minutes of additional travel time on a typical weekday due to freeway delay alone. Major corridor bottlenecks include eastbound and westbound Business 80 in Sacramento, westbound I-80 near Citrus heights, and the I-80/SR 65 interchange area near Roseville and Rocklin.

Major Road Truck Network

After 2012, SACOG began to inventory and map the region's goods movement network and trucking routes. This effort identified the STAA routes, California legal routes, and local restricted or recommended routes. These routes were mapped with the intensity of trucking in the region, measured in trucks per acre. The study found that STAA trucks and 48-foot and longer semi-trailers were using secondary highways and arterials in the region--despite their lack of ability to handle the dimensions of the longer vehicles. Often, industries are located in areas where longer STAA trucks do not have access to complete STAA routes/networks—areas such as the east side of Woodland, West Sacramento, North Sacramento, the Richards Boulevard area, South Sacramento, and Galt.

Air Cargo

Sacramento International Airport and Sacramento Mather Airport are among the top ten air cargo carrying airports in the state. Sacramento International Airport is one of the top 10 cargo airports in California, carrying more than 200 million pounds of freight each year. With nearby Amazon and Walmart distribution centers, demand for air cargo facilities is only growing in Sacramento. Air cargo at Sacramento International Airport is expected to grow 1.9% annually, adding another 100 million pounds of freight by 2040. Air cargo at SMF has grown 71% over the past decade and is expected to continue to grow as Amazon and FedEx locate regional facilities near the airport. The Amazon Fulfillment Center located near SMF, is expected to increase employment in the coming years due to the increase in online shopping and will use the corridor for their freight and shipping needs, although smaller personal vehicles and vans are occasionally employed for goods movement instead of semi-trucks. Sacramento Mather Airport (MHR) is approximately 14 miles east of downtown Sacramento south of U.S. 50 and is Sacramento County's designated airport to capture regional air cargo growth. MHR handled 836,000 metric tons of cargo in 2021, a 1086% increase from 2018. This is attributed to increase in e-commerce. United Parcel Service operates a 20,000-square-foot facility at MHR. The airport has 66 acres of existing and designated land for additional warehouse, office, auto parking, and trucking operations areas.

Inland Ports

Port of West Sacramento

This inland bulk port is located 4.7 miles west of downtown Sacramento near U.S. 50 in Yolo County. The Sacramento Deep Water Ship Channel (DWSC) runs 43 miles from Antioch (in Contra Costa County) near the mouth of the Sacramento River, ending at the harbor of West Sacramento. The Port can accommodate five ships at berth simultaneously. North Terminal cargo facilities are currently leased and operated by SSA Marine. There are over 300 acres of vacant, developable property surrounding the North Terminal that is currently managed by the Port.

Rail

Four freight railroad systems operate in the Region:

- **UPRR**, the largest Class I freight railroad in the U.S., it operates 3,267 miles of track in California. The J. R. Davis Yard, located in the City of Roseville in Placer County, is the largest classification yard on the West Coast. Approximately 98 percent of all UPRR traffic in Northern California is moved through this yard.
- **BNSF Railway**, the largest Class I intermodal container carrier in North America and the largest grain-hauling railroad in the U.S. In California, BNSF operates over 2,130 miles of track—1,155 miles of which are owned by BNSF with 975 miles of through trackage rights.
- **Sierra Northern Railway (SERA)**, the Class III regional railroad operates between Woodland and the Port of West Sacramento and interchanges with BNSF and UPRR. Typical commodities hauled include wood products, bulk commodities, agricultural and food products, as well as chemicals and steel.
- **California Northern Railroad (CFNR)**, the Class III short-line railroad operates two lines on tracks in District 3: between Davis in Yolo County and Tehama in Tehama County (District 2), and between Wyo and Hamilton City in Glenn County. CFNR carries mostly food-related commodities along with some stone, petroleum products, and chemicals.

According to the FAF database, rail tonnages traveling through the region are expected to grow from just over 30 million annual tons in 2011 to nearly 48 million tons by 2035 (approximately two percent per year).[272]

PART 1. SECTION 2: POLICIES, PROGRAMS, AND MAJOR FREIGHT INFRASTRUCTURE INVESTMENTS

Regional Policies and Programs

SACOG looks to grow its multibillion-dollar agricultural economy; and recognizes growth depends on rural roads, highways, and freeways, as trucks are the main form of transportation for agriculture in the region. The RUCS project seeks to better understand how trucks and other traffic are utilizing designated trucking routes and other roads in the region to guide strategic investments in the area and better plan for maintenance and upgrades.

SACOG's MTP/SCS invests nearly $2 billion of the Plan's road capacity budget in projects that will primarily be carried out by Caltrans for state highway investments. The investment focus is on new managed lanes, auxiliary lanes, and interchanges along the freeway system. Collectively, these investments serve travel between activity centers and accommodate trucks for inter-regional goods movement. Freight movement through the Sacramento region is predominately through trucks that carry goods from agricultural areas and port which are reliant on the highway network. Fixing bottlenecks along trucking corridors is important for effective movement of goods throughout the region and for traffic management. The MTP/SCS includes the following freight supportive policies and are consistent with California Sustainable Freight Action Plan Principles:

- SACOG should continue to inform local governments and businesses about a regional strategy for siting industry and warehousing with good freight access.
- Consider strategies to green the system, such as quieter pavements, cleaner vehicles, and lower energy equipment where cost effective, and consider regional funding contributions to help cover the incremental cost.

- SACOG should study, consult with, and help coordinate local agency activities to provide for smoother freight movement through and throughout the region.
- SACOG intends to preserve some capacity on major freeways within the region for freight and other interregional traffic by providing additional capacity for local and regional traffic on major arterials that provide alternative routes or running parallel to the major freeways.
    - An example of this effort is the Baseline/Riego Road connection from Roseville along the I-80 corridor and SR 99 in Sutter County. This roadway provides an east west connection to help divert around the Sacramento Core

SACOG also programs Federal and State funding for freight supportive projects in the Metropolitan Transportation Improvement Program (MTIP) and State Transportation Improvement Program (STIP) through regional funding rounds. SACOG assists project sponsors to objectively assess their funding applications against a variety of project selection criteria using SACOG's Project Performance Assessment (PPA) tool to analyze transportation investments at the project level. The tool specifically analyzes the following freight supportive metrics based on the project characteristics and footprint.

- Improve Goods Movement, including Farm-To-Market Travel, in and through the Region
    - Does the project serve, or connect to, a corridor used by goods movement? Indicator: Commercial VMT/ Total VMT
    - Does the project serve a facility that is congested for freight and goods movement travel? Indicator: Commercial Congested VMT(CVMT)/Commercial VMT
    - Does the project serve an area with freight-dependent jobs? Indicator: Percent of jobs in freight-dependent industries

Example Freight Infrastructure Investments

A SACOG inventory of STAA routes around the Port found that the network was not complete. Ensuring there is a complete network of access roads to and from the Port for STAA trucks is important to facilitate the continued growth of Port activities.

SR 99 and I-5

SR 99 and I-5 are two north-south corridors that cross through the mega-region. Coordinating improvements to SR 99 and I-5 could better support truck flows. This may include safety improvements and targeted capacity improvements, as well as conceptual strategies such as truck-only toll lanes to allow for smoother speeds and truck platooning. Simultaneously, facilitating truck movement between SR 99 and I-5 would help reduce congestion throughout the mega-region, as SR 99 was not originally designed to Interstate standards and passes through several major urban areas.

I-80 Corridor

I-80 is the east-west corridor that crosses the mega-region and supports year-round national freight movement across the Sierra Nevada Mountains to and from the east. Investments could include truck climbing lanes, truck parking, electric charging or hydrogen fueling locations, and investments to SR65 and SR20 to divert a significant number of trucks away from the congestion on I-80 near I-5 and US50 in downtown Sacramento.

SR 65 Corridor

The SR 65 corridor is a north-west corridor that connects the Roseville/Rocklin areas of Placer County to the Yuba County near Marysville. This section of the route transitions from a freeway to a highway and main street that interacts with freight truck traffic. This is illustrated as the corridor's transitions from an urban to rural setting as it transitions to the north. Further investments into the corridor should focus on increasing truck throughput and reducing delay.

Port of West Sacramento Unit Train Landing Track

The Port of West Sacramento works with UPRR, Sierra Northern Railroads, and Cemex to support unit trains to increase competitiveness and rail transport ability. The track improvements needed for unit train service to the Port require the construction of a $1.8M unit train landing track along Industrial Blvd. There are over 300 acres of vacant, developable property surrounding the North Terminal that currently is managed by the Port of West Sacramento. The Port is experiencing some growth after a decade of financial troubles, investments with lower than expected return, and challenging projects. The current strategy includes attracting green industries, deepening the channel to 35 feet along its entire length, and reinitiating the Marine Highway project--establishing a marine highway from the Port of Oakland to West Sacramento that can divert a significant number of trucks off I-580.

Mid and Southern Central Valley

Highways

SR 132

The SR 132 corridor is the primary east/west highway and freight corridor between the City of Modesto and I-580. The route serves Beard's Tract, an industrial area east of Modesto, but does not conform to STAA standards. SR 132 is a major truck connector route along its western portion between I-5 and SR 99. The route is utilized to transport agricultural goods produced in Stanislaus County, such as nuts, vegetables, and fruits, to the Bay Area, PofOAK, and domestic and international markets. Approximately 8.2 million tons of freight use the SR 132 Corridor annually.

SR 108/120

Existing SR 108/120 is a vital east-west interregional corridor connecting the Central Valley's heart to the Sierra Nevada mountains to the Nevada border. It begins from the backbone of the state near SR 99 and traverses through Stanislaus County and the Cities of Modesto, Riverbank, and Oakdale. It continues as SR 120 through the rural counties of Tuolumne, Mariposa, and Mono to the Nevada border.

The corridor combining SR 108 and SR 120 is an important freight corridor route into Tuolumne County. Throughout much of Stanislaus County, it is a two-lane conventional highway traversing the core of downtown Modesto, Riverbank, and Oakdale. Travelers would benefit if the route bypassed the three cities. The North County Corridor (NCC) Project is an integrated freeway/expressway project that would relieve traffic congestion and improve east-west freight mobility in Stanislaus County and the cities of Oakdale, Riverbank, and Modesto. The project will relocate SR 108 on a new alignment (while the existing SR 108 would be relinquished to the respective public agency as a local roadway) and will connect SR 108 near the City of Modesto to SR 120 near the City of Oakdale. The enhanced connectivity would generate substantial travel time savings, improve safety, reduce emissions, reduce vehicle operating costs, and overall improve quality of life for communities in the region. Implementation of NCC would support efficient movement of goods by providing a new west-east transportation facility that will reduce the number of conflict areas with non-motorized traffic, increase the average operating speeds, and improve travel time reliability. The project would also improve goods movement efficiency at a regional level, which would strengthen the agricultural and general economy of Stanislaus County.

SR 58

Highway 58 is a vital connection between the San Joaquin (SJ) Valley and Southern California/Southern United States via I-15 and I-40. It has seen a significant increase in truck traffic since 2011 of approximately 4,000 trucks per day. SR 58 plays a crucial role in transporting freight from SJ Valley's agriculture industry and distribution centers to Southern California and the Southern United States, especially during the closure of I-5's Tejon Pass due to extreme weather conditions.

The planned intermodal freight terminals in Mojave and Barstow will rely on SR 58 as the east-west corridor for transporting cargo containers delivered by rail from the Long Beach/Los Angeles Ports. The UPRR track through Tehachapi Grade faces limitations, causing congestion in freight rail and increasing reliance on SR 58 freight movement for transporting goods from the SJ Valley. Kern County's multi-rail-truck tonnage is predicted to rise significantly by 2040. The highway requires a safety truck-passing-lane project in the Tehachapi Grade, and by 2023, most of SR 58 will have four lanes, except for a seven-mile segment near Bakersfield.

Crows Landing Road

Crows Landing Road is more than 20 miles long, passing through a rural residential area and providing access to and from I-5 and SR 99 to several medium and large farms and dairy and food processing firms. Both the I-5 and SR 99 interchanges are grade-separated.

Mitchell Road

Mitchell Road is approximately 4.8 miles long, bridging SR 99 and SR 132 and providing access to the Modesto City-County Airport and nearby industrial land uses, including several distribution warehouses and food processing firms. South of the airport area, Mitchell Road passes through residential and commercial land uses In the City of Ceres. The road is generally two lanes in each direction with a center turn lane. Mitchell Road provides direct access for trucks with origins or destinations south of Modesto to reach the airport industrial zone from SR 99.

Air Cargo

Stockton Municipal Airport and Lathrop Intermodal Yard

Complicating the truck traffic at the Roth Road and Lathrop Intermodal Yard is the movement of airfreight associated with Amazon at the Stockton Municipal Airport that employs Airport Way to move parcels and packages to or from their fulfillment centers in Tracy and Patterson. Currently, Amazon runs three daily round-trip flights through Stockton Municipal Airport.

Ports

Port of Stockton

The Port of Stockton is the largest bulk shipping port on the West Coast. A record volume of goods moved in and out of the Port in 2017, and only slowed down with the imposition of tariffs. Efforts have been underway to diversify the Port's cargo handling to include shipping containers as part of the re-implementation of the M-580 marine highway.

Port of Oakland

The Port of Oakland, the largest container port near the region, is responsible for loading and offloading 99 percent of all containerized goods moving through Northern California. It is unclear what the volume of imports arriving at the Port circulate within the Bay Area and the number that move out into the hinterland or move interstate. However, there is increasing growth in trucking companies, transloading, and warehousing in San Joaquin and Stanislaus in the communities of Tracy, Lathrop, Stockton, and Patterson. Many of the projects improving interchanges, grade separations, or last-mile connectors on routes such as I-5, I-205, I-580, SR 120, and SR 99 reflect this change. An example of this is the City of Manteca's proposed McKinley Avenue interchange project on SR 120, which should enhance truck access from SR 120 to Roth Road to nearby warehousing.

Rail

Major Lines, Facilities and Planned Improvements

Within the context of the northern San Joaquin Valley, the major rail freight facilities are located in Stockton and Modesto. There are three facilities associated with the BNSF: the Mormon Yard located in Stockton, the Mariposa Intermodal Yard located southeast of Stockton, and the Beard's Tract/ Valley lift facility in Empire, east of Modesto. There are two additional facilities associated with the UPRR: the Stockton Yard and the Lathrop Intermodal Yard. A planned expansion of the Lathrop Intermodal Yard has led to plans for several operational improvements and upgrades at Roth Road beginning at the ramp with I-5, with STAA improvements at the intersection with Airport Road, and a grade separation. Efforts are underway to address a rail bottleneck at the Stockton Tower Interlink where the two Class I railroads intersect.

Southern Gateways/Connectors

The I-5 Tejon Pass gateway connects the two largest CFMP regions in the state and is the primary highway corridor between Southern California and the Bay Area. It has the highest percent trucks for Caltrans high-volume truck count locations - with 10,000+ trucks per day and 10 percent-plus trucks - seeing more than 13,000 trucks daily, comprising 30 percent of all traffic. By comparison, the SR 710 at SR 405 in Southern California saw 16,000 trucks, comprising 28 percent of the traffic.[273]

Southern California and San Diego are the top origins and destinations for Central Valley goods. The two regions make up 56 percent of California's population, 87 percent of containerized port traffic in California, and more than 30 percent of national container traffic.[274,275] Still, while there are out-of-state rail services in the Central Valley, there are almost no rail freight services between the Central Valley and Southern California.

SR 58 runs through the Tehachapi Pass and connects I-15/I-40 (near Barstow) to I-5 in the Central Valley. SR 58 has experienced an almost four thousand-trucks-per-day increase since 2011 and has 25 percent more truck traffic than I-80 over Donner Pass. A safety truck-passing-lane project is needed on eastbound SR 58 near SR 223. By 2022, the entirety of SR 58 will be four lanes except for a seven-mile segment between I-5 and the west edge of Bakersfield at Stockdale Highway. In addition, the SR 58/14 corridor provides for important freight transport resiliency when I-5's Tejon Pass is closed due to severe climate conditions.

As freight related cost in the Inland Empire increase, the South-Central Valley is experiencing spillover growth from Southern California. Amazon has built fulfillment centers in Fresno and Bakersfield, and Walmart is building a grocery distribution center in Shafter. With more than 12 square miles of vacant industrial land in the Shafter/BFL International Airport, Delano and Tejon Ranch, the region is poised to receive additional mega distribution centers.

Throughout the South Central Valley, numerous cross-valley connectors on the STAA truck network connect to additional gateways, including but not limited to SRs 152, 33, 180, 168, 41, 43, 46, 145, 198, 65, 137, 269, 58, 119, 184, 223, 166, 14, 395 and major local roads serving regional traffic, such as Avenue 7/West Nees Avenue, 6th/Corcoran Avenue, 7th Standard Road, Stockdale Highway, others. These routes provide necessary last-mile connectors to major agriculture and other resource development areas and connections to neighboring regions. For example, SR 46 provides an essential connection for Salinas Valley produce to Delano's UPRR refrigerated intermodal facility.

The Kern Area Regional Goods Movement Operation (KARGO) study objective is to present a complete understanding of existing conditions as well as project future circulation conditions in the study area. Latest regional plans, general plans, circulation plans, list of projects, existing and future land use projections, available data for traffic counts, origin-destination data, congestion/speed data, and collision history data. Public and industry stakeholders are consulted to get information about existing issues and needs related to traffic circulation, along with anticipated projects and programs that might address these issues or exacerbate current conditions. Both existing and future circulation conditions are assessed to identify transportation needs in the study area.

The TradePort California project (formerly the California Inland Port System project) is an integrated clean energy and logistics system being developed and implemented under direction from the Fresno Council of Governments (Fresno COG). The project aims to leverage California's economy and unique geography by creating a system of sustainable inland ports in the Central Valley built on an integrated infrastructure and investment platform. This approach is aimed at creating substantial economic development opportunities through leveraging public and private investments. The project seeks to increase efficiency and reduce congestion at the San Pedro Bay Port Complex. The core principles of the project include creating a more efficient national supply chain system, reducing greenhouse gas emissions and air pollutant emissions, and increasing economic competitiveness and opportunity in the Central Valley.

Tehachapi Pass Gateway

The Tehachapi Pass gateway, located on SR 58, is thirty miles northwest of Tejon Pass, along the Sierras. The pass features the only BNSF/UPRR corridor connecting the Central Valley and Southern California. Nearly all rail freight shipments on this route connect to out-of-state destinations in the Midwest. In this connecting corridor, Rio Tinto -- a borax mining operation --

has daily BNSF unit train service to/from the POLA. If a rail freight shuttle from the Central Valley could connect to this service in Mojave, at a competitive rate, the potential for a diversion of Central Valley truck freight – one of the largest movements within the State -- to rail might be possible. Potential emission savings and wear and tear on roadways could be leveraged as a state incentive for the project, similar to a state-subsidized, container unit train service in Norfolk, VA.

In addition, the early operating segment of the High-Speed Rail Project may free up capacity on the BNSF mainline between Merced and Bakersfield, providing an opportunity for containerized freight shuttle services from Merced, with possible stops at container loading ramps in Fresno and Shafter connecting to the Rio-Tinto unit train in Mojave. Fresno has the only intermodal container rail yard operating in the South-Central Valley; however, Delano has the UPRR Cold Connect (refrigerated unit train service) operating between California and New York exporting produce to the East Coast via rail.

The Mojave Inland Port will occupy 400 acres of open land owned outright by Pioneer Partners in the unincorporated area of Mojave in east Kern County, abutting the Mojave Air & Space Port. The property is bounded on the northwest and northeast sides by California Highways 14 and 58, and by United Street and Rosewood Boulevard on the west and south sides, respectively. The property has a contiguous connection with the Mojave Air & Space Port. UPRR Lone Pine Branch bisects the Mojave Inland Port property in a southwest/northeast alignment. The property is already zoned by Kern County, and the Project has received county planning approval for specific use as an inland port. The Mojave Inland Port will have an annual throughput capacity of 2.6 million TEU's. This is the largest such site available for intermodal freight expansion in California, and it is the only site in California directly served by rail, road, and air.

PART 2. SECTION 2. MID AND SOUTHERN CENTRAL VALLEY CORRIDOR POLICIES, PROGRAMS, INFRASTRUCTURE INVESTMENTS

Corridor-wide system components

SJCOG I-205, I-5, SR120 & SR99 Congested Corridor Plan (CCP) - a comprehensive multi-modal corridor study that will assess conditions along the I-205, I-5, State Route 120, and State Route 99 corridor, including parallel passenger rail, bus transit, and bicycle and pedestrian facilities. The plan will identify improvements that will help improve safety, congestion, accessibility, economic development, and air quality.

There are two studies under development that further supports goods movement, including:

- SJCOG Truck Planning Study (Under Development) – Studies the existing STAA route network and recommends new routes for jurisdiction consideration.
- Alternative Fuels Vision Plan (Under Development) - Addresses the needs of multiple classes of alternative fuel vehicles and will identify clean fueling infrastructure opportunities along major freight corridors and other regionally significant roadways.

A megaregion working group of MTC, SACOG, and SJCOG were assembled to identify projects, known as the "Megaregion Dozen," of megaregion significance between 6 counties of the Sacramento County area, San Joaquin County, and nine counties of the San Francisco Bay Area. The "Megaregion Dozen" is a package of projects that guide and advance the transportation investment principles and strategies that the working group approved. The guiding principles helped narrow to four regional projects that advance the following investments and strategies:1) Interregional Functionality, 2) Improved Policy Alignment, 3) Persuasive Leverage, and 4) Strategic Investment.

The San Joaquin Valley Regional Planning Agencies, led by Kern COG, completed the I-5 Freight Zero Emissions Route Operations (ZERO) Pilot Study. Sponsored by eight COGs of San Joaquin Valley and other state partners, this study outlines the current and future conditions, issues and challenges, and exploratory analyses of solutions to freight operation problems in the San Joaquin Valley (SJV). The SJV is a key trade and transportation gateway, vital for the local economy, and accompanied by sustainability concerns relating to the movement of goods. Transportation and goods movement have many harmful externalities, which will be exacerbated by the significant growth expected to occur in the coming years. This work addresses these concerns in planning through small-scale and long-term large-scale conceptual pilot studies. Paired with an analysis of different technological solutions, these pilot studies serve as the next step in proposing problem-specific technology and other solutions that will help improve sustainability in the SJV.

The 2017 I-5/99 Goods Movement Study looked at several region-wide programs along the backbone of the South-Central Valley corridor and identified the following investment areas:

- Shovel-ready projects,
- Connector projects,
- ITS – technological improvements, and
- A truck-platooning demonstration project.

These investment areas were further broken down into project types with benefits and applicability throughout the Central Valley Corridor region.

The list has been modified to include the entire 5-district region.

1. *Roadway pavement and bridge maintenance.
2. *Overweight/oversize policy to allow heavier/longer trucks on I-5 in both directions between San Joaquin and Kern counties.
3. *Truck-only toll Lanes on I-5 between the I-5 and the I-205 junction in San Joaquin County and the I-5 and SR 99 junction in Kern County.
4. *Truck climbing lanes at steep locations such as Altamont, Pacheco, and Tehachapi passes.
5. Capital projects for bottlenecks congestion relief.
6. *Operational projects for bottlenecks congestion relief.
7. Connector, capital, and operational projects for improved accessibility.
8. Interchange reconfiguration program for key freight access interchanges with inadequate designs.
9. *Capital projects for safety hotspot alleviation.
10. *Operational projects for safety hotspot alleviation.
11. *Container depot service near Stockton for the PofOAK and in Shafter for POLB/POLA.
12. *Short-haul rail/unit train service between the SJV and the PofOAK.
13. *Short-haul rail/unit train service between SJV and POLB/POLA.
14. *Caltrans truck parking information system on I-5.
15. *Truck platooning – Pilot on I-5.

16. Neighboring region/out-of-state STAA connector corridor capital, operational, safety improvements (i.e., I-80, SR 58, SR 89/44/395/14 Central Valley bypass, others).
17. *Transition to low- and zero-emission technology -- RNG, hydrogen, electric, etc.

Over half of the 17 project types above are sustainable freight projects (indicated by an *). It is important to note that in disadvantaged communities, one of the primary strategies to improve the communities is to provide diverse economic opportunities and improve the jobs/housing balance within the region.

Central Coast Region

SECTION 1: CORRIDOR OVERVIEW

The Central Coast region includes Santa Barbara, San Luis Obispo, Monterey, San Benito, and Santa Cruz counties. The region is known for its fresh produce and wine grape production. The region is home to major industries in agriculture, manufacturing, food processing, and other freight-related business clusters.

U.S. 101 is the primary freight transportation route and economic asset for the Central Coast region and serves a vital function along the central coast as an alternate route to I-5 during weather-related closures at the Grapevine in Southern California. Routes that provide east-west interregional connectivity include SR 166, SR 41/SR 46, and SR 156/SR 152. Similar to U.S. 101, these routes are high-volume truck routes and critical to freight goods movement.

The Central Coast Region also has two Class III Short Lines, the privately-owned Santa Maria Valley Railroad (SMVRR) and the Santa Cruz Branch Rail Line. The SMVRR system consists of 14 miles of main line track interchanging with the UPRR railroad in Guadalupe and serves the City of Santa Maria and Santa Maria Valley. The Santa Cruz Branch Rail Line is owned by Santa Cruz County Regional Transportation Commission (SCCRTC) for freight and excursion passenger service. Freight service on the Santa Cruz Branch Line operates near Watsonville, connecting to the UPRR main line in Pajaro. In general, railroads in the region tend to move goods such as agricultural products, lumber, coal, construction materials, fertilizer, and steel.

In 2013, goods movement-dependent industries accounted for approximately 33 percent of the jobs in the region. Goods movement-dependent industries accounted for more than $13 billion of the $52.4 billion gross regional product (GRP). These industries are highly reliant on U.S. 101 for local shipments as well as to provide a connection to surrounding regions that allow goods to travel throughout the United States and the world.[276] **Figure 6.3** shows more freight-related statistics.

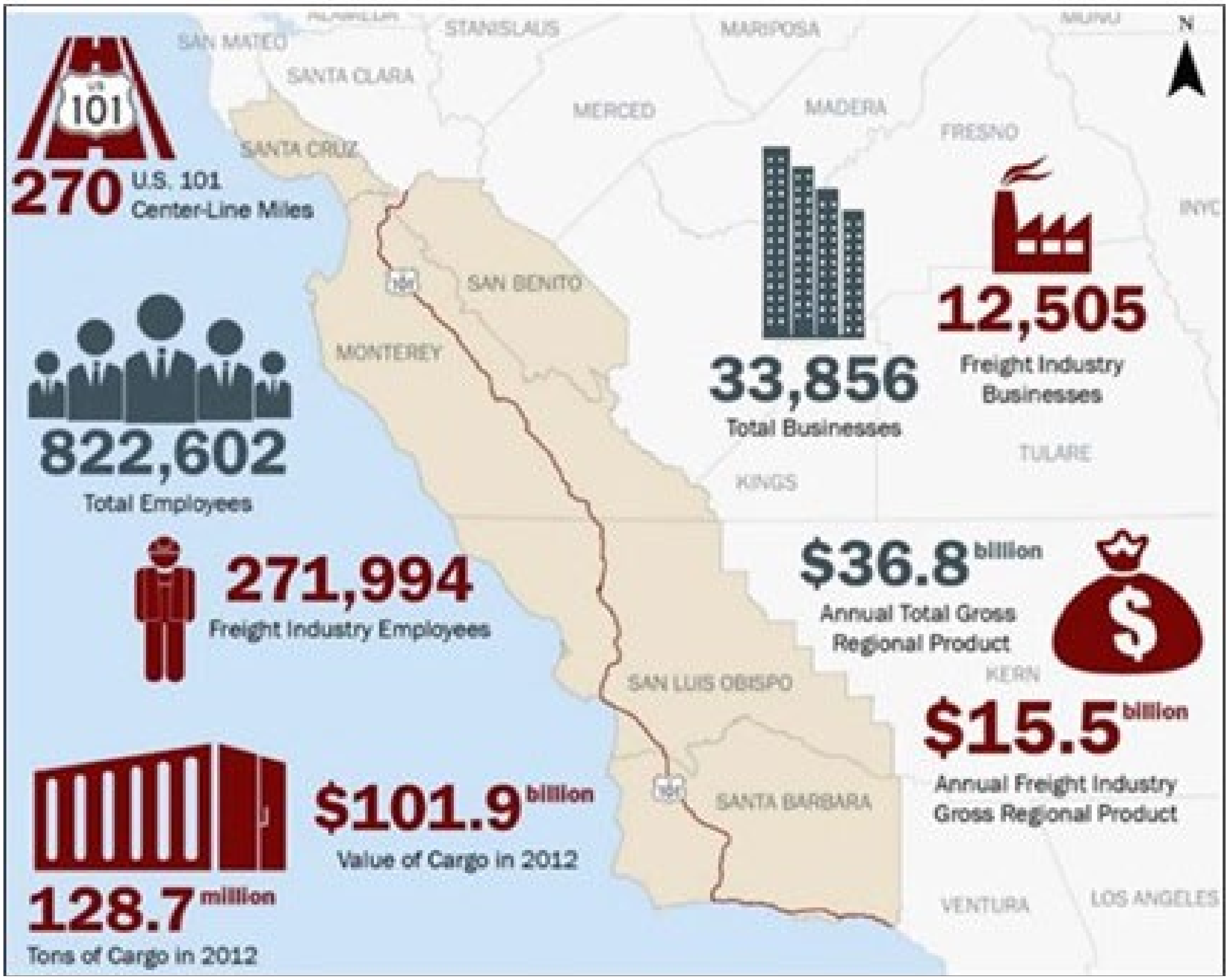

Figure 6.3: Freight-Related Statistics, U.S. 101 Central Coast California (Source: U.S. DOT Bureau of Transportation Statistics using the following data set years—employees (2013); cargo tons/value (2012); businesses (2011); gross regional product (2009))

Table 6.6 summarizes key socio-economic and infrastructure characteristics in the corridor that drive the movement of goods.

Table 6.6: Central Coast California Summary Economic Profile by County

Description	Monterey	San Benito	Santa Cruz	San Luis Obispo	Santa Barbara
Population (2020)	**438,500**	**64,507**	**270,353**	**282,231**	**448,096**
Population (2035)	495,086	81,332	308,582	315,636	507,482
Goods Movement Dependent Industry Employment (2013)	96,170	8,978a	40,410b	46,242c	80,194
Total GRP (2009)	$16,016	No Data	$9,122	$9,577	$17,732
Key Industries	Agriculture (salad, wine), retail, manufacturing (including food products)	Retail, manufacturing (including food products), agriculture	Retail, construction, manufacturing (including food products), agriculture	Retail, construction, manufacturing (includes food products)	Retail, manufacturing (including food products), agriculture
Key Trading Partners	San Joaquin Valley, Southern California, San Francisco Bay Area	San Francisco Bay Area	San Francisco Bay Area	San Joaquin Valley, Southern California, San Francisco Bay Area	San Joaquin Valley, Southern California, San Francisco Bay Area
Major Connecting Roads to U.S. 101	SR 156	SR 152 (some truck restrictions) SR 129 SR 156	SR 17/I-880 SR 1/SR 129	SR 46 SR 41 SR 1 SR 166	SR 135 SR 154 SR 246 SR 1
Source: US Bureau of Economic Analysis, RTP-MTP/SCS for each MPO, Central Coast California Commodity Flow Study. Population projections based off 2000 or 2010 Census figures. U.S. Census QuickFacts					

AGRICULTURE

The agriculture industry accounts for over 60 million tons of freight per year in the region. The Central Coast is notable for producing over 80 percent of the nation's lettuce, leading to its reputation as the "Salad Bowl of the World". It is also a major producer of broccoli, strawberries, and other specialty vegetables and fruits. Wine production is also prevalent in the Central Coast.

Data Axle USA data shows high concentrations of agriculture businesses along the U.S. 101 corridor, with key clusters located around Salinas, south of Watsonville, Soledad, Paso Robles, and Santa Maria. Apart from U.S. 101, SRs 41/46, 152/156, and 166 are major interregional connecting routes between the Central Coast and the Central Valley that support these businesses. Therefore, their conditions must continue to be maintained or improved to ensure efficient delivery of goods to market.

MANUFACTURING

Manufacturing is a diverse industry in the region, with key manufacturing clusters in Santa Cruz, Paso Robles, San Luis Obispo, Santa Maria, and Santa Barbara. Food manufacturing, which includes wine production, is an essential component of manufacturing in the region. The key food manufacturing clusters are also located along the U.S. 101 corridor.

TRANSPORTATION AND WAREHOUSING

Throughout the region, freight transportation is conducted mainly through trucking and rail, with connections to other modes in neighboring regions. Transportation and warehousing businesses are concentrated in areas that generally overlap agriculture and manufacturing clusters. Key clusters are in the Salinas Valley, Watsonville, northern U.S. 101, Paso Robles, San Luis Obispo, Santa Maria, and Santa Barbara. Truck connections include U.S. 101, SR 166, SR 41/SR 46, and SR 152/SR 156.

FREIGHT RAIL

Along the Central Coast Region, UPRR owns and operates the Class I rail system from Santa Barbara in the south, through Salinas, and continuing north into the Bay Area. Approximately four percent of all shipments, measured by both tons and value, move by rail. Total freight rail outflow and inflow range upwards of 750 thousand tons within Caltrans District 5.

There is no east-to-west freight rail route connection between Caltrans Districts 5 (Central Coast) and 6 (Central Valley) and are no plans for a connection, which means there is absolute reliance on trucks for goods movement between these regions. With the Central Coast region's agricultural sector growing, the Central Valley expanding its mega-distributions centers, and population growth occurring throughout both regions, we can anticipate significant truck volume increases on the SR 166, SR 41/SR 46, and SR 152/SR 156 east-west corridors.

GOODS MOVEMENT FLOWS

Transporting goods in, out, and through the Central Coast region is heavily dependent on trucking. According to the Central Coast California Commercial Flow Study (2012), approximately 82 percent of shipments by tonnage and 76 percentage of shipments by value move by truck. The region imports higher priced consumer goods and specialty products while exporting relatively lower value agricultural products and some manufactured goods, mostly tied to the agricultural industry. In the Central Coast region, freight is projected to grow 3.3 percent a year by value between 2012 and 2040. More information can be found in **Figure 6.4.**

By value, inbound shipments to the study region represented accounting for approximately 64 percent of the total value of goods in 2012. Outbound shipments accounted for approximately 35 percent, with intraregional shipments accounting for one percent. 2040 projections show that over 68 percent of the total value of goods moved in the region will come through inbound shipments, 31 percent through outbound shipments, and approximately one percent in intraregional trade.

Domestic shipments are the dominant type of movement by both value and weight. By weight in 2012, imports and exports combined only accounted for five percent of shipments. By value, imports and exports accounted for less than four percent of shipments. The dominance of domestic shipments is projected to continue in 2040.

Figures 6.5 and 6.6 show the mode split for shipments into, out of, and within the study region in 2012. Measured by value, trucking was the dominant mode in 2012, accounting for 74 percent of total shipments. Multiple Modes and Mail was the second highest mode, accounting for 13.3 percent of shipments. This reflects the use of multimodal and parcel services to carry higher value, lower weight shipments, as well as a continuing trend towards containerization (for intermodal truck-rail shipping). This also is seen in the lower share of goods moved by carload rail (only 1.8 percent), which typically carries lower value, bulk goods such as construction material, minerals, or waste/scrap.

In the Central Coast region, electronics (9.7 percent), machinery (9.4 percent), and mixed freight (7.6 percent) comprised the top three commodities moved by value and accounted for 27 percent of all shipments, which represents a solid consumer base, and high-tech and defense sector in the region. Commodities directly related to agriculture include other agricultural products (6.1 percent) and other foodstuffs (5.8 percent).

Figure 6.4: Central Coast Agriculture Production (Source: Data from ESRI Business Analyst; mapped by Cambridge Systematics, 2019)

TRENDS

Over the next several decades, the Central Coast region can expect to see significant trends that hinder freight movement. Challenges to freight movement include population increases, changes in consumer demand (e-commerce shopping), and a substantial increase in goods movement flow.

Population trends are a key driver of freight demand in any region since the rate of growth or decline of the population impacts the volume of goods shipments required for consumption by local residents. The population of the five-county Central Coast region of California was approximately 1.5 million in 2020 (2020 Census). In total, the population of the five-county region grew by 5.4 percent from 2010 to 2020, or by about 77,000 people. By 2040, the population of the region is expected to grow approximately 30 percent above 2010's levels, leading to an increase the number of trucks on the roads.[277]

Not only is the volume of goods increasing, but also the frequency of demand. The growth rate in demand for consumer products is related to population growth and income growth for families. For example, San Luis Obispo County's median household income increased from $57,365 in 2010 to $77,948 in 2020 (2020 census), at a 35 percent increase over ten years. While median household incomes vary county by county, increases are trending upwards throughout the entire Central Coast region. This is an important trend to monitor and analyze moving forward as the growth in online e-commerce shopping is increasing the demand for freight shipments of parcels and other personal deliveries at a higher rate than population growth alone would suggest. These types of deliveries to local residences and businesses often place additional demand on transportation infrastructure that is not commonly used by freight, including local roads and neighborhood streets, all interconnected to the state highway system.

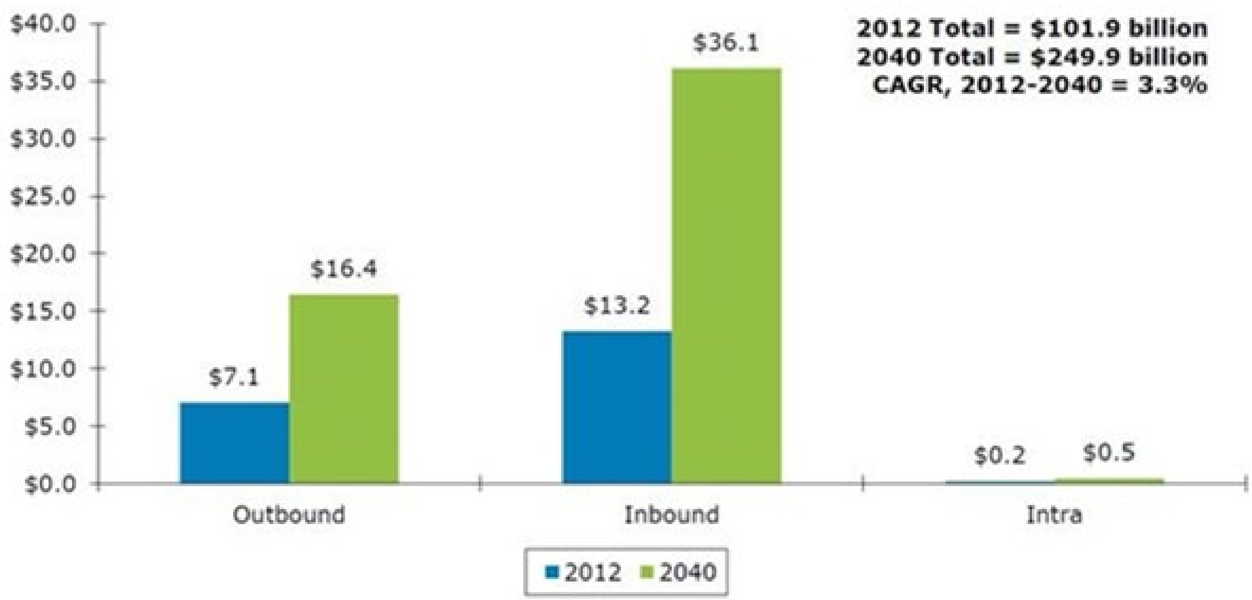

Figure 6.5: Central Coast California Regional Freight Flows by Direction of Movement, 2012 & 2040 (Source: AMBAG, "U.S. 101 Central Coast California Freight Strategy," 2016; data from Federal Highway Administration, Freight Analysis Framework 3, 2012. Additional analysis by Cambridge Systematics, 2012)

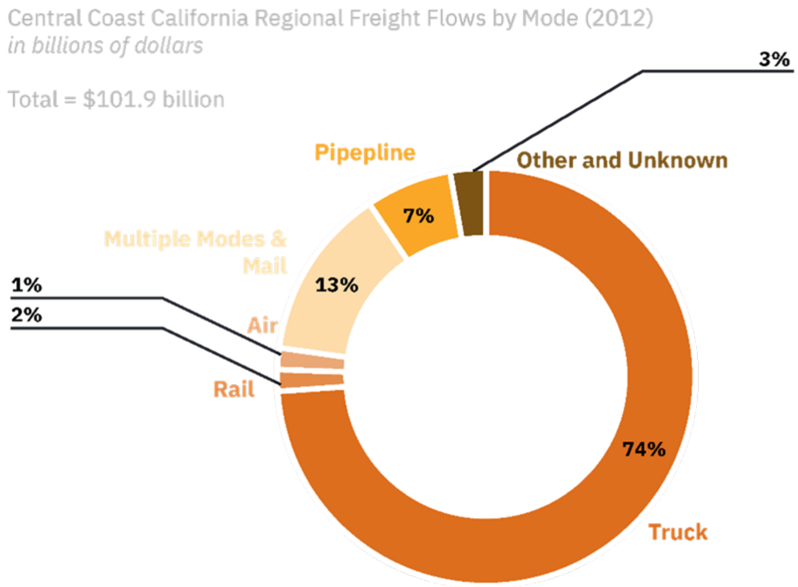

Figure 6.6: Figure 6.5: Central Coast California Regional Freight Flows by Mode, 2012 (Source: AMBAG, "U.S. 101 Central Coast California Freight Strategy," 2016)

The increase in goods movement flow as noted previously is also a factor in transportation infrastructure challenges and needs in the Central Coast region. In 2012, freight tonnage flowed primarily inbound and outbound at 62 and 60 million tons. The Central Coast region is trending to double tonnage by 2040 to a total approximate sum of 209 million tons, again by a near balanced outbound and inbound goods movement flow. At a nearly 63 percent increase in tonnage goods movement flow, the Central Coast region's transportation infrastructure is expected to be significantly impacted. Freight flows predominately by truck through the U.S. 101 which goes north to the Bay Area (Caltrans District 4) and south to the greater Los Angeles area (Caltrans District 7). SR 166, SR 41/SR 46, SR 156/SR 152 are east-west interregional connectors that are high-volume truck routes and critical to freight goods movement, connecting the Central Coast to the Central Valley (Caltrans Districts 6 and 10).

SECTION 2: POLICIES, PROGRAMS AND MAJOR FREIGHT INFRASTRUCTURE INVESTMENTS

The policies that are proposed within the Central Coast region strategize to increase the accessibility and mobility of people and freight while reducing truck delays, enhance the integration and connectivity of the transportation system across and between modes, and identify and construct projects to improve freight movement, including rail and highway projects, and projects to improve ground access to airports and rail terminals in the region. The Central Coast region plans to regularly collect and update information on freight and goods movement and facility needs for all freight corridors. Policies also include consideration of freight and goods movement in the design and planning of all projects, creating plans for intermodal connectivity, and striving to reduce and mitigate environmental, social, health, and economic impacts from goods movement operations.

The Central Coast has many broad long-term needs for the freight infrastructure system that will help the region to support the Plan's vision. Below are a number of regional freight needs:

- Congestion relief and freeway conversion on U.S. 101. This corridor, U.S. 101, is the primary artery running north-south through the region and provides direct connectivity to major markets and intermodal facilities in the Los Angeles and San Francisco Bay Area regions. U.S. 101 also serves as the main north-south corridor for the state during I-5 closures.
- Improved east-west connections between U.S. 101 and I-5 in the Central Valley along SR 166, SR 41/SR 46, SR 156/SR 152, including improvements such as 4-lane divided expressway conversions and installing truck climbing and passing lanes to improve driver safety. Additionally, SR 25 is important in connecting more remote agricultural areas of southern San Benito County and will provide greater connectivity U.S. 101 for goods movement. The expressway conversion are critical improvements for the region. **Figure 6.7** identifies these key freight routes.
- Improve at-grade highway interchanges and intersections. Some highway interchanges and at-grade intersections present challenges for trucks along the U.S. 101 Corridor. Highway interchanges, especially with SR 156 and SR 41/SR 46, are some of the most congested locations on U.S. 101. Additionally, at-grade intersections present challenges for safety of the traveling public (not just for trucks). As volumes increase on U.S. 101, the importance of freeway conversion becomes even more critical.
- Addressing truck parking issues. A lack of legal and safe truck parking has been identified in numerous plans as a challenge for commercial vehicle movements along the U.S. 101 Corridor and connected routes, such as SR 46.
- Ramp metering on U.S. 101 and key east-west routes in or adjacent to urban locations, emphasizing on-ramps that are particularly congested during peak harvest season times, such as US 101/SR 156.
- Seek to add additional electronic changeable message signs along U.S. 101 and key east-west routes. Signs would be integrated with Caltrans District 5 Traffic Management Center. Closely linked with the need for CMS is the addition of Closed-Circuit Television (CCTV) monitoring cameras along U.S. 101 and key east-west intersecting routes to fill gaps in the existing CCTV network.
- Continued improvement to freight rail infrastructure including the development of truck-to-rail facilities near agricultural harvesting and/or packaging areas.
- At the local level, support expansion of the number of jurisdictions and municipalities with designated truck routes and improve truck route education amongst drivers to better guide truck movement to and from U.S. 101.
- Employ wayfinding tools to help truck drivers find fueling stations, parking locations, key freight origins and destinations, or other truck related infrastructure located in local municipalities.
- Truck driver training and labor policy improvements to alleviate the truck driver shortage.
- Agricultural worker housing and improved labor policies to reduce VMT associated with transportation of agricultural workers to and from the crop locations.
- Improve freight data availability. Caltrans truck counts are the only reliable source of information for truck movements in the California Central Coast, and they do not contain the detail needed to fully understand the movements of goods. Specifically, there is a need for regular surveys of freight movement on intersecting truck routes that go to and from I- 5. Also, additional data is needed on seasonality trends.
- Improve the alternative fueling infrastructure for freight vehicles, including electric charging and hydrogen fueling infrastructure.

- The Central Coast MPOs and Caltrans District 5 are currently compiling the California Central Coast Sustainable Freight Study which will be completed in 2025. This document will further illustrate key Central Coast freight policies, programs, and investments for the region, and will be consistent with all related State and regional plans.

Figure 6.7: Central Coast Key Highway Freight Routes (Source: AMBAG data, prepared by Cambridge Systematics, 2012

Los Angeles/Inland Empire

SECTION 1. CORRIDOR OVERVIEW

Goods movement is essential to support the economy and quality of life in the Los Angeles/Inland Empire Trade Corridor. Comprising the counties of Los Angeles, Orange, Riverside, San Bernardino, and Ventura, the region's extensive goods movement system is a multimodal, coordinated network that includes deep-water marine ports, Class I rail lines, interstate highways, state routes and local connector roads, air cargo facilities, intermodal facilities, and industrial warehouse and distribution clusters, as shown in **Figure 6.8**. As of 2019, over 1 billion tons of goods valued at over $1.9 trillion moved across the region's transportation system—serving local, state, national, and international consumer markets[278]. The Ports of Long Beach and Los Angeles represent the largest container-based port complex in the U.S. for both imports and exports that feed directly into the region's major freight corridor/routes.

The industries and businesses in this region are world leaders in commerce and represent a major exchange point for international trade as businesses from across the globe trade via its seaport, airport, and highway facilities. Goods movement is woven into the fabric of life in the Corridor, but still faces serious challenges that require considerable collaboration and investment to remain a cornerstone of the local, regional, state, and national economy.

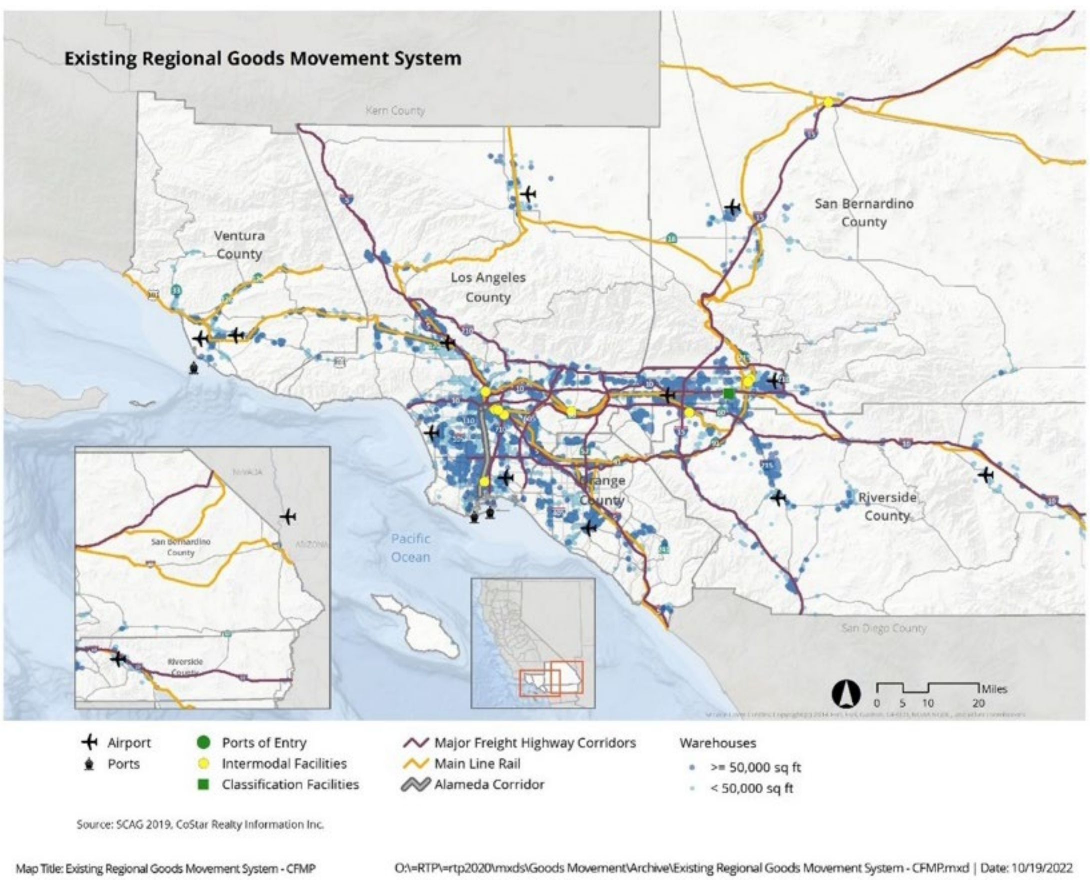

Figure 6.8: Existing Regional Goods Movement System (Map by SCAG, 2019; data from CoStar)

The Los Angeles/Inland Empire Trade Corridor partner agencies which includes the Southern California Association of Governments (SCAG), six county transportation commissions, the Ports of Los Angeles, Long Beach, and Hueneme, Caltrans Districts 7, 8, and 12, among others, have established a vision for a regional goods movement system that is consistent with the CFMP vision and goals, as well as with the CSFAP principles. Additionally, the vision is a critical component of SCAG's current 2020-2045 Regional Transportation Plan and Sustainable Communities Strategy (RTP/SCS), or Connect SoCal, and serves as the foundation of the Corridor's Freight Investment Strategy.

INVESTMENT THAT TARGETS KEY INDUSTRIES TO SUPPORT AND SUSTAIN THE ECONOMY

In 2021, goods movement-dependent industries (manufacturing, construction, retail trade, wholesale trade, and transportation and warehousing) employed close to 2.4 million people in the SCAG region reflecting 29 percent of all employees[279]. In 2019, the goods movement-dependent industries contributed over $401 billion to Gross Domestic Product (GDP) by county, reflecting over 30 percent of all industries[280]. Additionally, trade through Southern California's container ports supported 2.7 million jobs throughout the U.S.[281]. The Corridor Freight Investment Strategy ensures that local and regional businesses have access to transportation services and facilities necessary to support growth by targeting investments in key corridors where these industries are located. The Los Angeles/Inland Empire Freight Investment Strategy promotes improvements in logistics system efficiency aimed to contain rising costs of goods and services. This freight investment strategy also ensures that the region will continue to be a leading trade gateway for imports and exports to the Pacific Rim by supporting improvements in marine terminals, intermodal terminals, railroad mainlines, roadway access routes to the seaports and airports, and industrial warehouse and distribution facilities.

ADDRESSING GROWTH THROUGH MULTIMODAL SOLUTIONS, FREIGHT SYSTEM EFFICIENCY, SAFETY AND OPERATIONAL IMPROVEMENTS

The Los Angeles/Inland Empire Freight Investment Strategy includes projects and initiatives to promote the fluid movement of goods consistent with user expectations for a world-class transportation system that emphasizes multimodal solutions. The Los Angeles/Inland Empire Freight Investment Strategy supports rail mainline investments so that the regional rail system can accommodate the projected annualized two percent growth rate in freight cargo volumes and anticipated increased passenger rail service, without increasing delay[282]. The strategy also includes investments in highway and local access and connector improvements that reduce truck vehicle hours traveled (VHT).

The Los Angeles/Inland Empire Freight Investment Strategy also includes creative approaches to shared use corridors through increased separation of passenger and freight activities where possible, leading to a safer, more efficient transportation system. SCAG recently led an Integrated Passenger and Freight Rail Forecast identifying rail capacity improvements for both freight and passenger rail services throughout the LA basin. Another example includes truck climbing and other operational improvements that provide room for heavy duty trucks to operate, thus reducing conflicts between fast- and slow-moving vehicle and enhancing overall operational safety.

In addition, truck parking is a critical issue facing the Los Angeles/Inland Empire region. Per the recently completed California Statewide Truck Parking Study, corridors where parking demand is higher than current supply include the following for the Los Angeles/Inland Empire region – the I-

5 Santa Clarita, San Fernando Valley, West Covina, and San Pedro Bay corridors in District 7; the I-15 (Mountain Pass, Baker, Victorville), I-40 (Needles, Ludlow) Inland Empire, and I-10 (Beaumont, Coachella Valley, Blythe) corridors in District 8; and the I-5, SR-55, SR-57, and SR-91 corridors in District 12.

EXPANDING THE GOODS MOVEMENT SYSTEM WHILE PROVIDING FOR A HEALTHY ENVIRONMENT AND LIVABLE COMMUNITIES

The Los Angeles/Inland Empire Freight Investment Strategy includes a strong commitment to reduced emissions from transportation sources by establishing a roadmap for the broad deployment of zero-emission and near zero-emission (ZE/NZE) transportation technologies. The development of a world-class ZE/NZE freight transportation system is necessary to maintain economic growth in the region, to sustain quality of life, and to meet federal and State air quality requirements.

The region has already made substantial progress on air quality, reducing 8-hour ozone levels by 40 percent since 1990 and particulate matter (PM) 2.5 emissions by over 50 percent, all while the population has increased by 20 percent[283]. Despite these achievements, further progress is necessary to promote environmental sustainability and improve air quality.

The Los Angeles/Inland Empire Freight Investment Strategy sets forth an aggressive technology development and deployment program to achieve this objective. The Los Angeles/Inland Empire Freight Investment Strategy also includes efforts to mitigate neighborhood and community impacts to the maximum extent possible. The region has a rich history of working with various partners and stakeholders to lead the State's advancements towards ZE/NZE initiatives including:

- San Pedro Bay Ports Clean Air Action Plan (CAAP): The CAAP, updated in 2017, identifies strategies to reduce pollution from every source – ships, trucks, trains, harbor craft (such as tugs and workboats), and cargo-handling equipment (such as cranes and yard tractors). Since 2005, these strategies have resulted in emission reductions exceeding 88 percent for particulate matter, 64 percent for nitrogen oxides, and 98 percent for sulfur oxides.
- Clean Truck Program: This is a strategy in the CAAP to help reduce pollution from on-road drayage trucks, which mandates that any new truck registered within the Port Drayage Truck Registry after October 1, 2018 must be a model year 2014 or newer. Trucks must also be compliant with CARB Drayage Truck Regulation and Truck and Bus Regulation. Clean Truck Fund (CTF) Rate is a key component of the Port's efforts to transition to a zero-emissions truck fleet by 2035, as established in the CAAP. The CTF Rate is expected to generate approximately $90 million in the first year, or $45 million per Port. On March 24, 2022, the Board of Harbor Commissioners approved a three-year CTF Rate Spending Plan, allocating 100% of the fund for zero-emission trucks in the first year.
- CAAP Technology Advancement Program (TAP): The TAP is a key component of the CAAP that provides grant funds to defray the cost of testing new and emerging clean technologies, with the goal of accelerating their entry into the market so the entire industry has cleaner vehicles and equipment for moving cargo. Applicants for the TAP funding must show their projects have a high probability of reducing emissions of key pollutants and are likely to earn verification from the California Air Resources Board (CARB) confirming the technology achieves its stated pollution control goals. Projects

must also show a strong business case for their commercial success. TAP's benefits include:

- Identifying promising clean technology.
- Helping to fund demonstration projects.
- Accelerating government approval and market availability to industry.

- The Pacific Ports Clean Air Collaborative (PPCAC): The PPCAC has been working with numerous global stakeholders with the goal to share information, collaborate on common air and environmental issues, and work jointly to develop and evaluate potential port policies and mitigation measures[284].
- The Regional ZE Collaborative: The Collaborative comprising numerous stakeholders has been focused on efforts to share information and to jointly seek grant funding for supporting research and demonstration of ZE technologies.
- Last Mile Freight Program (LMFP): The LMFP is being led by SCAG in partnership with the Mobile Source Air Pollution Reduction Review Committee (MSRC) to commercially deploy zero-emission and near zero-emission (ZE/NZE) vehicles, equipment, and supporting infrastructure. A total of $16,751,000 has been approved for Phase 1 project implementation. 27 total projects selected in Phase 1 with 19 MOUs completed by Nov 2022.
- Supporting Infrastructure for Zero-Emission Medium & Heavy-Duty Trucks: SCAG is planning a study to help envision a regional network of zero emission charging and fueling infrastructure. This study will create a phased blueprint and action plan towards realizing this goal and answer key questions about how stations in the region may operate to serve different truck markets and business functions.
- I-10 Multi-State Truck Parking Availability Systems Pilot Project: This project involves California, Arizona, New Mexico, and Texas, and is one of the CSFAP's identified pilot projects. The project's intent is to provide real-time truck parking availability information from SRRAs to the trucking industry that would result in better planning and scheduling of shipments, improvements to safety, mobility, and reduction of emissions along the I-10 corridor.
- SR-60 Freight Corridor Priority Investment: Regionally significant truck lanes project developed through interagency cooperation and internal coordination, spanning about 38 miles across three counties (LA, RIV, and SBD) which aims to provide improvements along the corridor including: operational improvements between ports and distribution centers, addressing supply chain issues, providing congestion relief, and reducing GHG emissions and noise pollution[285].
- Other examples include: Port of Los Angeles Freight Advanced Traveler Information System (FRATIS) for optimizing truck movements, Drayage Freight and Logistics Exchange (DrayFLEX) which entails an enhancement of FRATIS, Port of Los Angeles Eco-Drive which is a connected (vehicle-to-infrastructure) demonstration project, Port of Los Angeles Port Optimizer™ serving as an information portal to digitize maritime shipping data for cargo owners and supply chain stakeholders, Port of Los Angeles/Long Beach VirtualPort System to improve roadway vehicular traffic and incident management within the Ports and their surrounding area.

KEY GOODS MOVEMENT FUNCTIONS IN THE ECONOMY

Goods movement is what economists refer to as a derived demand – the demand for goods movement is an outgrowth of overall economic activity. The goods movement system supports regional industries and global supply chains that trade in international, domestic, and local markets. To understand what drives demand for goods movement in the region, it is useful to think of four major functions supported by goods movement.

Provides Access to International Gateways

Southern California is the nation's premier international gateway for imports and exports. The nation's largest port complex, a large regional consumer market, and a vast supply of warehouse and distribution facilities have made it one of the nation's largest centers for distribution of imported consumer products, while also serving as the largest container-based export market. The importance of the region's gateways in connecting consumer goods manufactured in Asia with U.S. markets has been well-documented, and the overall importance of the system in supporting the flows of containerized goods continues to grow. In 2021, goods valued over $552 billion moved through the Los Angeles Customs District[286]. Nationwide, the POLA-POLB container volumes generate 2.7 million jobs and originate from or are destined for every region and congressional district in the U.S.[287]. Combined, the region's three seaports (Port of Los Angeles, Port of Long Beach, and Port of Hueneme) and two international airports (Los Angeles International and Ontario International) make significant contributions to the regional and state economy.

National and Regional Benefits to Rural Communities and U.S. Exports

While the POLA-POLB is widely acknowledged as the dominant U.S. port for containerized imports, it also serves as a leading export gateway, supporting goods produced in California and exported from states across the continental U.S., thereby connecting rural areas to global markets. This is notable for top agricultural product exports including frozen meat, cotton, fruit, nuts, soybeans, and hay. When combining product items such as frozen beef and pork, bales of cotton, pistachios, almonds, grapes, oranges, lemons, limes, soybeans, alfalfa, and other varieties of hay, the POLA-POLB exported 6.2 million metric tons with a value of $9.4 billion in 2021[288]. Out of these top agricultural exports frozen beef and pork, cotton, and pistachios constitute nearly 70% of the value, while alfalfa and other hay, soybeans, cotton, and frozen beef and pork constitute over 90% of the metric tons[289].

This ranked fourth against other major commodity category exports across the Los Angeles District, only trailing machinery and parts ($16.1 billion), electric machinery and components ($16 billion), and Optical, Photographic, and Medical or Surgical Instruments ($9.8 billion)[290]. Agricultural product exports support the economies of rural communities within many states in the U.S., notably California, the Southwest, Southeast, and Midwest regions, as well as the Northwest and Northeast.

Supports Regional Manufacturing Activities

Even at the height of the Great Recession (2007-2009), the U.S. remained the world's largest manufacturing economy, and Southern California continued to be a critical manufacturing hub[291]. The Southern California region is the second largest manufacturing center in the country, trailing only the State of California as a whole. In 2019, manufacturing activities contributed approximately $134.7 billion to the region's GDP by county with regional manufacturers trading in both international and domestic markets[292]. The region's manufacturing sector is highly diverse with computer and electronic products, chemicals, transportation equipment, fabricated metal products, processed food, and machinery manufacturing. Higher-value, time-sensitive products, like computers and electronics, rely heavily on the region's truck and air cargo systems while bulk and heavy-weight products that are less time sensitive, such as chemicals and fabricated metals, generally use a mix of trucking and rail to move products. **Figure 6.9** shows the manufacturing firms in the region at a region-level scale.

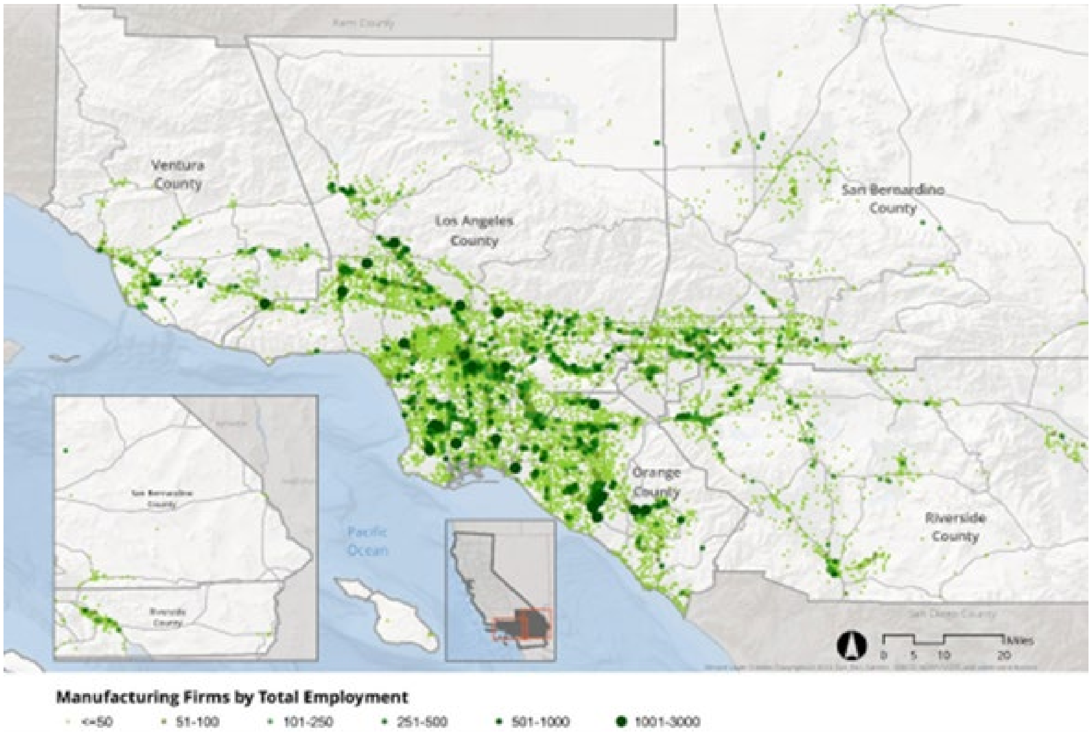

Figure 6.9: Manufacturing Firms in the Region (Source: Map by SCAG; data from InfoGroup, 2011)

Serves the Needs of Local Businesses and Residents

Like most metropolitan areas of a large size, a substantial majority of the region's goods movement activity is associated with local pickup and delivery, construction, utility, agriculture, and other services. Virtually all of this local activity takes place using trucks. As the region's population continues to grow, particularly on the eastern ends where land is less scarce, the demands for consumer products distributed through the region's large wholesale and retail trade sector will continue to fuel growth in local distribution and service trucking. Another component of the local distribution and service function is the movement of materials and equipment to/from construction sites. In 2021, construction-related activities employed over 376,000 people in the region[293]. It also contributed about $50 billion to GDP in 2019.[294]

Supports A Thriving Logistics Industry

In the Los Angeles/Inland Empire region, the logistics industry (which includes transportation, warehousing, distribution, and logistics services) has become an important component of the economy. Collectively, these industries rely on all components of the region's transportation system – maritime shipping and air freight (for international supply chains), trucking and rail (for intra-regional, inter-regional and inter-state shipments and drayage moves), and industrial warehousing and distribution (to support both international trade and local delivery of consumer goods). In 2021, transportation and warehousing activities provided nearly 300,000 jobs in the region and accounted for $45 billion of GDP in 2019[295][296].

THE GOODS MOVEMENT SYSTEM

The goods movement system in the Los Angeles/Inland Empire region is a complex series of interconnected infrastructure components that must operate as an integrated whole to serve the goods movement functions from a user perspective. Highways and Connectors play an important role within this system. They provide not only access to ports, but also create connections between ports, warehouses and intermodal facilities generally located within the Inland Empire. The end-to-end performance of this system drives costs, throughput, velocity, and goods movement reliability. International trade and e-commerce recently expanded the need for more fulfillment, sortation, and local distribution centers closer to major urban centers. Consumers now expect digital orders to be delivered within a day or less and return policies, increasing trip patterns across the system exponentially. The variety of modal alternatives, access to key goods movement centers, connections to markets and suppliers, and the quality of intermodal connections make Southern California an attractive center for goods movement activities. Local transportation sales tax measures have made significant improvements to highway networks which are critical for making these connections and distributing goods throughout Southern California and the nation

The region's goods movement system, including many elements that share throughput with passenger traffic, is owned and operated by a mix of public and private sector entities. Understanding the interactions among the diverse mix of owners, operators, and users is critical to how the goods movement system functions.

Seaports

The region is home to three deep-water ports: POLA-POLB: (San Pedro Bay Ports) and the Port of Hueneme in Ventura County. The POLA-POLB are the two largest container ports by volume in the U.S. Combined, in 2021, the San Pedro Bay Ports were the world's ninth busiest container port[297]. The Port of Hueneme has developed a competitive focus on automotive and fresh fruit products, with $11.4 billion in total trade in 2021[298].

Containerized trade between the U.S. and Asia constitutes most international cargo transiting the SCAG region, with approximately 31 percent of all containers in the U.S. moving through the San Pedro Bay Ports[299]. About 40 percent of all U.S. imports and 25 percent of all U.S. exports move through the POLA-POLB[300]. Despite some modest shifts recently in container volumes to other U.S., Canadian and Mexican ports, the San Pedro Bay Ports witnessed an all-time containerized cargo high during 2021 with a throughput of 20.1 million twenty-foot equivalent units (TEUs), and $400 billion in trade value[301]. Total container capacity is projected to increase to over 36 million TEUs by 2045[302].

Imports, which constitute most containers that move through the San Pedro Bay Ports, may be local or discretionary. Local containerized traffic is that which is ultimately consumed in a geographical area local to the San Pedro Bay Ports (Southern California, Southern Nevada, Arizona, New Mexico, and southern portions of Utah and Colorado). Discretionary containerized traffic moves to/from the POLA-POLB via rail, directly via on-dock and off-dock railyards, or indirectly via transload facilities. Recent analysis indicates that local traffic carrying containerized imports accounts for approximately 35 percent of San Pedro Bay Ports' total import-related traffic. The other 65 percent is assumed to be discretionary traffic, routed through the San Pedro Bay Ports for economic reasons[303]. The San Pedro Bay Ports have long worked with regional and state transportation planning organizations to identify and promote projects that will alleviate congestion to and from port areas and improve air quality in the region. The POLB also serves as a national strategic seaport in the National Port Readiness Network and would be expected to move military/supplies for national emergencies and/or humanitarian efforts.

The Port of Long Beach is known internationally as an industry leader in advancing cleaner cargo movement. In order to tackle greenhouse gases and criteria pollutants, the Port of Long Beach has set a goal of all zero-emissions cargo-handling equipment by 2030 and a zero-emissions drayage truck fleet by 2035. About 17% of the cargo-handling equipment at the Port is electric powered, the largest such fleet in the United States[304]. Announced in late 2022, heavy-duty electric trucks servicing San Pedro Bay port terminals can charge for free at the Port of Long Beach. These chargers are the first two public charging stations in the nation for the heavy-duty freight vehicles.

Airports

There are eight airports that provide air cargo services in the region. Collectively, these airports handled more than 3.6 million tons of air cargo in 2021[305]. Los Angeles International Airport (LAX) and Ontario International Airport (ONT) handled most of the region's international and domestic air cargo during 2021, including international goods valued at $139.2 billion[306]. LAX ranked 3rd in the U.S. for import trade value during 2021[307], while ONT ranked 9th in all cargo landed weight in 2021 per the FAA[308]. Most of the remaining air cargo moves through San Bernardino International Airport (SBD), which is ranked 37th and growing rapidly[309], and March Inland Port Airport (MIPA), ranked 87th[310]. In addition, Hollywood Burbank Airport (BUR), Long Beach (LGB), John Wayne (SNA), and Palm Springs International Airport (PSP) are also located in the region and handle air cargo, but are not in the top 100.

Air cargo handled at the region's airports is served by a mix of commercial passenger carriers (often, referred to as "belly cargo"), integrated carriers (such as Federal Express (FedEx) and United Parcel Service (UPS)) which provide integrated air and truck service, and air cargo carriers. Both LAX and ONT provide all three of these types of air cargo carriage. In 2020, SBD was named by Amazon Air as their new western hub, as it was recognized after it became a node in the UPS air network in late 2017 and FedEx Express opened a facility in 2018[311]. Air cargo can be broken down by freight or mail with most freight products and components including high-value and/or time-sensitive shipments. Air cargo tonnage for international and domestic cargo is forecast to grow by over 140 percent to 7.8 million tons by 2045[312].

Rail

Critical to the growth of the economy, the BNSF Railway Company (BNSF) and Union Pacific Railroad Company (UPRR), the region's two Class I railroads, carry international and domestic cargo to and from distant parts of the country. The BNSF mainline operates on the Transcontinental Line (Cajon and San Bernardino Subdivisions). The UPRR operates on the Coast

Line, Saugus Line through Santa Clarita, Alhambra and LA Subdivisions, and Yuma Subdivision to El Paso.

Both railroads operate on the Alameda Corridor that connects directly to the San Pedro Bay Ports as well as on the Alameda Corridor-East designated by Congress and the State of California. The San Pedro Bay Ports also provide several on-dock rail terminals along with seven intermodal terminals operated by BNSF and UPRR outside of the POLA-POLB. Within the Los Angeles/Inland Empire region, there are three Class III railroads: Pacific Harbor Line (PHL), Los Angeles Junction Railway (LAJ) and the Ventura County Railroad (VCRR) that provide short-haul services. PHL provides rail transportation, maintenance, and dispatching services within the San Pedro Bay Ports area. The LAJ provides industrial switching services in the Cities of Vernon, Maywood, Bell and Commerce. The LAJ also provides connection to both UPRR and BNSF. The VCRR extends for just over 12 miles on four branches serving the industrial areas of south Oxnard, the Port of Hueneme and U.S. Naval Base Ventura County Port of Hueneme Division and connects with the UPRR Coast Maine Line in downtown Oxnard. Both UPRR and BNSF move container, automobile, liquid bulk, dry bulk, and break-bulk cargo inbound and outbound from the POLA-POLB. In addition to these intermodal terminals, there are railyards in the region that serve carload traffic of various types. UPRR also has a large carload freight classification yard at West Colton (at the east end of the Alhambra Subdivision). A large UPRR auto unloading terminal is located at Mira Loma (midway between Pomona and West Riverside on the Los Angeles Subdivision). BNSF also has an automobile facility located at the City of San Bernardino off of the San Bernardino Subdivision line. Both BNSF and UPRR continue to invest in their existing facilities and capacity. In 2022, BNSF announced plans to invest more than $1.5 billion to construct a state-of-the-art master-planned rail facility – Barstow International Gateway. It will be an approximately 4,500-acre new integrated rail facility on the west side of Barstow, consisting of a rail yard, intermodal facility and warehouses for transloading freight from international containers to domestic containers[313].

The Alameda Corridor eliminated all at-grade crossings between the Ports and the intermodal railyards located on Washington Boulevard (BNSF Hobart Yard and UPRR’s East Los Angeles). To transition from the Alameda Corridor to the Alhambra Subdivision, the UPRR utilizes trackage rights over Metrolink’s East Bank Line, which runs parallel to the Los Angeles River on the east side of downtown Los Angeles. There are no grade crossings on the East Bank line. The UPRR Los Angeles Subdivision terminates at West Riverside Junction where it joins the BNSF San Bernardino Subdivision. The BNSF San Bernardino Subdivision continues north of Colton Crossing and transitions to the BNSF Cajon Subdivision. The Cajon line continues north to Barstow and Daggett, and then east toward Needles, California and beyond. UPRR trains exercise trackage rights over the BNSF Subdivision from West Riverside Junction to San Bernardino, and over the Cajon Subdivision from San Bernardino to Daggett, which is a short distance east of Barstow. The UPRR Alhambra Subdivision and the BNSF San Bernardino Subdivision cross at Colton Crossing in San Bernardino County. East of Colton Crossing, the UPRR Yuma Subdivision passes through the Palm Springs area, Indio, and to Arizona and beyond. UPRR also operates on the Coast Mainline, which serves as a connection between the City of Oxnard and all major West Coast destinations. As the only intercity freight rail provider in the city, this line provides an important link for the delivery of goods out of Oxnard[314].

The LOSSAN (Los Angeles – San Diego – San Luis Obispo) rail corridor provides connections for freight and passenger rail running north/south through the region and connecting into the San Diego/Imperial Counties Border region to the south as well as connecting to the Central Coast

Region to the north. The corridor is the second busiest intercity rail corridor in the nation, playing a critical role in the movement of people and goods within the Southern California region. The state is prioritizing and coordinating with partner agencies the need to resolve coastal infrastructure resilience issues along the entire coastline corridor. This is becoming increasingly more important due to the number of extreme weather events unfolding along the corridor. In 2023, a portion of the LOSSAN rail corridor through Orange County was closed due to debris on the tracks from a landslide, cutting off service to Southern Orange County and San Diego County.

Since 2012, the region has been able to construct seven roadway grade separation crossings along the BNSF corridor between Fullerton and Yorba Linda through the Orange County Bridges Grade Separations Program. The grade separations were funded by Orange County Transportation Authority through Measure M2, a half cent sales tax for transportation, and state and federal transportation funding. These projects highlight the important benefits of a local transportation sales tax measure. Measure M2 provides funding for additional rail infrastructure improvements along the LOSSAN corridor in addition to grade separations, such as passing siding projects and other safety improvements.

Various shared-use agreements via trackage rights exist for both passenger and freight rail service, with the predominant mainline operations being owned and operated by freight rail operators. Growth in freight rail traffic is projected to grow at an annualized two percent rate in freight volumes over the next few decades[315].

Highways and Connectors

By 2045, the POLA-POLB is projected to handle over 36 million TEUs, which will generate close to 120,000 truck trips/day (from 68,000 in 2018) and further strain the nation's most important freight gateway[316]. Additionally, 35 percent of all U.S. waterborne containers move by rail on the Alameda Corridor (part of the U.S. Department of Transportation – DOT designated National Multi-Modal Freight Network), or by truck on the I-710, I-110, and SR 47, all of which are important NHFN/ routes. The I-710 alone moves about 15 percent of all U.S. waterborne containers. The I-710 freeway offers direct access to the San Pedro Bay Port complex, as well as to points north and to almost every major east-west highway corridor, acting as a primary access route to the Gateway Cities subregion and Inland Empire[317]. There are three bridges connecting the freeway system to Terminal Island: Vincent Thomas Bridge on the west, Commodore Schuyler F. Heim Bridge on the north, and the Long Beach International Gateway Bridge on the east. The primary access route to the Port of Hueneme (the third international seaport in the SCAG region) is US 101, which connects to SR 126, SR 232, SR 118, and I-405, while secondary access to Highway 101 is possible via Ventura Road, a 4-lane roadway located east of The Port's main gate. As specified by the Port of Hueneme, the primary corridors for trucks are Rice Avenue and Hueneme Road, while Victoria Avenue and Ventura Road are identified as the contingency corridors. The Port access roads have been designated "Highways of National Significance" since they also serve the U.S. Naval Base.

Two of the largest air cargo facilities at LAX are the Imperial Cargo Complex and the Century Cargo Complex. These facilities are located along West Century Boulevard and Imperial Highway, which, along with La Cienega Boulevard (connecting Century Boulevard and Imperial Highway), were identified by the Los Angeles Department of Transportation as the major arterial truck routes serving air cargo at LAX. Major freeway connections are provided by I-405 and I-105.

Sections of I-5, I-10, I-15, I-110, I-605, I-710, SR 57, SR 60, SR 91, which carry the highest volumes of truck traffic in the region, averaged more than 25,000 trucks per day in 2016[318]. Other major components of the regional highway network also serve significant numbers of trucks. These include I-215, I-405, I-210, and SR 74. More than 20,000 trucks per day travel on some sections, such as SR 58 and I-40, among others, that reflect 50 percent of total traffic carrying agricultural goods. These roads carry a mix of cargo loads, including local, domestic, and international. The arterial roadway system also plays a critical role in goods movement, providing first and last-mile connections to regional ports, manufacturing facilities, intermodal terminals, warehousing and distribution centers, and retail outlets.

Industrial Warehouse and Distribution Space

Since the completed Industrial Warehouse Study, the Los Angeles/Inland Empire region has witnessed continued growth in warehousing, distribution, cold storage, and truck terminal facilities, with the square footage of facility space at 1.6 billion[319]. The mix of building sizes remains skewed to larger footprints with every two out of three buildings being greater than 50,000 square feet.[320] Industrial warehouse and distribution facilities have witnessed sustained growth in construction, with occupancy rates and market rent per square foot near all- time highs near 98% and $16 respectively, and vacancy rates remaining near historic lows close to 2%[321]. The majority of the growth continues to occur in the Inland Empire as the counties of Riverside and San Bernardino have the most developable land zoned for industrial uses.

The regional industrial warehouse and distribution centers are connection points for all modes of transportation and provide necessary services to stock inventory, transload and interchange transitional cargo, fulfill orders, and perform value-added services such as just-in-time delivery, among others. Many of the region's warehouse and distribution facilities are clustered along key goods movement highway corridors such as:

- I-405 provides access to clusters of air cargo facilities where sorting and consolidation/de-consolidation activities occur near LAX;
- I-710 provides access to logistics service providers, truck terminals, and transload facilities serving the goods movement industry near the San Pedro Bay Ports and provide connections to the warehouse concentrations in Downtown Los Angeles and East Los Angeles and intermodal rail yards. Approximately 15 percent of the region's warehousing space is located within a five-mile corridor along I-710[322];
- I-5 and SR-57 provide access to warehouse clusters in the Gateway Cities subregion and in areas in northern Orange County (such as warehousing clusters in Anaheim); and
- East-west corridors, including SR 60 and I-10, provide access to major warehouse clusters in the San Gabriel Valley (especially in the City of Industry) and the Inland Empire (including major concentrations in Ontario, Fontana, Mira Loma, Moreno Valley, SR 91, and I-215); SR 60 is a primary access route to many of these locations with over 50 percent of the region's warehouse space located in a corridor within five miles of the highway[323].

SECTION 2. POLICIES, PROGRAMS, AND MAJOR FREIGHT INFRASTRUCTURE INVESTMENTS

Key regional policies, programs, and major freight infrastructure investments that support California's vision and goals are organized as follows:

- Roadway access to major goods movement facilities.
- Freight corridor system.
- Off-dock and near-dock intermodal yard projects.
- Mainline rail.
- On-dock rail.
- Rail access improvements to Port of Long Beach and Port of Los Angeles.
- Rail-highway grade separations (particularly on the Alameda Corridor-East).
- Bottleneck relief projects.
- Truck parking mitigation.
- Last-mile delivery strategies.
- Technology and other goods movement initiatives.
- Zero-Emission Truck Program

The CFMP 2023 goals are closely tied with one another, as each goal's expected benefits will lead to cumulative improvements across the region. Economic competitiveness is a product of speed and throughput, which is directly connected with congestion relief, safety and security, infrastructure preservation, and technology adoption. Environmental stewardship continues to play an important role for all goods movement in the Los Angeles/Inland Empire region as all stakeholders remain committed to a cooperative, close working relationship with the Governor of California and its State agencies. The region is the largest within the State and U.S. serving the needs of millions of households, business establishments, and government and non-profit organizations. This Regional Investment Strategy provides a range of thoughtful and carefully considered policies, programs, and freight infrastructure investments ranging from supporting the testing and deployment of the newest ZE/NZE technologies for vehicles, equipment and infrastructure, to planning, developing and building critical freight components to garner operational efficiencies and increase the throughput of goods movement throughout Southern California and the rest of the U.S.

The policies, programs, and freight infrastructure investments provide for operations, maintenance, and preservation of the system. Through the alignment of the region's vision, SCAG's RTP/SCS, POLA-POLB CAAP and TAP, among other plans and programs, including countless coordinated engagements with county transportation commissions and member agencies, the region's policies, programs, and freight investments are strongly aligned with those of the CFMP, and will support the objectives within, and principles of the CSFAP.

SCAG is currently in the development process for the 2024 Connect SoCal Update (Regional Transportation Plan/Sustainable Communities Strategy). Connect SoCal 2020 also includes a Goods Movement technical report with a vision supporting a world-class, coordinated Southern California goods movement system that accommodates growth in the throughput of freight to the region and nation in ways that support the region's economic vitality, attainment of clean air standards, and quality of life for its communities. Connect SoCal promotes this vision by:

- Maintaining the long-term economic competitiveness of the region
- Promoting local and regional job creation and retention
- Increasing freight and passenger mobility
- Improving safety of goods movement activities
- Mitigating environmental impacts of goods movement operations

SCAG has established a Last Mile Freight Program (LMFP) where the agency is directly supporting the Accelerated Electrification Key Connection through managing the implementation of zero-and near-zero emission vehicles, equipment, and supporting infrastructure throughout the region. Currently, Phase 1 of the LMFP is working with major established companies, newer technology innovators, and smaller independent owner-operators. Phase 2 of the LMFP is still under development with the intent of coordinating with both public and private sector stakeholders to deploy broader innovative technologies currently being demonstrated by leading last mile delivery companies, particularly in e-commerce use-cases.

SCAG continues to initiate and coordinate multi-modal studies and programs with respect to rail operations and curb space management, while also working with local communities throughout the region. SCAG has recently completed the Integrated Passenger & Freight Rail Forecast and Curb Space Management Study, and the agency is also working on curb-related efforts through its Sustainable Communities Program (SCP) Smart Cities and Mobility Innovations projects. These efforts are critical to better understand rail capacity needs for both mid- and long-term growth expectations, and to further assess impacts of e-commerce and last-mile deliveries as part of the holistic curb environment. SCAG has also recently completed the Goods Movement Communities Opportunities Assessment, which directly engaged numerous local jurisdictions collectively throughout the region to discuss key freight issues and challenges.

SCAG is planning a study to help envision a regional network of zero emission charging and fueling infrastructure. This study will create a phased blueprint and action plan towards realizing this goal and answer key questions about how stations in the region may operate to serve different truck markets and business functions. Though convened by SCAG, this study will be guided by a Technical Advisory Committee of key stakeholders, who will ultimately be instrumental in implementing this plan. Details related to the quantity, distribution and characteristics of charging and fueling stations will be quantified to the extent possible to help visualize and plan for infrastructure needs and investments. Study findings and products will also feed into the Electric Truck Research and Utilization Center (eTRUC) Project, funded by the California Energy Commission (CEC) Research Hub for Electric Technologies in Truck Applications (RHETTA) Program and led by EPRI. The regional prioritization of electric trucking station locations will feed into the prioritization of infrastructure locations for this project and simultaneously SCAG will also do additional work to plan priority fueling locations for hydrogen fuel cell trucks. While SCAG remains technology neutral, this study will provide projections of the demand for each technology and show how it can be met in a holistic fashion.

San Diego - Imperial Counties Border

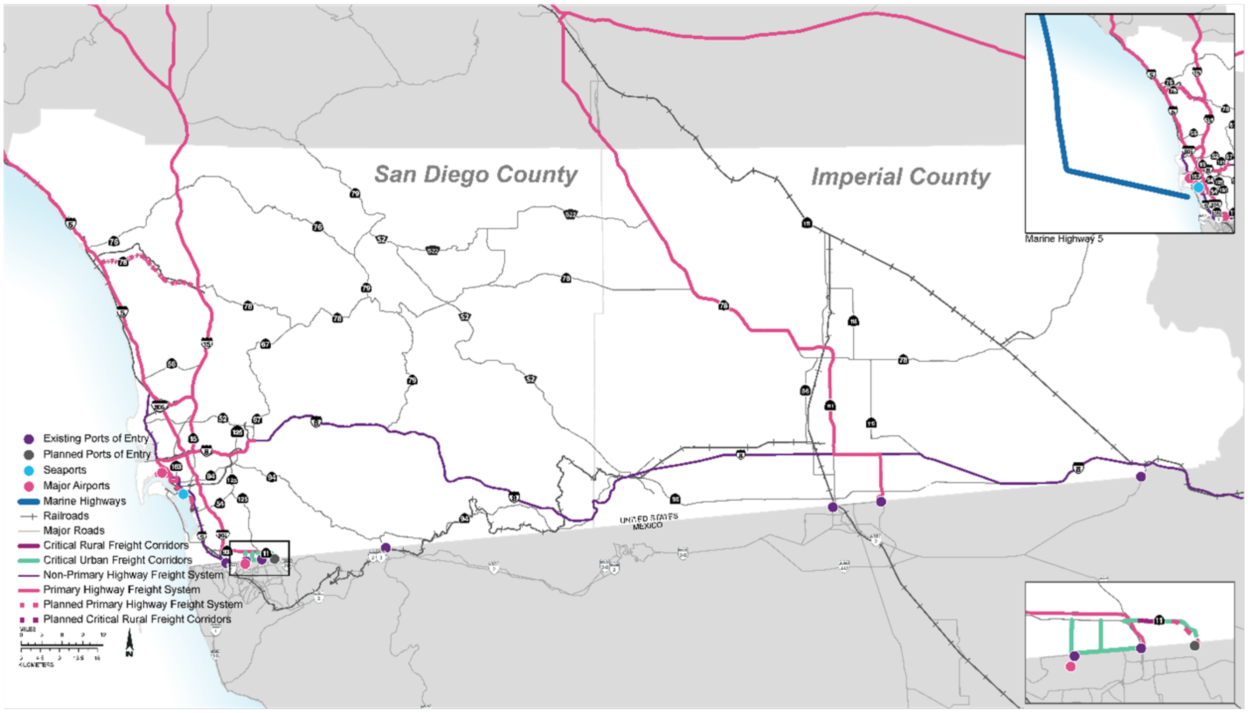

Figure 6.10: San Diego – Imperial County Map (Source: SANDAG 2021 Freight Gateway Study Update)

SECTION 1. CORRIDOR OVERVIEW

Situated between major production, trade, and population centers, San Diego and Imperial Counties depend on an integrated transportation network to effectively move people and goods within and through the region to the rest of the nation and around the world, as shown in **Figure 6.10**. Due to the interdependent nature of its binational economies, the Border Corridor's globally competitive business environment hosts a manufacturing sector that is one of the world's strongest cross-border supply chains, with a combined gross domestic product of approximately $253 billion for San Diego and Imperial Counties in 2018. [324]

The Border Corridor connects some of the largest supply chains in the nation by bridging the major goods movement hubs in Southern California – the California-Baja California border region, the Ports of San Diego, Los Angeles, and Long Beach, and the Inland Empire distribution centers. For these connections to thrive, the freight transportation system in this Border Corridor includes interstate and state highways, Class I freight rail operations, short line railroads (most freight operations occur on tracks shared with passenger rail services), airport cargo systems, the Port of San Diego (with two working marine terminals), and the Otay Mesa, Tecate, and Calexico East commercial border crossings, which are described in detail below.

ROADS/HIGHWAYS

Most freight in the Border Corridor is transported by truck. Congested freeways and highways slow the freight movement at significant freight hubs, including POEs and the Port of San Diego. Major east-west routes include I-8 (from coastal San Diego to the Arizona border), SR 52, SR 54, SR 76, SR 78, SR 94, SR 98, and SR 905. Major north-south routes include I-5 (the United States/Mexico Border north through San Diego County, up the entire West Coast to the Canadian Border), I-15 (a northeast route that continues to the Canadian Border with Montana), I-805, SR 86, SR 111, and SR 125. Routes primarily connecting POEs are I-5, I-805, SR 7, SR 11 (for future connection to the planned Otay Mesa East POE), SR 188, and SR 905.

The Imperial County freight highway network provides an interregional connection for shipping and logistics that handles approximately 97 percent of total commodity flows across the county. There are four major north-south corridors handling freight within the county: Forrester Road, from I-8 to SR 78/86 in Westmorland; SR 7 from the Calexico East Port of Entry to I-8 Freeway; SR 111 from the Calexico West Port of Entry to SR 86 in Riverside County; and SR 86, from SR 111 to Riverside County where it connects with I-10. Additionally, there are two major east-west corridors for trucks: I-8 freeway which originates in San Diego County through Imperial to the California/Arizona Border; and SR 98 which parallels I-8 through most of the southern part of the county. The Imperial freight highway system facilitates the movement of goods from the international border with Mexico and $2 billion in agricultural products from Imperial County through to Coachella Valley in Riverside County with connections west to the Los Angeles/Long Beach Seaports and other key distribution centers throughout California.

LAND PORTS OF ENTRY

The Border Corridor shares a 140-mile international border with seven POEs, including six traditional POEs – (1) San Ysidro, (2) Otay Mesa, (3) Tecate, (4) Calexico West, (5) Calexico East, and (6) Andrade – and one hybrid POE, (7) the Cross Border Xpress, which is a privately facility for direct access between San Diego and Tijuana International Airport. A new POE, Otay Mesa East, is under development and several POEs are undergoing expansion and improvement. As of 2021, the three land Ports of Entry (POEs) in the California-Baja California, Mexico Border region that handle commercial vehicles facilitate more than $74.5 billion dollars in cross-border trade annually, including over $27 billion dollars' worth of goods crossing southbound.[325]

In San Diego County, Otay Mesa and Tecate handle 99 percent (by value) of all border commercial shipments. The Otay Mesa POE is a multi-modal land POE which processes commercial vehicles, passenger vehicles, and pedestrians. Otay Mesa is the busiest commercial facility on the California-Baja California, Mexico international border handling the second-highest volume of trucks with more than 1 million trucks passing North in 2021, and the third highest dollar value of bilateral trade among all U.S.-Mexico land POEs at $53.5 billion in 2021.[326] Construction of the new Otay Mesa East POE is ongoing and expected to be completed and begin operations in 2024. The new POE features integrated operations through a regional border management system designed to inform travelers and provide fast, predicable border crossings with reliable information on current border wait times. The new POE integrates innovative technology and features, such as a border wait time detection system, advanced traveler alert systems, and variable tolling systems for revenue collection and demand management, with meeting the 20-minute average wait time goal.

In Imperial County, the Calexico East POE is the principal gateway for trade by truck in Imperial Valley and the second busiest commercial POE on the California-Baja California border. In 2021, Calexico East processed $7.8 billion in exports and $11.5 billion in imports, ranking seventh among the U.S.-Mexico commercial border crossings in terms of trade value carried by trucks.[327] In the same year, the POE processed more than 435,000 trucks northbound into the U.S.[328]

MARITIME

San Diego Bay is a natural, deep-water harbor located approximately 96 nautical miles southeast of the Port of Los Angeles and less than 20 miles north of the United States-Mexico International Border. Location, deep-water berths, and proximity to highways and rail earned the Port a designation as one of 17 "strategic ports" by the U.S. DOT, Maritime Administration. San Diego serves one of the largest U.S. Navy fleets and is home to the only major shipyard on the west coast of the U.S.

The Port of San Diego's maritime facilities includes two cruise ship terminals and two cargo terminals: Tenth Avenue Marine Terminal (TAMT) and National City Marine Terminal (NCMT). In 2017, the two terminals handled about 1.5 million short tons of cargo. Built in the 1950s, the TAMT is a general cargo terminal that supports cool-frozen food storage, break bulk, dry-liquid bulk, small container operations, and construction materials. The NCMT is the Port's roll-on and roll-off facility and a primary maritime POE for imported automobiles and lumber, with the capacity to handle 500,000 motor vehicles for distribution by rail and truck throughout the nation. The Port plays an important economic role as a key employer for the region. Indirectly, the Port accounts for 70,000 jobs in San Diego County (about one in 30), with an overall economic impact of $9.4 billion.

The Port's maritime capacity at TAMT is growing due to the U.S. DOT Transportation Investments Generating Economic Recovery (TIGER) grant project awarded to the Port in 2015 and was completed in 2020. This project served to modernize TAMT by supporting modern, clean, and efficient technology while increasing cargo operations. The port already added two break bulk liner services from Europe and a bulk service from Mexico because of that grant project, and additional liner services are likely. At NCMT, the National City Balanced Plan will restructure the terminal layout and surrounding area in order to increase community amenities and increase efficiencies in the marine terminal. Challenges for the marine terminals include optimizing their limited terminal space and deploying cutting-edge ZE/NZE infrastructure and equipment to meet State environmental requirements. Growth in maritime volumes must be complemented by enhanced terminal capabilities, such as additional on-dock rail and improved highway access. The Port's proximity to the Community of Portside Environmental Justice Neighborhoods (Portside Community) necessitates context-sensitive community improvements to support Port access projects.

In October 2021, the Port of San Diego adopted the Maritime Clean Air Strategy (MCAS), a policy document to help identify future projects and initiatives to improve health through cleaner air for all who live, work, and play on and around San Diego Bay while also supporting efficient and modern maritime operations. The MCAS includes a goal of 100 percent of cargo trucks calling on the Port's marine terminals being zero emissions (ZE) vehicles by 2030, 100 percent of cargo handling equipment being ZE by 2030, facilitating the implementation of the first all-electric tugboat in the United States by 2026, and contributing to the San Diego Air Pollution Control District's purchase and installation of new portable air filtration devices at participating Portside Community residences.

In October 2022, the United States Department of Transportation announced an award of $5.5 million in America's Marine Highway Grant funds for infrastructure upgrades at the Port of San Diego that will be deployed to handle cargo on the proposed service. The West Coast M-5 Coastal Connector service will use a barge to move building materials, including lumber, as well as containers and general cargo along a U.S. West Coast north/south route to strengthen supply chain resiliency and help address regional supply chain delays.

RAIL

BNSF Railway and UPRR, two Class I railroads, operate in the Border Corridor. BNSF serves the Port of San Diego providing primarily automobile rail service north and south along the LOSSAN corridor, interfacing in Los Angeles with a primary California freight rail corridor for BNSF – the Transcontinental (Transcon) Route – eastward to Chicago, Memphis, and Kansas City. UPRR serves the Imperial Valley near Plaster City, moving commodity, bulk, and mixed cargo eastward to Salt Lake City, Dallas, and Chicago. In addition, the Border region has one operating short line railroad. – The San Diego and Imperial Valley Railroad (SDIV) operates freight service on the La Mesa Branch between Downtown San Diego and El Cajon as well as the South Line between Downtown San Diego and the San Ysidro border crossing and freight rail yard. While accounting for only a small portion of total crossborder trade, approximately $171.5 million of goods passed through San Diego's rail crossing in 2021. These rail imports consist primarily of agricultural goods and raw materials like stone, iron, and steel.

The Baja California Railroad (BJRR) owns the rights to operate limited service between the Mexican border at San Ysidro/Tijuana through Mexico to Division (near the Mexican border at Tecate, BC). The section between Tijuana and Tecate is owned by the Mexican government. BJRR also has operating rights from Division and on to Plaster City in the western part of Imperial County. The section between Division and Plaster City is owned by MTS but currently closed. SANDAG, Caltrans, and MTS are studying the feasibility of rehabilitating this railroad and reinstating service.

The Border Corridor's rail operators handled commodities such as motor vehicles, lumber, chemicals, petroleum, agricultural products, cement, and aggregate. Freight capacity is constrained by limited track capacity and track sharing with passenger operations, including Amtrak, Metrolink, COASTER, SPRINTER, and the San Diego MTS Trolley.

Double-tracking the Los Angeles-San Diego-San Luis Obispo (LOSSAN) Corridor, the primary north-south route for BNSF Railway, is underway and will provide expanded service potential for freight and passenger rail service. Although there are projects planned to increase mainline throughput, carload capacity is limited primarily by the capacity of the rail yards. The BNSF San Diego rail yard has an estimated manifest cargo capacity of around 1.75 million tons per year, while auto handling capacity is estimated at 500 thousand tons per year. The capacity of cross-border rail movement through the San Ysidro Rail POE is estimated at about 1.6 million tons per year.

Proposed rail improvements in San Diego County could improve the performance of the network in the short term. Proposed projects include finalizing the double tracking along the LOSSAN corridor, stabilizing and ultimately moving trains off the Del Mar Bluffs via a new alignment, realigning curves around Miramar Hill, separating at-grade crossings, safety improvements, bridge replacements and other resiliency projects. In addition, NCTD and BNSF developed the Freight Pathing Study (2020) that identified opportunities and projects that would enable more freight service during the mid-day commute along the LOSSAN corridor.

Imperial County is served by rail connections from Mexico, Riverside County, and Arizona. Commodity flows by rail account for about 3% of total commodity flows in the county. The UPRR owns and operates a line originating at the Calexico West POE, extending north to El Centro and ultimately connecting with other UPRR tracks at Niland, heading north to Riverside County and southeast to Arizona (Sunset Line). UPRR also owns and operates the section between Plaster City and El Centro. That section is in service and connects with other UPRR lines at El Centro. At the Calexico West POE, the rail line processed $136 million in trade with Mexico in 2018. Currently, at the Calexico West POE/UPRR Rail Yard CBP staff is scheduled from 3:00am to 11:00am. The peak period of rail border travel occurs between 4:00am and 6:00am Monday through Friday.

AIR CARGO

Owned and operated by the San Diego County Regional Airport Authority, San Diego International Airport (SDIA) is the busiest single-runway airport in the nation and second in the world behind Gatwick Airport near London. SDIA is one of three commercial airports, along with McClellan–Palomar and Imperial County airports, within the region. SDIA, which processes most of the Border Corridor's air cargo, handled more than 171,000 metric tons of air cargo in 2016. In 2021, SDIA handled approximately 146,547 metric tons and is projected to handle 335,400 metric tons in 2050, which equates to an average increase of approximately 1.8% per year.[329] Four all-cargo airlines serve SDIA: BAX Global, DHL, Federal Express (FedEx), and United Parcel Service (UPS). Currently, air cargo capacity at SDIA is constrained by limited infrastructure and missing first and last-mile connections. Opportunities to leverage growth through the border-adjacent Tijuana International Airport, including the proposed Matrix air cargo and logistics park, could help alleviate some demand in the San Diego region.

The Imperial County Airport provides air service for private, commercial passenger, and freight transportation. Freight is transported through the courier services of FedEx and UPS. At the

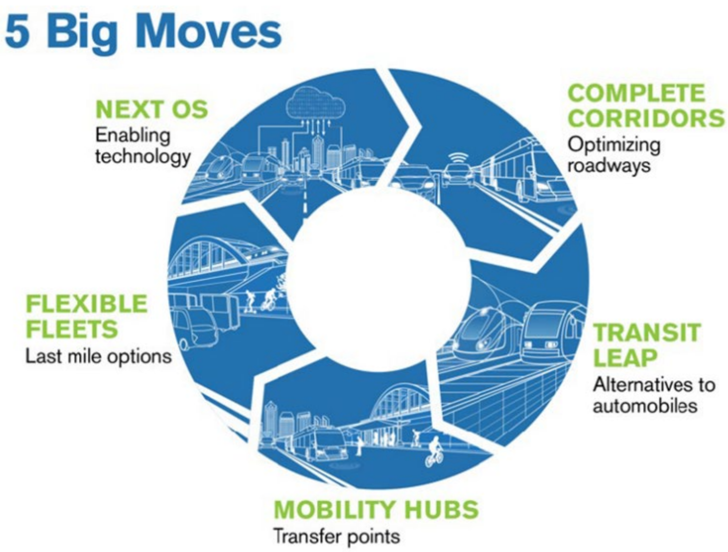

Figure 6.11: 5 Big Moves (Source: SANDAG 2021 Regional Plan)

Imperial County Airport, there are daily scheduled airline flights, air cargo, military operations, and Department of Homeland Security aircraft, as well as several business jets and private general aviation flights. The Calexico International Airport also facilitates cross-border and international travel, with U.S. Customs and Border Protection (CBP) Inspection Officers based at the airport. The Holtville Airstrip is closed to civil aircraft operations but has future economic development potential for a future regional air cargo and passenger facility.

PIPELINE (PETROLEUM)

In the San Diego region, Kinder Morgan Energy Partners (a private company) is the key provider of bulk freight transport by pipeline. The pipeline network runs between Orange, California and the Kinder Morgan Terminal in San Diego (Mission Valley). The 66-acre terminal has capacity to distribute significant amounts of petroleum products by truck on the I-5, I-8, I-805, I-15 freeways. While the volume of petroleum products shipped by pipeline in the region is projected to increase, improved truck access to this pipeline terminal could ensure efficient delivery of petroleum products throughout the region.

Imperial County has a major petroleum products pipeline, which consists of a 20" diameter petroleum products pipeline from the Los Angeles Basin to Yuma, Arizona. Also, from this main pipeline, a 10" pipeline extends southwest from a connection at Niland to a petroleum products terminal in the City of Imperial. This pipeline provides aviation fuel to the El Centro Naval Air Facility via another extension.

SECTION 2. POLICIES, PROGRAMS, AND MAJOR FREIGHT INFRASTRUCTURE INVESTMENTS

The San Diego Association of Governments (SANDAG) 2021 Regional Plan will be implemented through five key strategies for mobility, known collectively as the 5 Big Moves, shown in **Figure 6.11**. There are hubs for freight mobility and freight activity centers in various parts of the county that are the origin and terminus of freight throughout the day (Complete Corridors, Mobility Hubs). Nearly all rail tracks are shared by freight rail and passenger trains (Transit Leap). Staging, parking, truck services, and curb and sidewalk management will continue to be required for freight and package pick-up and delivery (Mobility Hubs, Flexible Fleets). Future support for freight movement within and through the county will require supportive technologies to optimize movements, create efficiencies, and improve safety (Next OS).

The plan provides an overview of goods movement in the region, includes forecasts out to 2050, and identifies the improvements needed to accommodate forecast growth. Roadway improvements, such as freight signal prioritization (FSP), dynamic truck parking, and near-zero/zero-emission infrastructure will reduce emissions and improve quality of life in communities adjacent to freight routes. The new Otay Mesa East Port of Entry will facilitate the flow of cross-border commercial vehicles, and variable tolling and a border wait time system will provide reliable crossing times. Improvements to railroads, air cargo facilities, and marine cargo terminals will bolster the multimodal freight system and increase transportation choices for the diverse goods moving through the region. Finally, the Next OS digital network will support truck routing, permitting, parking availability, and many other aspects of the San Diego region's transportation system.

The 2021 Regional Plan recognizes that the negative impacts of goods movement have historically been disproportionately borne by socioeconomically disadvantaged and marginalized communities. Disentangling these externalities and environmentally vulnerable populations will require a concerted and focused effort from the region's planning entities. To address these impacts, California Assembly Bill 805 (Gonzalez Fletcher, 2017) calls for SANDAG to include transportation strategies in its regional plans to reduce pollution exposure in the region's disadvantaged communities. Recent goods movement strategies developed and implemented by SANDAG, such as developing a border wait time system to assist in managing demand at our regional border crossings, have therefore focused on providing sustainable and innovative freight solutions that reduce emissions in local disadvantaged communities while still promoting trade.

In addition to the communities through which the goods movement network runs, there are also important equity considerations regarding the employees who operate these systems. As freight companies look to advance operational efficiency through the adoption of automation, the workforce and skills required to operate vehicles and conduct warehouse operations will change. It is crucial that programs be put in place to support upskilling workers if and when automation becomes the industry norm. As policies and programs are adopted to support communities impacted by freight operations, consideration also must be given to how the region will continue to accommodate necessary goods movement operations to keep food on the table and products on the shelves for the county's residents. Additionally, policies must consider the impacts of decisions on the ability for goods movement businesses, both small and large, to maintain the jobs that are essential for the supply chain to continue to function efficiently.

The California – Baja California Border Corridor is one of the most important and dynamic economic zones in North America. In 2019, more than 1.4 million trucks crossed from Baja California into California – representing over $39.5 billion in goods (2021 BMP; 5-47). By 2040, border crossing volumes are expected to increase significantly to an estimated 3.4 million trucks crossing annually (2021 BMP; ES-2). While the crossings are a critical element of the bi-national region's economic integration and competitiveness, growing demand has led to greater congestion at border crossings and increased delay and unreliable crossing times for cars, trucks, and pedestrians at California-Baja California POEs. Currently, travelers crossing the border between Tijuana and San Diego experience average wait times of 1.5 - 2 hours for passenger vehicles, and 1 - 2 hours for commercial vehicles**.** These delays and uncertainty at the border have the potential to reduce economic competitiveness and attractiveness of California to businesses, which can translate into lower levels of economic activity and growth.

Cross-border collaboration is central to solving challenges of congestion and delay at POEs through coordinated project delivery and transportation priorities. In 2021, Caltrans District 11, in partnership with the SANDAG Service Bureau and Secretaría de Infraestructura, Desarrollo Urbano y Reordenación Territorial del Estado de Baja California (SIDURT Baja California), completed the California-Baja California Border Master Plan (BMP) update. The 2021 update includes 183 POE and related transportation projects representing an investment of $13.5 billion ($2015 USD) for the Border Region over the next 20 years. The 2021 BMP includes ten POE projects—four planned for the construction of new POEs and six for the improvement and modernization of existing POEs.

The 2021 BMP proposes new concepts and innovations designed to improve how people and goods get around the Border Corridor. Goods movements strategies outlined in the plan will facilitate efficient crossings and processing of freight and commercial vehicles through (1) the implementation of unified cargo processing at all POEs that improve processing times and (2) the development of an appointment/arrival window system and staging area with dedicated lanes to expedite inspection times, reduce idling, and enable predefined appointment times.

Policymakers face the complex task of enhancing mobility for residents, workers, and businesses while at the same time supporting international trade by improving the efficiency of regional airports, seaports, and land border crossings. To assist in this task, identifying types of infrastructure investments that will best contribute to economic growth is essential. To enhance efficiency at the international trade gateways, strategies are needed to limit congestion and wait times. Businesses can be enabled to take advantage of scale economies as well as agglomeration economies from the consolidation of related production and warehousing facilities. Ultimately, a more efficient and improved border region transportation system will support California's sustainability and trade growth.

Transportation agencies in the Border Corridor are pioneers in integrating sustainability into their freight strategies and projects. SANDAG and Imperial County Transportation Commission (ICTC) are developing the San Diego and Imperial Counties Sustainable Freight Implementation Strategy, a planning study funded by a Caltrans Sustainable Transportation Planning Grant. The plan will seek to pilot innovative technologies that might be firsts in the nation; engage stakeholders to understand needs, opinions, and aspirations regarding implementation; identify potential funding sources for implementation; develop and strengthen partnerships between public agencies, community members, and the private sector; and create a workforce development toolkit highlighting training opportunities for constructing and maintaining these investments.

SANDAG is working on a Regional Medium- and Heavy-Duty Zero Emission Vehicle Blueprint in collaboration with the Port of San Diego, funded with a grant from the California Energy Commission. The Blueprint will guide the region by researching current vehicle, infrastructure, and market availability; engage the public and stakeholders; develop medium- and heavy-duty zero emission technology siting criteria; and identify key strategies and actions needed to transition goods movement and transit fleets to zero emission technology. For this project, SANDAG has partnered with the Environmental Health Coalition to engage members of the public to support environmental justice goals.

Caltrans District 11, in partnership with SANDAG, ICTC, SCAG, and other stakeholders, is making progress in implementing the initial phases of their Advanced Technology Corridors at Border Ports of Entry pilot project. Initial phases focus on installing equipment to measure southbound border wait times and displaying this information through an advanced traveler information system in order to better manage commercial and passenger vehicle traffic at the border. Caltrans District 11 and SANDAG will be installing air monitoring equipment to track progress in improving air quality in border communities. In addition, members of the San Diego Working Waterfront (previously the San Diego Port Tenants Association), through a California Energy Commission grant, recently transitioned some of their fleets to ZE/NZE vehicles. The organization implemented a freight signal prioritization (FSP) pilot project along Harbor Drive for one year; summary results showed improvements in travel times and a reduction in idle times.

Caltrans, SANDAG, and the Port of San Diego are collaborating on the Harbor Drive 2.0 Port Access Improvements project, which will make permanent and expand on the FSP pilot in San Diego's Working Waterfront with additional roadway enhancements through truck-only lanes, truck queue jumps, and ITS technologies that (1) reduce freight travel times, and (2) minimize truck impacts on San Diego's AB-617 Portside Environmental Justice Neighborhoods of Barrio Logan and National City. As an economic engine for the San Diego region, the project will transform San Diego's Working Waterfront into a sustainable freight corridor by promoting commercial near-zero or zero-emission vehicle (ZEV) charging stations and supportive infrastructure. The Project will address longstanding community concerns about diverting truck traffic away from local streets in the residential communities of Barrio Logan and improving the connections and throughput between San Diego's Working Waterfront, intermodal freight facilities, Interstate 5 (I-5), and State Route 15 (SR-15) freeways The agencies are working with the AB 617 Portside Community Steering Committee on implementing strategies identified in the Portside Community Emissions Reduction Plan to improve air quality in the surrounding neighborhoods. After hosting a truck parking summit in 2018, the Port of San Diego, Caltrans District 11, and SANDAG are also looking into potential truck parking opportunities near the working waterfront and near the Otay Mesa POE.

SANDAG is partnering with the San Diego County Regional Airport Authority to prepare an Advanced Air Mobility (AAM) Regional Strategy, with funding provided through a Caltrans Sustainable Transportation Planning Grant. This project seeks to establish a uniform vision for AAM technologies and identify near-term pilot opportunities to alleviate transportation demands on the ground, including goods movement. As part of the project, a Collaborative will be convened and act as a forum for discussion and information-sharing to guide the development of an AAM Policy Framework and Implementation Strategy for local jurisdictions. Resources produced may be adapted by other regions and inform state policy and efforts spearheaded by the Caltrans Division of Aeronautics.

Examples of regional policies and programs are shown in **Table 6.7**.

Table 6.7: Regional Policies and Programs by County

Regional Policy/Program	County
Collaborate with U.S. and Mexican agencies, community members, commercial industry representatives, and additional stakeholders on freight projects and policies	San Diego/ Imperial
Collaborate with stakeholders, including community members, public agencies, and commercial industry representatives on the implementation of air quality improvement programs	San Diego/ Imperial
Collect or procure freight origin-destination data to determine intraregional and interregional flows and better inform planning decisions	San Diego/ Imperial
Develop a curbside and sidewalk management strategy for urban deliveries	San Diego
Encourage context-sensitive community improvements that support access to freight hubs	San Diego/ Imperial
Develop and implement truck parking strategies	San Diego/Imperial
Encourage operational improvements to better manage vehicle and rail traffic in the region	San Diego/Imperial
Expand ZE/NZE infrastructure	San Diego/Imperial
Collaborate to implement the Advanced Technology Corridors at Border Ports of Entry pilot project	San Diego/Imperial
Partner with the San Diego County Regional Airport Authority to prepare an Advanced Air Mobility (AAM) Regional Strategy	San Diego
Develop the San Diego and Imperial Counties Sustainable Freight Implementation Strategy.	San Diego/Imperial
Develop the San Diego Regional Medium- and Heavy-Duty Zero-Emission Vehicle Blueprint.	San Diego
Source: Caltrans	

Glossary

Glossary

Aerotropolis: A land use development form consisting of aviation-intensive businesses and related enterprises surrounding a major airport, which serves as its core. The concept is based on airports as drivers of local economic development as well as hubs of global communications and trade.

Air Cargo: Any property carried or to be carried in an aircraft. This includes commercial air freight, including express packages and airmail, transported by passenger or dedicated cargo airplanes.

All-Cargo Carrier: An air carrier certificated to provide scheduled air freight, express, and mail transportation over specified routes; may also conduct nonscheduled operations that may include passengers.

Air Quality Management District (AQMD): In 1947, the State of California enacted the Air Pollution Control Act that authorized the creation of Air Pollution Control Districts (APCD) or Air Quality Management Districts (AQMD) in every county of the State. California has 22 APCDs, 12 AQMDs and 1 Air Resources District for a total of 35 districts.

Airport Rescue and Firefighting (ARFF): A special category of firefighting that involves the response, hazard mitigation, evacuation and possible rescue of passengers and crew of an aircraft involved in (typically) an airport ground emergency.

Air Service Agreement (ASA): A contractual agreement between two countries that determines the designation of access points for air transport services to carry through.

At-Grade Crossing: A junction or intersection where two or more transport axes cross at the same level (or grade).

Backhaul: Cargo carried on a return journey, typically a truck on a return trip from delivering a previous load.

Ballast Water: Water carried onboard a ship to increase stability or to achieve a desired depth. Ballast water is typically taken onboard a ship in one location and discharged in another, thus creating the possibility for distributing non-native and invasive plants, animals, viruses, and microorganisms.

Barge: A boat, usually flat-bottomed, for carrying freight on rivers and other waterways, either under its own power or towed by another vessel.

Belly Cargo: Freight that is carried under the main (e.g., passenger) deck of an aircraft.

Beneficial Cargo Owner: The importer of record who owns or has title to the freight being transported, physically takes possession of cargo at destination, and does not act as a third party in the movement of such goods.

Berth: Wharf space at which a ship docked. A wharf may have several berths, depending on the length of the ships accommodated. To berth (verb) a ship is to bring a ship into such a space.

Bill of Lading: A contract between a shipper and a carrier listing the terms and conditions for moving freight between specified points; serves as a receipt for goods and a contract to deliver it as freight.

Bobtail: A truck (tractor) operating without a trailer or chassis attached.

Bottleneck: A section of a highway or rail network that experiences operational problems such as congestion. Bottlenecks may result from factors such as major intersections, reduced roadway width, or steep grades that can slow trucks.

Boxcar: An enclosed railroad freight car, typically 40 or more feet long with sliding side doors, used for packaged freight and some bulk commodities.

Breakbulk Cargo: Non-containerized, general cargo of non-uniform sizes, often transported on pallets or in crates, boxes, barrels, sacks, drums, or bags. Examples of breakbulk cargo include iron, machinery, coffee beans, logs, and wood pulp.

Broker (transportation): A person or company that arranges for transportation of loads for a percentage of the revenue from the load.

Bulk Cargo: Loose cargo that is unbound as loaded or mechanically conveyed, without count and in an unpackaged form. Bulk cargo may be dry bulk or liquid bulk. Examples of bulk cargo include coal, grains, ore, cement, and petroleum products.

Bunker Fuel: A low-grade fuel oil used to power ocean-going ships. By State law (2008), vessels are required to switch from bunker fuel to cleaner, low-sulfur fuel when sailing within 24 miles of the California coast.

Cabotage Rights: The right of a company from one country to transport goods by vessel, aircraft, or other registered vehicle between two points in another country. Permission to engage in cabotage is, in general, strictly restricted in every country.

Capacity: The physical facilities, personnel and process available to meet the product of service needs of the customers. Capacity generally refers to the maximum output or producing ability of a machine, a person, a process, a factory, a product, or a service. Regarding the transportation system, this term references the ability of the transportation infrastructure to accommodate traffic flow.

Carrier: An individual or legal entity that is in the business of transporting passengers or goods for hire.

Cartage: Transport of goods by truck (or over-the-rail carrier) to or from a main carrier (e.g., vessel or aircraft), bonded warehouse, or free trade zone within the local port or airport commercial zone, usually under the supervision of customs authorities.

Chassis Pool Leasing: Where carriers that contribute to the pool may also lease chassis from the pool regardless of ownership.

Chassis: A metal trailer frame or undercarriage with tires, brakes, and lights that is designed to be pulled by a truck for over-the-road transportation of shipping containers, which are lifted on and off the chassis.

Class I Railroad: A large freight rail carrier having annual operating revenues of $250 million or more as adjusted annually for inflation (using the base year of 1991) by the Surface Transportation Board (STB). This group includes the nation's major railroads.

Class II Railroad: A freight rail carrier having annual operating revenues of less than $250 million but more than $20 million, as set and adjusted by the STB (using the base year of 1991). In 2017, operating revenues for Class II Railroads were less than $447,621,226, but more than $35,809,698. They are considered "regional railroads" by the Association of American Railroads.

Class III Railroad: Railroads with annual operating revenues of $20 million or less, as set and adjusted by the STB (using the base year of 1991). In 2017, operating revenues for Class III Railroads were $35,809,698 or less. The typical Class III is a short line railroad, which feeds traffic to or delivers traffic from a Class I or Class II railroad. All switching and terminal rail companies are Class III railroads, regardless of operating revenues.

Classification Yard: A rail yard used to break up, sort, and reconfigure trains among several tracks to optimize delivery of their cargo, usually by destination station or junction.

Classification: Grouping of railcars in a rail yard in accordance with train movement requirements, usually by destination station or junction. A yard where such activity takes place may be called a classification yard.

Clearance (Infrastructure): In goods movement generally, the distance between a limiting piece of infrastructure and a transport vehicle (e.g., the clearance under a bridge or tunnel).

Coal-n.e.c: Petroleum and Coal, Not Elsewhere Classified; other coal and petroleum product that is not elsewhere classified, such as liquefied natural gas, calcined petroleum coke-mfpm, coke petroleum (not produced in petroleum refineries), fireplace logs (made from coal), fuel briquettes or boulets (made with petroleum binder), and waxes (petroleum: not produced in petroleum refineries).

Coastal Shipping (or Short-Sea or Coastwise Shipping): Commercial marine shipping operations between ports along a single coast or involving a short sea crossing.

Cold-Ironing: The process of providing shoreside electrical power to a ship at berth while its main and auxiliary engines are turned off, thus substantially reducing air pollutant emissions. Cold-Ironing is also called shore power or alternative marine power. (Opposite: see "hotelling").

Common Carrier: A person or business (e.g., trucking firm, railroad, ship, or barge line) that is available for hire to transport goods or people on regular routes for a fee.

Consolidation: The action or process of combining several things into a single, more effective or coherent whole, such as cargo containing shipments of two or more shippers or suppliers.

Container (Intermodal): A large re-sealable, weather-tight transportation box (typically metal), into which cargo is packed for shipment, with suitable strength to withstand shipment, storage, and handling designed for more efficient freight transport due to its standard size and because cargo does not need to be unloaded and reloaded for transport between modes. International ocean-going shipping containers are commonly 20 or 40 feet in length and U.S. domestic standard containers are generally 48 or 53 feet (rail and truck).

Container and Container Shipping: A container is a large, standard-size, weather-tight, metal box into which cargo is packed for shipment aboard specially configured, ocean-going containerships. It is designed to be moved with common handling equipment enabling high-speed intermodal transfers in economically large units between ships, railcars, truck chassis, and barges using a minimum of labor. International shipping containers are commonly 20 or 40 feet in length. U.S. domestic standard containers are larger, generally 48 or 53 feet (rail and truck).

Container on Flatcar (COFC): A form of intermodal transport where containers without chassis are transported to a railhead and then loaded onto a flat rail car to continue their journey.

Container Terminal: A facility where cargo containers are transshipped from one vehicle or one mode of transportation to another for continued transport. Such a facility at a port, where ocean-going container vessels dock to discharge and load containers by cranes is a maritime container terminal. A facility where the transshipment is between land vehicles, such as between trucks and trains, is an inland container terminal. (Also see Terminal.)

Container Throughput: A measure of the number of containers handled over a period of time; a measure of productivity for a seaport or terminal.

Conventional (Rail) Car: An intermodal flat car designed to carry single-stacked trailers or containers, used for shipment of one or two trailers and about 89 feet long with a tare weight of about 35 tons.

Corporate Average Fuel Economy Standards (**CAFÉ Standards):** First enacted by Congress in 1975, the purpose of CAFE is to reduce energy consumption by increasing the fuel economy of cars and light trucks.

Corridor of the Future: Any of six interstate routes identified by the U.S. Department of Transportation in 2007 to participate in a federal initiative to develop multi-state corridors to help reduce congestion (Interstates 5, 10, 15, 69, 70, and 95).

Crossdock Facility: A materials-handling facility used in the short-turn-around transfer of intermodal rail or truck freight. Incoming shipments are transferred directly to outgoing trailers with little or no storage. Shipments may spend less than 24 hours at such facilities, sometimes less than an hour.

Cross-Sectoral: Relating to or affecting more than one group, area, or section; in goods movement, may refer to impacts or vulnerabilities in one sector that may affect other sectors.

Customs: A tax or duty imposed on imported goods. Also, customs may refer to the U.S. Customs and Border Protection agency, a unit of the Department of Homeland Security, which collects such fees and also works to prevent terrorists from entering the county, enforce immigration and drug law, and prevent the importation of illegal cargo.

Distribution Centers (DC): a strategically located warehouse-type facility, often highly automated, that receives, sorts, processes, temporarily stores, and redistributes inventory (products, goods) to retailers, wholesalers, or consumers. Distribution centers may or may not be dedicated to a single retail organization. Distribution centers may also perform value-added services, such as consolidation, packaging, light assembly, labeling, and performance tracking. Distribution centers may also be called a fulfillment center, cross-dock facility, break bulk center, or package handling center.

Dead Mileage (also called Deadheading): In freight transportation, the operation of a carrier service in a non-revenue mode (e.g., making a trip without freight), a return (backhaul) trip to a home terminal or base, or a vehicle's crew travelling as passengers. Movement of a paid crew (e.g., in a truck or on a freight train or ship) without performing goods movement service is considered dead mileage. In rail transportation use, may also apply to one locomotive hauled by another.

Declared Combined Gross Vehicle Weight (CGW): The total unladen weight of the combination of vehicles (motor truck and trailer) plus the heaviest load that will be transported by that combination.

Deep-Sea Shipping Service/ Liner, Charter, and Tanker Service: A liner service involves regular, scheduled stops at ports along a fixed route. Liner routes are dominated by container ships transporting manufactured goods. Charter service, also known as tramp shipping, is an "as-needed" mode of shipping, which moves between ports based on cargo availability; tramps inexpensively transport a single form of dry bulk cargo (e.g., grain, coal, ore, sugar) for a single shipper. Tanker service transports crude oil, petroleum, and other liquid products. Tankers can be chartered, but most are owned and operated by major oil companies.

Deep-Sea Shipping Vessels: Ocean-going ships that transport cargo to and from seaports. Vessels include dry bulk carriers, which transport commodities such as iron ore, coal, and food; liquid bulk carriers such as tankers that ship crude oil, chemicals, and petroleum products; diesel-powered container ships that transport imports and exports in standardized containers; general cargo ships; and roll on-roll off (Ro/Ro) vessels that transport wheeled cargo such as cars, trucks, and trains.

Deep-Sea/Water Ports: A port that is compatible with the large heavy loaded ships which may require the water to be 30 feet deep or even more.

Demurrage: The detention of a freight car or ship by the shipper beyond the permitted time (grace period) for loading or unloading. In maritime use, a penalty fee imposed for unreasonable delay in loading or unloading cargo or damages payable by a ship charterer to the ship owner as compensation for lost time (e.g., when a chartered ship is not returned to the owner by a specified date). In rail use, a charge assessed by railroads for the detention of rail cars by shippers or receivers beyond a specified free time.

Dock: A space used for loading or receiving merchandise at a freight terminal.

Double-Stack: Railcar movement of containers stacked two units high.

Draft: The vertical distance (depth) of a vessel from its waterline to the deepest point of its hull. Draft, which varies according to how much cargo the vessel is carrying, determines the minimum depth of water a vessel can safely navigate.

Drayage: Transportation of freight (often containers from railyard or seaports) by truck typically over a relatively short distance to an intermediate or final destination; may also refer to a charge for pickup/delivery of goods moving short distances (e.g., from marine terminal to warehouse). Originally, the term dray referred to a cart, usually three-sided, used to haul goods.

Dredge: To remove sediment from the bottom of a harbor channel, river, or other waterway to improve the passage for vessels. A waterborne machine is used for this purpose.

Dry Bulk Cargo: Cargo loaded or unloaded by means of conveyor belts, spouts, or scoops, and not placed individually; flowing cargoes such as rice, grain, various ores, etc.; stored loose.

Dwell Time: The length of time a rail car(s) sits at a particular location.

Environmental Justice: The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Export: To send or transport goods abroad for trade or sale (opposite, see Import).

Farm-to-Market Corridor: The U.S. Department of Transportation (U.S. DOT) has designated State Route (SR) 99 from south of Bakersfield to Sacramento as the California Farm-to-Market Corridor, a High Priority Corridor on the National Highway System.

Fifth Wheel: The semi-circular steel coupling device mounted on a tractor which engages and locks with a chassis semi–trailer.

Infrastructure Investment and Jobs Act (**IIJA**)**:** Is a five-year federal funding and authorization bill signed into law in November 2021 that governs the U.S. federal surface transportation spending. IIJA includes a provision that requires each State that receives funding under the National

Highway Freight Program to develop a State Freight Plan that provides a comprehensive plan for the immediate and long-range planning activities and investments of the State.

Flatcar: In rail transportation, a freight rail car that has a floor without any housing or body above, frequently used to carry containers and trailers or oversized and odd-shaped commodities.

Flip-Line: An area of a terminal or yard designated for mounting containers on a chassis or exchanging (switching out) one chassis for another. Switching out a chassis may be done for various reasons (e.g., because the chassis is defective, or to change from a yard chassis to a highway chassis or because the driver is required to match ownership of the container to ownership of the chassis). To flip may refer to picking a container up off the ground and mounting it on a chassis for highway transport.

Focus Routes: Identified in the Caltrans Interregional Transportation Strategic Plan (ITSP), this subset of the High Emphasis Routes highlights the State's highest priority routes that, when complete, will connect all urban areas and geographic goods movement gateways, as well as link rural and small urban areas to the trunk system.

Fork Lift: A machine used to pick up and move goods loaded on pallets or skids.

Freight Forwarder: A person or company whose business is to act as an agent on behalf of a shipper. A freight forwarder frequently consolidates several shipments from various shippers into one large shipment and coordinates booking reservations. Upon reaching the destination, the shipment is separated into small shipments and delivered.

Gantry Crane: A track-mounted, shoreside crane used in loading or unloading of cargo.

Gate: In goods movement, the location or structure at a port of entry, seaport, or intermodal terminal where trucks are cleared to enter or exit. Increasingly, gate entry procedures are automated to confirm required information about the vehicle, the load, and compliance with applicable rules.

General Aviation: Any civilian aviation activity other than regularly scheduled commercial passenger airlines or military operations.

Geofencing: A virtual perimeter for a real-world geographic area; geofences around yards and other downtime areas provide instant notifications when a vehicle enters or exits an area when it should not.

General Cargo: In contrast to bulk cargo, any containerized or breakbulk goods.

Gondola: In rail transportation, a freight car with sides and no roof.

Goods Movement: The processes and activities involved in picking up, moving, and delivering products or raw materials from points of origin (or producers) to points of delivery or use (or consumers). Goods movement relies on transportation, financial, and information systems that involve global, international, national, interstate, statewide, regional, and local networks.

Grade Separation: A construction design in which travelled ways**:** e.g., highways, railroad lines, or pedestrian walkways**:** cross under or over each other at different vertical elevations in order to avoid conflicts.

Green Equipment: In goods movement, vehicles (such as trucks and locomotives) and cargo-handling equipment that uses emission-reducing technologies. Green locomotives, for example, use alternative forms of energy from diesel, thus reducing air pollutant emissions. Hybrid locomotives feature a bank of batteries and a small diesel engine that is used to recharge the batteries (e.g., "Green Goat" (BNSF) yard-switcher locomotives). GenSet locomotives have multiple engines operating in tandem rather than a single engine.

Gross vehicle Weight: The combined total weight of a vehicle and its freight.

Ground Handling: In aviation, the servicing of an aircraft while it is on the ground and usually parked at a terminal gate of an airport.

Harbor: Any place to which ships may resort for shelter, or to load or unload passengers or goods, or to obtain fuel, water or supplies.

Hazardous Material (or "HazMat"): A substance or material that, because of its quantity, concentration, or physical or chemical characteristics, may cause or significantly pose a substantial hazard to human health or the environment when improperly packaged, stored, transported, or otherwise managed.

Heavy Hauler: A truck equipped to handle unusually heavy loads (e.g., steel, heavy machinery, transformers, boats, bulldozers, etc.).

High Emphasis Routes: Highways having the State's highest priority for programming to meet freeway/expressway standards or otherwise designated for their critical importance to interregional travel. High emphasis routes were first recognized in the 1990 Interregional Road System Plan (Caltrans).

Highway: Any road, street, parkway, or freeway/expressway that includes rights-of-way, bridges, railroad-highway crossings, tunnels, drainage structures, signs, guardrail, and protective structures in connection with highways. The highway further includes that portion of any interstate or international bridge or tunnel and the approaches thereto (23 U.S.C. 101a).

Hopper Car: A freight car having sloping floors leading down to one or more doors designed for releasing (dumping) the contents (such as coal or ore) by gravity. Such cars are often used for handling dry bulk goods.

Hotelling: Allowing the auxiliary engines of a ship to run continuously while at dock to provide power for lighting, ventilation, heating and cooling, pumps, communication, and other onboard equipment. (Opposite: see "cold-ironing").

Hub: A common connection point for components in a network; a common term in describing a freight transportation network, as in "hub and spoke."

Import: To receive, bring in, or carry in goods from an outside source, especially to bring in goods or materials from a foreign country for trade or sale (opposite, see Export).

Infrastructure: In goods movement, the roads and highways, tunnels and bridges, rail lines and yards, seaports and improved waterways, airports, and related intermodal yards and communication systems (including intelligent transportation systems) that support the movement of products and raw materials.

Integrated Carrier: A cargo transporter (or freight forwarder) that uses its own multiple fleets or equipment (aircraft, ships, trucks, etc.) instead of the scheduled airlines or shipping lines.

Intermodal Car: A rail car designed specifically for handling piggyback trailers or containers, or both. Intermodal cars may be long flatcars with collapsible trailer hitches, or shorter, lightweight platforms with rigid hitches for use at mechanized terminals. Some newer designs are articulated and have as many as ten platforms connected to form one "car."

Intermodal Equipment Provider: Any person that interchanges intermodal equipment (e.g., chassis or trailers) with a motor carrier pursuant to a written interchange agreement or has a contractual responsibility for the maintenance of the intermodal equipment.

Intermodal Freight Transportation: Transportation of freight, typically in an intermodal container or vehicle, using more than one mode of transportation (e.g., rail, ship, or truck) in a single trip, generally with no handling of the freight itself when changing modes.

Intermodal Terminal: A location where different transportation modes and networks connect.

Intermodal: Involving two or more different modes of transportation in conveying goods.

JIT Shipping: Just-in-Time shipping; an inventory control strategy that strives to achieve a steady flow of materials through the supply chain and to minimize or avoid warehousing by having components or products produced and shipped to arrive just in time for use. In this strategy, containers or transporting ships or vehicles may serve as "movable warehouses." This inventory control method depends on highly reliable transportation.

King Pin: A coupling pin centered on the front underside of chassis; couples to the tractor.

Labor Union: An organized association of workers, often in trade or profession, formed to protect and further their rights and interests.

Lading: Contents of a shipment. The freight in or on a railcar, container, or trailer.

Landbridge: The movement of cargo (such as containerized goods) from one country through the port of another country and then by rail or truck to an inland point in that county or to another country**:** for example, the through movement of Asian goods to Europe across North America.

Landed Cost: The total cost of a product to a buyer, up to the final destination (e.g., at the port of destination or at the buyer's door), including the original purchase price (cost) of the item, all brokerage and logistics fees, complete shipping costs, customs duties, tariffs, taxes, insurance, currency conversion, crating costs, and handling fees, as applicable.

Landlord Port: A seaport where the port authority builds the wharves, which it then rents or leases to terminal operators. The operators, in turn, provide the cargo-handling equipment (cranes, forklifts, etc.), hire longshore laborers to operate machinery, and negotiate contracts with ocean carriers to handle the unloading or loading of their cargoes. (Contrast with operating port).

Less Than Container Load (LCL) and Less Than Truckload (LTL): A shipment of cargo that is not large enough to fill a standard-size container; various shippers may pool their LCL shipments together in one container. In trucking, a shipment that would not by itself fill the truck to capacity by weight or volume.

Lift On-Lift Off (Lo/Lo): A cargo-handling technique involving the transfer of commodities to and from a ship using shoreside cranes or the ship's lifting gear.

Lights Out Facility: A storage or retrieval facility, such as a warehouse or distribution center, with minimal or no staffing.

Line Abandonment: Discontinuation by a railroad of rail service and maintenance on a rail line or line segment subject to approval of appropriate federal and state agencies.

Line Haul: Movement of freight over tracks of a railroad from one station to another (not a switching service).

Liquid Bulk Cargo: A type of bulk cargo that consists of liquid items, such as petroleum, water, or liquid natural gas.

Logistics Park: A development concept in which distribution centers typically seen in a suburban area are built in a park like setting, usually populated by warehouses and logistics-related companies/offices and is also an intermodal facility where truck trailers and containers are transferred between trucks and the railroad.

Logistics: In the freight industry, a collective term for a wide set of activities dedicated to the production, transformation, and distribution of goods, from raw material sourcing to final market distribution, as well as the related information flows and scheduling.

Longshoremen: Dock workers who load and unload ships or perform associated administrative tasks. May or may not be members of labor unions. Longshoremen are also called stevedores. Longshore gangs are hired by stevedoring firms to work the ships.

Manifest Train: A freight train with a mixture of car types and cargoes. Also known as a Mixed Freight Train.

Manifest: A transport document or invoice that provides a summary of all cargo being transported on a train, ship, or truck.

MAP-21: Moving Ahead Progress for the 21st Century Act; signed in July 2012 and funds surface transportation programs. It provided needed funds and it transformed the policy and programmatic framework for investments to guide the growth and development of the country's vital transportation infrastructure. Replaced by the Fixing America's Surface Transportation act (FAST Act - see above).

Maquiladora: Assembly facilities in Mexico, especially those located near the United States-Mexico border, to which foreign materials and parts are shipped (duty free) and assembled into products that are returned to the same market or exported, the facility ownership thus taking advantage of cheaper labor and less restrictive regulations.

Marine Terminal: Any designated area of a seaport used for the receipt or shipment of waterborne cargo, typically including wharves, storage areas, loading and unloading equipment, rail and truck facilities, offices, maintenance areas, and other related functions.

Mean Low Water: A tidal datum (a base elevation used as a reference point). The average of all the low water heights observed over a 19-year period.

METRANS: The METRANS Transportation Center was established in 1998 through the Transportation Equity Act for the 21st Century (TEA-21) as the first University Transportation Center in Southern California. METRANS is a partnership of the University of Southern California (USC) and California State University, Long Beach (CSULB).

Mile: A unit equal to 5,280 feet on land; a nautical mile is the distance of one minute of longitude at the equator, approximately 6,076.115 feet; metric equivalent is 1,852 feet.

Multimodal: The availability of multiple transportation options, or modes, within a system or a corridor. The transportation of goods under a single contract but performed with at least two different means of transport (See also intermodal freight transportation).

Nitrogen Oxides (NOx): A generic term for the nitrogen oxides that are most relevant for air pollution. These gases contribute to the formation of smog and acid rain, as well as affecting tropospheric ozone. In air pollution control, nitrogen dioxide (NO2) is of primary interest and used as an indicator for the larger group of nitrogen oxides.

Off-Dock Rail: Freight railyards located not immediately on a marine terminal but rather within the larger region served by a port. Typically, cargo is trucked from a marine terminal or transload facility to these yards, where transcontinental rail service is available.

Omni-Channel Supply Chain: A multichannel approach to sales that seeks to provide customers with a seamless shopping experience, whether they're shopping online from a desktop or mobile device, by telephone, or in a brick-and-mortar store. An omnichannel approach means there's integration between distribution, promotion and communication channels on the back end.

On-Dock Rail: Freight railyards located at marine terminals, providing direct shipside rail service. On-dock railyards receive import cargo discharged from marine vessels as well as export cargo unloaded from freight trains. Typically, these yards consist of rail tracks, temporary storage areas for equipment and cargo, and staging areas.

Operating Port: A seaport where the port authority builds the wharves, owns the cranes and cargo-handling equipment, and hires the labor to move the cargo. A stevedore hires longshore labor to lift cargo between the ship and dock, where the port's laborers pick it up and move it to a storage or shipping site (contrast with landlord port).

Pallet: A wooden, plastic, or paper platform, sometimes with sides and/or a top, on which packaged goods are placed to facilitate movement by forklifts and other freight-handling equipment. Pallets come in a wide variety of types and dimensions; common sizes include 48" x 40", 42" x 42", and 36" x 36." Various organizations, including the International Organization for Standardization (ISO) promote standardization of international pallet sizes.

Panamax/New Panamax/Post Panamax or Neopanamax: Terms for the size limits for ships travelling through the Panama Canal. An ocean-going ship with dimensions of the maximum size possible to pass through the Panama Canal. In 2011, these dimensions are: maximum length 295 meters, maximum beam overall 32.25 meters, and maximum draft 13.50 meters. When expansion of the canal is completed, the new Panamax vessel will be: maximum length 366 meters, maximum beam 49 meters, and maximum draft 15.2 meters.

Performance Measures: Objective, usually quantified standards used to evaluate how well a system is functioning when compared to baseline goals or objectives.

Physical Internet: A conceptual initiative that uses the Internet as a metaphor to envision an open, global logistics network of the future, enabled by a standard set of protocols, modular containers, and smart interfaces for increased efficiency and sustainability.

Piggyback: A transportation arrangement in which truck trailers with their loads are moved by train to a destination.

Placard: A sign affixed to a rail car or truck, which indicates the (typically hazardous) designation of the product being transported in that vehicle.

Particulate Matter (PM): In air pollution control, solid particles and liquid droplets found in the air. Particles range in size from visible materials, such as dust, dirt, soot, or smoke, to particles so small that they can only be detected using an electron microscope. Particle pollution includes "inhalable coarse particles," with diameters larger than 2.5 micrometers and smaller than 10 micrometers and "fine particles," with diameters that are 2.5 micrometers and smaller. Diesel engines emit a complex mix of toxic pollutants, including very small carbon particles ("soot") called diesel PM, known to contain over 40 cancer-causing substances.

Particulate Matter 10 (PM 10): Refers to tiny particles or droplets in the air that are 10 microns in width. Because of their small size, particles on the order of 10 micrometers or less (coarse particulate matter, PM10) can penetrate the deepest part of the lungs such as the bronchioles or alveoli.

Particulate Matter 2.5 (PM 2.5): Refers to tiny particles or droplets in the air that are one half microns or less in width. Exposure to fine particles can cause short-term health effects such as eye, nose, throat and lung irritation, coughing, sneezing, runny nose and shortness of breath. Exposure to fine particles can also affect lung function and worsen medical conditions such as asthma and heart disease.

Project Cargo: Term broadly applied to large, heavy, high value or project-critical materials and equipment being shipped (either domestic or overseas) for a specific purpose, such as for a new factory, highway, oil drilling platform, wind turbine generators, etc.

Proposition 1B: The ballot initiative passed by California voters in November of 2006, subsequently enacted as the Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006. Prop 1B authorized the State to sell $19.925 billion of general obligation bonds to fund transportation projects "to relieve congestion, improve the movement of goods, improve air quality, and enhance the safety and security of the transportation system."

Public Use Airport: A publicly or privately-owned airport that offers the use of its facilities to the public without users obtaining special clearances, and that has been issued a California Airport Permit by Caltrans.

Public-Private Partnerships: In transportation planning, arrangements between government and private sector entities for the purpose of providing or improving infrastructure, facilities, and services. (Sometimes called P3 projects.)

Rail Yard: A rail terminal, typically with a network of tracks and multiple sidings, at which traditional railroad activities occur, such as assembling trains and sorting and redistribution of railcars and cargo (see classification). Railcars in yards are moved by gravity (e.g., rolling into position from a manufactured hill, or hump) or by specially designed yard locomotives called switchers.

Railhead: The end of a railroad line or a point in the operations at which cargo is loaded or unloaded.

Reefer: In shipping, a controlled temperature (i.e., refrigerated) shipping container.

Repower: The replacement of an older, more polluting diesel engine with a newer, less polluting engine. Repower may involve the use of alternative fuel sources, such as liquid natural gas or electric power.

Rolling Stock: The inventory of wheeled transport vehicles owned by a railroad or motor carrier; often used in rail transportation, usually referring to both powered and unpowered vehicles, including locomotives, railroad cars, and passenger coaches.

Shipper: The person or company who is usually the supplier or owner of commodities shipped. Also called Consignor.

Shipping Company: A company whose business is in transporting goods or passengers in ships.

Shipping Line: A business that transports cargo aboard ships.

Short Line Railroad: An independent or subsidiary railroad that operates over a relatively short distance; generally, a Class III railroad. Short line and regional railroads operate and maintain 29 percent of the American railroad industry's route mileage, and account for 9 percent of the rail industry's freight revenue and 11 percent of railroad employment.

Short Ton: A weight unit of measure equal to 2,000 pounds.

Short-Sea Shipping: Commercial marine shipping operations between ports along a single coast or involving a short sea crossing; also known as coastal shipping or coastwise shipping.

Side-Handler: A diesel-powered, container-moving vehicle used at a terminal or yard with a motorized lift and spreader that attaches to the side of an empty container; used for moving empty containers onto or off trucks or stacks of containers. (Compare with top-handler.)

Siding: In rail transportation, track adjacent to a main or secondary track for meeting or passing trains.

Slow Steaming: The deliberate reduction of a marine vessel's cruising speed to reduce fuel consumption, thus lowering operational costs, as well as reducing $CO2$ emissions.

Stack Car: An articulated five-platform rail car that allows containers to be double stacked. A typical stack car holds ten 40-foot equivalent units.

Standard Industrial Classification: A standard numerical code used by the U.S. Government to classify products and services.

Stevedore: A labor management company that provides equipment and hires workers to transfer cargo between ships and docks and is responsible for the loading or unloading of ships in port. Also used to mean an individual worker (i.e., a longshoreman).

Straddle Carrier: Motorized, rail-mounted or rubber-tired, container terminal equipment that straddles a row of containers and is used to move containers around the terminal; may also move containers to and from truck chassis. Straddle carriers can typically lift up to 60 tons or two full containers. (See transtainer).

Strategic Rail Corridor Network: An interconnected and continuous rail line network consisting of over 36,000 miles of track serving over 140 defense installations.

Sulfur Oxides (Sox): A group of pollutants that contain both sulfur and oxygen molecules. Sulfur dioxide, $SO2$ is the most common form in the lower atmosphere. Exposure to sulfur oxides can be harmful to human health. Since sulfur oxides are irritants, they have been associated with reduced lung function, increased incidence of respiratory diseases, irritation of the eyes, nose, and throat, and even death.

Supply Chain: A network of production, trade, and services required to move a product or service from supplier to customer, beginning with the transformation of raw materials, through intermediate manufacturing stages, to the delivery of finished goods to a market.

Sustainability: Policies and strategies that are aimed at meeting contemporary social needs without compromising the ability of future generations to meet their needs.

Switching: Movement of freight cars between two locations in close proximity. Typically involves moving cars within a rail yard or from specific industry locations to a yard for placement on a train.

Tank Barges or Tankers: Ships used for transporting bulk liquids, such as petroleum, chemicals, molasses, vegetable oils, liquefied gases, etc.

Tank Car: A railcar used exclusively for transporting liquids, liquefied gases, compressed gases, or solids that are liquefied or compressed prior to loading.

Tare Weight: The weight of clean, empty equipment (e.g., the weight of a rail car containing no lading or packing and debris resulting from previous lading).

Tariff: A schedule or system of charges, duties, or fees imposed by a government on imports or exports.

Terminal Access Route: A designated truck route from a STAA-designated route to a terminal. Federal law requires that states allow STAA trucks reasonable access to terminals.

Terminal Operator: A company that oversees activities at a site where vehicles that transport materials empty their cargo and load new products or manages a place where oil or petrochemical products are stored.

Terminal: Generally, a facility at which freight is received, handled, and shipped. Terminals are usually locations where vehicle combinations (rail cars, trucks, trailers, chassis, etc.) are regularly exchanged and temporarily stored. In rail transportation, a railroad facility used for handling freight and the receiving, classifying, assembling, and dispatching of trains. (Also see rail yard.) At seaports, a wharf area where an owner or tenant operates cargo-handling equipment to load and unload ships. (Also see container terminal.)

Third-Party Logistics (3PL) Provider: A specialist in logistics who may provide a variety of transportation, warehousing, and logistics-related services to buyers or sellers.

Throughput: In goods movement, a measure of how much cargo is moving through a system, measured in terms of volume of trucks, trains, or cargo.

Ton and Tonne: A ton (also known as a short ton) is a unit of weight equal to 2,000 pounds, used almost exclusively in the United States. A tonne (or metric ton) is a unit of weight equal to 1,000 kilograms, used everywhere else in the world. A tonne is equivalent to about 2,205 pounds.

Ton-Mile: The movement of a ton of freight one mile.

Tonnage: Generally, refers to freight handled.

Top-Handler: A diesel-powered, container-moving vehicle used at a terminal or yard with a motorized lift and spreader that attaches on the top of an empty container; used for moving containers onto or off trucks or stacks of containers. (See side-handler.)

Trackage Rights: In rail transportation, rights obtained by one railroad to operate its trains over another railroad's tracks.

Tractor Unit: A characteristically heavy-duty towing engine and cab that provides power for hauling a towed or trailered load.

Tractor-Trailer: A combined trucking vehicle consisting of a motorized towing engine and cab (tractor) and an attached trailer, semitrailer, or both (a double) having four or more axles (also known as "semis," "big rigs" or "18-wheelers").

Trade Barrier: A (usually) government-imposed restriction on the free (usually international) exchange of goods or services. May take the form of import policies, tariffs, licensing, or other restrictions.

Trade Corridor Improvement Fund (TCIF): One of the key program elements authorized by the Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006, approved by the voters in 2006 as Proposition 1B. The $2 billion fund is available to the California Transportation Commission (CTC), as appropriated, for programmed infrastructure improvements along federally designated "Trade Corridors of National Significance" or other corridors with a high volume of freight movement.

Trade Corridors of National Significance: A federal designation under SAFETEA-LU. These are one of the categories of facilities available for funding under TCIF.

Trailer on Flat Car (TOFC): A container placed on a chassis that is in turn placed on a railcar.

Trailer: A nonautomotive freight vehicle to be drawn by a truck tractor unit or other motor truck.

Tramp Shipping: In marine transportation, shipping by means of a vessel that does not operate on a published schedule but serves different ports in response to tenders of cargo.

Transload Facility: Any place where transloading is conducted.

Transloading: The operation of transferring cargo from one transportation mode to another. May also refer to the operation of transferring cargo from one container to another for any of a number of reasons, such as for consolidation, weight restrictions, palletizing, leasing contract requirements, or supply chain management (e.g., to synchronize delivery of goods to meet real-time demands).

Transshipment: The shipment of goods (or containers) to an intermediate destination by one carrier, then shipped again to another destination by the same or another carrier. Shipments transferred from one transportation line to another, such as from rail to a water carrier.

Transtainer: Large, motorized, rubber-tired gantry (RTG) or rail-mounted gantry (RMG) hoist used to move and stack containers in a yard or at a terminal. Transtainers can lift 30 to 40 tons and straddle up to six rows of containers stacked five or six containers high. They may be used to load or unload containers on trucks, terminal chassis, or rail cars.

Trucking Company: A company that ships goods or possessions by truck.

Trucks: Any of a broad range of motorized vehicles used to transport freight. The Federal Highway Administration (FHWA) classification system recognizes 10 types of trucks, with classes 4 through 7 being medium-duty trucks, and classes 8 through 13 heavy- duty trucks. In intermodal transport, freight is often carried by tractor-trailers; the tractor is the front part, including the cab, and the tractor is the detachable wheeled chassis behind the tractor on which the container is placed. Tractor-trailers with a semitrailer, trailer, or both and four or more axles may be known as "semis" or "18-wheelers." The largest trucks that may operate legally in California are defined by the federal Surface Transportation Assistance Act (STAA) of 1982. A STAA semitrailer may be up to 53 feet in length, with a kingpin-to-rear axle (KPRA) maximum of 40 feet, and with no overall length limit. The maximum length for a California legal truck tractor and semitrailer combination is 65 feet overall. A motor truck (3 axles) and trailer or semitrailer combination (double) may be 75 feet.

Tugboat and Towboat: A tugboat is a type of harbor craft used for maneuvering larger ships in and out of port. A towboat is a type of watercraft used to pull (tow) or push barges.

Unit Train: Freight trains moving large tonnages of a single (often bulk) product between two points without intermediate yarding or switching.

Velocity: In goods movement, a measure of how fast cargo is moving through a transportation system, typically measured in terms of average vehicle speed per unit time.

Warehouse: A commercial building used to store goods. Warehouses usually are located and designed to facilitate movement and handling of materials, components, or products, with truck (and often rail) access, loading docks, and vehicle storage. Cool warehouses or cold storage may be used for agricultural products. Large (e.g., "big box") stores may combine warehouse and retail functions in the same building.

Waybill: Documents used to identify the shipper and consignee, routing, cargo, rate, weight, and other shipping information.

Appendices

Appendix A. 2014 CFMP Goals, Objectives, Strategies, and Accomplishments

The following are the six goals, objectives, and strategies from the 2014 CFMP. The projects and achievements to accomplish each goal are also presented.

Goal 1: Economic Competitiveness

Improve the contribution of the California freight transportation system to economic efficiency, productivity, and competitiveness.

OBJECTIVES

- Build on California's history of investments to seek sustainable and flexible funding solutions with federal, private, and green partners
- Invest in freight projects that enhance economic activity, freight mobility, reliability, and global competitiveness

STRATEGIES

- Conduct a cost-benefit analysis for each freight project proposed for programming
- Reduce transportation costs by eliminating bottlenecks and recurrent delay, making operational improvements, and accelerating rapid incident response on priority freight corridors
- Seek creation of national, state, and regional dedicated freight funding programs
- Expand capacity of freight corridors or subsections through infrastructure or operational improvements
- Eliminate unnecessary freight lifts or handling
- Improve system condition and performance on priority freight corridors
- Coordinate with other states and regions to improve multi-jurisdictional freight corridors to reduce delay, increase speed, improve reliability, and improve safety

Accomplishments Since 2014

- Investments in freight infrastructure and mobility to enhance the State's economic activity, freight mobility, reliability, and global competitiveness
- The creation of new federal and state dedicated freight funding sources, such as:
    - The federal Fixing Americans Surface Transportation (FAST) Act that established the National Highway Freight Program (NHFP), providing California with approximately $535 million to fund projects that improve the efficient movement of freight on the National Highway Freight Network (NHFN) and support various federal freight goals
    - The State of California's Road Repair and Accountability Act of 2017, also known as Senate Bill (SB) 1, created a new Trade Corridor Enhancement Program (TCEP)

providing approximately $300 million per year in state funding for projects which more efficiently enhance the movement of goods along corridors

Goal 2: Safety & Resiliency

Improve the safety, security, and resilience of the freight transportation system.

OBJECTIVES

- Reduce rates of incidents, collisions, fatalities, and serious injuries associated with freight movements
- Utilize technology to increase the resilience and security of the freight transportation system

STRATEGIES

- Reduce points of conflict on the freight system by constructing railroad grade crossings where there is a history of crashes and at crossings that have a high volume of vehicle and train traffic
- Create truck-only lanes and facilities, and encourage off-peak usage
- Fully implement positive train control (PTC)
- Expand number and scope of cargo security screenings
- Expand the system of truck parking facilities
- Ensure consistent and effective safety and security requirements at all California ports
- Identify alternate freight routes to maintain freight movement at times of disruption by disaster or other causes
- Inventory and assess risks for freight facilities vulnerable to sea level rise and other natural disasters and prioritize for abandoning, armoring, adapting, moving, or replacing

Accomplishments Since 2014

- The State of California's 2020-2024 Strategic Highway Safety Plan (SHSP), a data-driven plan reducing traffic-related fatalities and severe injuries on all public roads through:
  - Strategies and actions identified as having the greatest impact on road safety for all modes of travel and guidance for the investment of the Federal Highway Administration (FHWA) and the National Highway Traffic Safety Administration (NHTSA) safety funding across multiple state departments
  - Actions identified and delivered through public and private industries representing the 4 Es of safety (Education, Enforcement, Emergency Services, and Engineering)
- Implementation of PTC on all California Class I Railways

Programmed and Constructed Projects

- Lake County SR 29 Expressway Project (SHOPP) – Caltrans District 1
  Facilitate the efficient flow of goods and service through Lake County, provide a facility with the potential for diverting through traffic (including through truck traffic) from north shore SR 20, and improve the safety and operation of SR 29
- Yuba County SR 20 at Timbuctoo Improvements – Caltrans District 3
  Improve safety by reducing the number of run-off-road collisions on a section of SR 20 in Yuba County; provide a truck climbing lane

- Etiwanda Avenue Grade Separation – Rancho Cucamonga
  Widen and construct Etiwanda Avenue as a grade-separated roadway over the SCRRA/BNSF San Gabriel subdivision, currently an at-grade crossing; a grade separation reduces vehicles and truck delays and queuing along Etiwanda Avenue and improves mobility, safety, and level of service at the crossing
- Fyffe Grade Separation – Port of Stockton
  Improve safety by removing the at-grade crossing and eliminating the potential for vehicle/rail conflicts. Provides a critical, reliable emergency evacuation route for the employees, tenants, visitors, and emergency response vehicles at the Port of Stockton West Complex
- Rice Avenue and 5 Street Grade Separation – Caltrans District 7
  Eliminate conflicts between vehicles and trains at the rail-highway crossing
- 7th Street Grade Separation (East) – Alameda County Transportation Commission
  Realign and reconstruct the existing railroad underpass and multi-use path along 7th Street between west of I-880 and Maritime Street to increase vertical and horizontal clearances for trucks to current standards and improves the shared pedestrian/bicycle pathway
- SR 60 Truck Safety and Efficiency (Phase 1A) – Riverside County Transportation Commission
  Construct new eastbound climbing and westbound descending truck lanes from Gilman Springs Rd to approximately 1.47 miles west of Jack Rabbit Trail and upgrade existing inside and outside shoulders to standard width
- Quiet Zone Safety Engineering Measures

Goal 3: Freight System Infrastructure Preservation

Improve the state of good repair of the freight transportation system.

OBJECTIVES

- Apply sustainable preventive maintenance and rehabilitation strategies

STRATEGIES

- Ensure adequate and sustainable funding for preservation of the freight system
- Expand scope of freight system rehabilitation projects to include facility modernization, where possible and merited, to increase range of available funding sources
- Make preservation projects multi-purpose
- Identify maintenance and preservation needs on priority freight corridors

Programmed and Constructed Projects

- District 1 - Del Norte - Highway 101 Hunter/Panther Creek Bridge Replacement
  - Upgrade Hunter Creek and Panther Creek Bridges to meet current seismic and design standards; the existing structures are over 50 years old and do not meet Caltrans requirements for seismic safety
- District 1 - Humboldt - Highway 101 Redcrest Capital Pavement Maintenance (CPAM)
  - Preserve and extend the service life of the existing distressed pavement on US 101, a critical north/ south interregional freight corridor

- District 3 - Placer – I-80 Bridge Rehabilitation
  - Rehabilitate or replace deficient structural components at four over-crossings located at various locations along I-80 in Placer County. Interstate I-80 is a critical interregional east-west freight corridor which serves freight traffic moving from the Ports of Oakland and West Sacramento across the state, into Nevada, and beyond. Within the project limits, I-80 is a four-lane freeway with intermittent truck climbing lanes
- District 3 - Sacramento - SR 99 Rubberized Hot Mix Asphalt (RHMA) Overlay
  - Preserve and extend this section of the pavement life on SR 99, a critical north/south interregional freight corridor travel by high volumes of heavy trucks
- District 4 - Solano - Interstate 80 -Bridge Rehabilitation
  - Increase the vertical clearance of the six over-crossings over I-80 to standard 16'-6" to allow over-height and commercial permit vehicles to travel continuously along I-80 under these over-crossings
- District 6 - Fresno - SR 99 Roadway Rehabilitation (R2)
  - Extend the service life of the pavement structure for a minimum of 40 years on a critical north/ south interregional freight corridor travel with high volumes of heavy trucks
- District 6 - Kings - SR 99 Kingsburg Rehabilitation Overlay
  - Preserve and extend the pavement life on SR 99, a critical north/south interregional freight corridor travel by high volumes of heavy trucks
- District 6 - Kern - SR 99 Roadway Rehabilitation (R2)
  - Resolve structure pavement failure on SR 99, a critical north/south interregional freight corridor, caused by high volumes of heavy trucks and restore the structural integrity by rehabilitating the roadbed
- District 7 - Los Angeles – I-5 Pavement Rehabilitation
  - Preserve and extend the pavement life on I-5, a critical north/south interregional freight corridor traveled by high volumes of heavy trucks

Goal 4: Environmental Stewardship

Avoid and reduce adverse environmental and community impacts of the freight transportation system.

OBJECTIVES

- Integrate environmental, health, and social equity considerations into all stages of freight planning and implementation, including considering impacts and mitigation relative to the context of the project location
- Conserve and enhance natural and cultural resources
- Avoid and reduce air and water pollution, greenhouse gas (GHG) emissions, and other negative impacts associated with freight transportation by transitioning to a lower-carbon and more efficient freight transportation system
- Implement freight projects that demonstrate, enable, implement or incentivize use of advanced, clean technologies (including zero- and near-zero-emissions technologies) and efficiency measures needed to attain ambient air quality standards and achieve needed air toxics and GHG emission reductions

STRATEGIES

- Establish corridor specific-impact reduction goals and projects
- Incentivize and prioritize freight projects that maximize GHG, criteria pollutant, and air toxin emission reductions
- Incentivize impact reduction
- Implement projects in freight corridors that are specifically targeted to avoid, reduce, or mitigate freight impacts on the environment and community
- Support and fund research focused on impact reductions and mitigation
- Ensure coordination and alignment of the Plan with State GHG reduction goals and requirements and State and federal air quality standards
- Develop an efficiency metric that captures the intensity of pollutants per unit of freight moved

Accomplishments Since 2014

- Adoption of the California Sustainable Freight Action Plan (CSFAP), freight targets, and pilot projects in 2016.
- Significant investments in all three CSFAP Pilot Projects:
    - Dairy Biomethane for Freight Vehicles: approximately $3 million from the California Energy Commission (CEC) for a community-scale advanced biofuels production project, and a minimum of five more projects to soon launch
    - Advanced Technology Corridors at Border Ports of Entry: Phases I and II, which includes 15 air quality monitors, funded through the TCEP and other Caltrans funds
    - Advanced Technology for Truck Corridors in Southern California: significant investments by the South Coast Air Quality Management District in zero-emission freight vehicles and equipment, and the I-10 Truck Parking Availability System fully funded through California, Arizona, New Mexico, and Texas
- Adoption of the Zero-Emission Vehicle (ZEV) Action Plan
- Deployment of an estimate of over 10,000 freight ZEV and equipment, with a goal of 100,000 deployed by 2030
- 60-98% reduction of criteria pollutants and 13% reduction of carbon dioxide emitted at the San Pedro Ports from 2005 to 2017, 98% reduction in truck emissions, and 76% reduction in vessel emissions at the Port of Oakland from 2009 to 2018
- Establishment of the Community Air Protection Program (pursuant to Assembly Bill (AB) 617) to reduce exposure in communities most impacted by air pollution
- Commitment to the Clean Transportation Program, the Cap and Trade system, and the Low Carbon Transportation Investments and the Air Quality Improvement Program, which includes freight-specific funding

Goal 5: Congestion Relief

Reduce costs to users by minimizing congestion on the freight transportation system.

OBJECTIVES

- Develop, manage, and operate an efficient, integrated freight system
- Identify causes and solutions to freight bottlenecks
- Invest strategically to optimize system performance

STRATEGIES

- Create a multimodal freight bottleneck list for priority corridors and prioritize for correction
- Identify the most congested freight corridors and facilities and prioritize these for improvement
- Implement vehicle detection on priority corridors to identify problem areas across modes, particularly targeted to truck data
- Construct railroad grade separations at high volume roadway crossings
- Add mainline track and sidings to accommodate demand for freight and passenger rail services
- Implement system management and expand the freight travel information availability with the focus on freight corridors
- Expand freight travel information availability to the entire truck fleet

Accomplishments Since 2014

- Caltrans' collaboration with Metropolitan Planning Organizations and Regional Transportation Planning Agencies in the development of a performance target for truck travel time reliability on the interstate system
- Caltrans' continued analysis and reporting of the state's progress in reaching the FHWA's travel truck time reliability targets
- Caltrans' identification of major freight bottleneck locations, inclusion of those locations in the 2018 California Freight Mobility Plan Addendum, and the monitoring of the State's progress in reducing the congestion at those locations
- District 7: I-605 / SR 91 Interchange Improvement Gateways Cities Freight Crossroads
    - This project reduces congestion, improves freeway operations on the mainline and ramps, and enhances safety on local and system interchange operations
- District 8: US 395 Widening from SR 18 to Chamberlain Way
    - The widening improvements will reduce congestion and enhance the operational efficiencies on this critical north/south interregional freight corridor that carries a large volume of traffic with a high percentage of heavy trucks
- District 12: ORA-SR 57/ SR 91/ I-5 Install and Modify Intelligent Transportation System (ITS) Elements
    - This project upgrades existing elements, facilitates heavy truck traffic flow, and deploys new elements to enhance the fail-safe system through redundancy in managing incidents and congestion during normal operations and special events

Goal 6: Innovative Technologies and Practices

Use innovative technology and practices to operate, maintain, and optimize the efficiency of the freight transportation system while reducing environmental and community impacts.

OBJECTIVES

- Support research, demonstration, development, and deployment of innovative technologies

- Promote the use of zero- and near-zero-emissions technologies within the freight industry to support the State Implementation Plan (SIP), attainment of California greenhouse gas reduction targets, and reduction of local air toxics
- Support and incorporate the use of low-carbon renewable fuels
- Promote innovative technologies and practices that utilize real-time information to move freight on all modes more efficiently

STRATEGIES

- Prioritize Freight Plan projects implementing state-of-the-art and demonstration technologies
- Support deployment of new, non-fossil fuel distribution, recharging facilities, and shore-side power on the freight system, focusing on particular regions and corridors
- Support implementation of cleaner, quieter engine technologies
- Research opportunities for automation of certain freight movements

Accomplishments Since 2014

- Port Optimizer software at the Ports of Los Angeles and Long Beach is being implemented and is anticipated to significantly reduce port congestion
- The Port of Long Beach has been involved in the Freight Logistics Optimization Works (FLOW). Led by the U.S. Department of Transportation, the project aims to pilot an exchange of key freight information among members of the goods movement supply chain
- $82.5M awarded through TCEP to border projects, which includes funding for Phases I and II of the Advanced Technology Corridors at Border Ports of Entry, a CSFAP Pilot Project on the Caltrans District 11 Border
- Continuation of the CEC's Clean Transportation Program, formerly known as the Alternative and Renewable Fuel and Vehicle Technology Program, to fund over $100 million per year to promote accelerated development and deployment of advanced transportation and fuel technologies
- Investments in zero-emission truck technologies leading to advancements in engine torque to reduce speed differentials and system mechanics that help reduce wear and tear on roadways
- Implementation of PTC to make freight rail transportation safer on the major freight rail corridors by automatically stopping a train before certain types of collisions occur
- Formation of workgroups to establish formal standards for medium- and heavy-duty charging
- Testing and deployment of truck platooning technologies
- Commitment to alleviating truck parking issues through:
    - The launch of americantruckparking.com
    - Testing and soon deploying truck parking availability systems
    - Forming the Truck Parking Technical Advisory Committee
- Establishment of the San Diego Unmanned Aircraft System (UAS) Integration Pilot Program to accelerate safe UAS integration and innovation, including freight deliveries

Appendix B. Freight System Policy Framework

This section provides an overview of federal and state laws and policies influencing California's freight transportation decisions. It lists federal agencies and the critical role they provide in freight policy and funding as well as historical federal legislation through to current legislation and executive orders since inception. Federal plans are listed that provide freight strategies. State legislation and executive orders are listed that also shape California's freight system.

Federal Agencies

U.S. DEPARTMENT OF TRANSPORTATION (DOT)

Freight policy and regulation is primarily a function of the U.S. DOT. Within DOT, the FHWA provides much of the federal funding for infrastructure construction, operations, and maintenance for truck cargo. While FHWA focuses on building and maintaining the National Highway System (NHS) which is a public asset, the Federal Railroad Administration (FRA), Federal Aviation Administration (FAA), Maritime Administration (MARAD), and Pipeline and Hazardous Materials Safety Administration (PHMSA) each focus primarily on safety and security associated with moving goods on privately-owned infrastructure. FRA's funding role is limited to projects that enhance safety, such as grade-separations of railroad/roadway at-grade crossings and positive train control (PTC). Similarly, FAA focuses on safe operations of air traffic, while MARAD focuses on security of maritime operations in our nation's ports and inland waterways.

Both the National Highway Traffic Safety Administration (NHTSA) and the Federal Motor Carrier Safety Administration (FMCSA) focus on equipment manufacturing and vehicle operations – which also play significant roles in the transportation of goods. The NHTSA primarily focuses on the total population of drivers and vehicles, while the FMCSA focuses on commercial vehicles. Funding for U.S. DOT agencies occur through multi-year bills passed by Congress and signed into law by the President. Each agency receives and allocates funding approved through these transportation bills to carry out their duties. The most recent transportation bills are described later in this section.

U.S. DEPARTMENT OF ENERGY (DOE)

The U.S. DOE plays a role in freight as it relates to both transportation and site selection decisions for logistics facilities. In recent years, the Office of Energy Efficiency and Renewable Energy has become a major player in the strengthening of federal, state, and regional and local air quality rules and regulations, with an increasing focus on clean energy options. The U.S. DOE research, through its National Laboratories, assists original equipment manufacturers (OEM) with the development of cleaner vehicles, including heavy heavy-duty trucks. The U.S. DOE also supports the development of technologies to improve how electricity is created, stored, and used, in addition to development of disruptive technologies, including robotics, additive manufacturing, and artificial intelligence. California is fortunate to have four of the Nation's 17 laboratories. Federal funding bills allocate funding to U.S. DOE for investments in Research and Development, as well as aiding private industry with the purchase of cleaner equipment pursuant to air quality goals.

U.S. DEPARTMENT OF COMMERCE (DOC)

The U.S. DOC promotes private investments in economic development through its Economic Development Administration (EDA). In 2018, the EDA programs focused on Regional Innovation Strategies (RIS) and University Center Economic Development. Whereas RIS provides funding for high-technology and innovation start- up companies to further research and development, the University Center's program focuses on training/retraining the workforce of tomorrow. The EDA grants have funded a significant amount of disaster recovery and business resiliency efforts over the past decade, including efforts from the aftermath of hurricanes Harvey and Irma.

U.S. DEPARTMENT OF LABOR (DOL)

The U.S. DOL provides information about jobs and labor, and it serves to regulate both employers and workers. The Bureau of Labor Statistics (BLS) provides information about where firms are located and how many workers they employ. Other U.S. DOL agencies are responsible for enforcing labor laws, such as labor hours and safety rules for warehouse, dock, and aviation workers. Truck driver hours of service (HOS) regulations are controlled by the FMCSA, a U.S. DOT agency; however, truck driver safety while picking up or dropping off cargo at a facility is regulated by DOL's Occupational Safety and Health Administration (OSHA). The U.S. DOL funds safety programs that address workplace hazards.

FIXING AMERICA'S SURFACE TRANSPORTATION (FAST) ACT

The FAST Act of 2015 provided $305 billion over five years for transportation funding.[330] This bill was the first to establish a permanent federal discretionary formula funding program specifically for freight projects, as well as a competitive freight projects grant program. Specifically, FAST did the following:

- Established a National Multimodal Freight Policy
- Required the development of a National Freight Strategic Plan
- Created a freight-focused grant program of $4.5 billion over five years
- Established the National Highway Freight Program that provides $6.3 billion in formula funds over five years for states to invest in freight projects on the National Highway Freight Network.

THE INFRASTRUCTURE INVESTMENT JOBS ACT (IIJA) signed into law in November 2021 builds upon FAST Act investments and establishes a new Office of Multimodal Freight Infrastructure and Policy under the U.S. DOT Secretary to develop and manage the National Freight Strategic Plan (49 U.S.C. §70102), the National Multimodal Freight Network, oversee the development and updating of the State Freight Plans (SFP), provide SFP guidance and best practices, administer the multimodal freight grant programs and establish procedures for analyzing and evaluating grant applications. assist States in establishing State freight advisory committees, multi-State freight mobility compacts, and provide to the Bureau of Transportation Statistics input regarding freight data and planning tools.

49 U.S.C. §70101 NATIONAL MULTIMODAL FREIGHT POLICY provides the national policy goals for maintaining and improving the condition and performance of the National Multimodal Freight Network and informs state freight plans.

49 U.S.C. §70201 STATE FREIGHT ADVISORY COMMITTEES establishes the state freight advisory committee framework, including representatives, qualifications, and committee roles.

49 U.S.C. §70202 STATE FREIGHT PLANS establishes the framework and requirements for the development of state freight plans.

23 U.S.C. §167 NATIONAL HIGHWAY FREIGHT PROGRAM is a federal-aid formula funding program to improve the efficient movement of freight on the National Highway Freight Network (NHFN) and support infrastructure and operational improvements investments that strengthens economic competitiveness, reduce congestion, reduce the cost of freight transportation, improve reliability, and increase productivity, Improves freight transportation safety, security, efficiency, and resiliency in rural and urban areas, and Improves the NHFS' state of good repair, and safety, efficiency, reliability, and productivity

23 U.S.C. §150 NATIONAL GOALS AND PERFORMANCE MANAGEMENT MEASURES establishes the national policy framework and goals, performance measures, targets, and reporting requirements for the National Highway Performance Program, Regions, the Highway Safety Improvement Program, the Congestion Mitigation and Air Quality Program, and the national freight movement.

OCEAN SHIPPING ACT OF 2022 provides Federal Maritime Commission (FMC) the means to enhance its supervision of international ocean shipper to eliminate unfair charges levied against importers, prevent unreasonable denial of American exports, and relieve economic stresses against American businesses and consumers.

PRESIDENT'S EXECUTIVE ORDER 14017 ON AMERICAN'S SUPPLY CHAINS (2021) directs a review of the transportation and logistics industrial base to strengthen the resilience of America's supply chains.

PRESIDENT'S EXECUTIVE ORDER Revitalizing Our Nation's Commitment to Environmental Justice for All (April 2023) works to ensure that all people – regardless of race, background, income, ability, Tribal affiliation, or zip code – can benefit from the vital safeguards enshrined in our nation's foundational environmental and civil rights laws.

Federal Plans and Policies

NATIONAL STRATEGIC FREIGHT PLAN (DRAFT, 2016)

A draft version of the National Freight Strategic Plan was released for public comment in early 2016, and the comment period closed on April 25, 2016. The plan has not been finalized.[331] The draft plan describes the freight transportation system, including major corridors and gateways, and assesses the physical, institutional, and financial barriers to improvement. The draft plan also highlights strategies to help support our freight transportation system through improved planning, dedicated funding streams, and innovative technologies.

NATIONAL MULTIMODAL FREIGHT NETWORK

In 2016, the National Highway Freight Network (NHFN) replaced the Primary Freight Network (PFN) and the National Freight Network.[332] The NHFN was established to strategically direct federal resources and policies toward improved performance on highways carrying higher amounts of freight. As part of the NHFN, critical connections to freight facilities, such as rail intermodal yards, seaports and airports, were added through two new designations, Critical

Rural Freight Corridors (CRFC) and Critical Urban Freight Corridors (CUFC). States and MPOs are responsible for designating facilities within their jurisdictions pursuant to federally set mileage allocations for each state.

NATIONAL FREIGHT STRATEGIC PLAN 2020[333]

The NFSP defines the Nation's multimodal freight system vision, goals, and strategies. The strategies include evaluating the movement of freight produced by American energy, agriculture, manufacturing, and natural resources industries, informing infrastructure planning, coordinating investments, and support future freight efficiencies that improve shippers' experiences, providing a framework for increased cross-sector, multi-jurisdictional, and multimodal coordination and partnerships, and identifying freight data needs to support decision-making.

INTERIM NATIONAL MULTIMODAL FREIGHT NETWORK

The Interim NHFN was established to strategically direct federal resources and policies toward improved performance on highways carrying higher amounts of freight. As part of the NHFN, critical connections to freight facilities, such as rail intermodal yards, seaports and airports, were added through two new designations, Critical Rural Freight Corridors (CRFC) and Critical Urban Freight Corridors (CUFC). States and MPOs are responsible for designating facilities within their jurisdictions pursuant to federally set mileage allocations for each state.

SUPPLY CHAIN ASSESSMENT OF THE TRANSPORTATION INDUSTRIAL BASE: FREIGHT AND LOGISTICS 2022[334]

The Report is the response to the President's Executive Order 140171 directing a review of the transportation and logistics industrial base. The recommendations included within this report are designed to respond to the current disruptions, and to stand the test of time by building supply chains resilient to future disruptions.

State Legislation and Executive Orders

SENATE BILL 1 - THE ROAD REPAIR AND ACCOUNTABILITY ACT OF 2017

Senate Bill 1 established the Trade Corridor Enhancement Program (TCEP). An on-going dedicated state funding program that provides $300 million annually for freight-related projects which more efficiently enhance the movement of goods along corridors that have a high freight volume. Subsequent legislation (SB 103, Committee on Budget and Fiscal Review, 2017), combined the Trade Corridor Enhancement Program funds with existing federal National Highway Freight Program funding.

ASSEMBLY BILL 32 (NUNEZ, 2006)

The California Global Warming Solutions Act of 2006 created the Cap-and-Trade Program, and established the goal of reducing California's GHG emissions to 1990 levels by 2020.

ASSEMBLY BILL 133 (WEBER, 2016)

This bill provided transfer of $11M to the Trade Corridor Improvements Fund (TCIF), a program initially implemented and funded by Proposition 1B. The TCIF funds can be used directly or indirectly to improve freight movement in key corridors.

SENATE BILL 350 (DE LEON, 2015)

On October 7, 2015, the California State Senate passed Senate Bill 350: Clean Energy and Pollution Reduction Act into law. SB 350 established California's 2030 greenhouse gas reduction target of 40 percent below 1990 levels. To achieve this goal, SB 350 sets ambitious 2030 targets for energy efficiency and renewable electricity, among other actions aimed at reducing greenhouse gas emissions across the energy and transportation sectors.

SENATE BILL 32 (PAVLEY, 2016)

Senate Bill 32 amended the Global Warming Solution Act of 2006 by establishing a statewide GHG limit equivalent to a 40 percent decrease from 1990 levels by 2030.

ASSEMBLY BILL 617 (GOMEZ, 2017)

Requires CARB and all local air districts, including the Sacramento Metropolitan Air Quality Management District (Sac Metro Air District or District), to take measures to protect communities disproportionally impacted by air pollution. With input from communities and air districts throughout California.

SENATE BILL 671 (GONZALEZ, 2021)

Requires that the CTC prepare a Clean Freight Corridor Efficiency Assessment to identify freight corridors, or segments of corridors, and the infrastructure needed to support the deployment of zero-emission medium and heavy-duty vehicles by December 1, 2023. Also requires the state freight plan to include a description of needed infrastructure, projects, and operations for the deployment of zero-emission medium- and heavy-duty vehicles and the development of freight corridors identified pursuant to California Government Code §14517.

CALIFORNIA GOVERNMENT CODE §13978.8 authorizes and requires the California Transportation Agency to develop a state freight plan to comply with federal requirements. This law also provides instructions for the inclusion of state requirements, and the submittal and approval of the plan.

CALIFORNIA GOVERNMENT CODE §14517 requires the California Transportation Commission in coordination with the State Air Resources Board, Public Utilities Commission, State Energy Resources Conservation and Development Commission, and Governor's Office of Business and Economic Development, to develop the Clean Freight Corridor Efficiency Assessment.

CALIFORNIA STREETS AND HIGHWAYS CODE §2192 establishes the Trade Corridors Improvement Fund and project eligibility guidelines.

GOVERNOR'S EXECUTIVE ORDERS (EO)

EO S-3-05[335] – Requires continued reduction of transportation-related GHG emissions to a new standard of 80 percent below 1990 levels by 2050.
EO B-16-12[336] – Reaffirms EO S-3-05and calls for continued reduction of GHG emissions in the transportation sector to 80 percent below 1990 levels by 2050.
EO B-30-15[337] – Establishes a California GHG target of 40 percent below 1990 levels by 2030 – the most aggressive benchmark enacted by a government in North America to reduce dangerous carbon emissions over the next decade and a half.
EO B-32-15[338] - Provides a vision for California's transition to a more efficient, more economically competitive, and less polluting freight transport system.

EO N-19-19[339] - Empowers the California State Transportation Agency (CalSTA) to leverage discretionary state transportation funds to help meet the state's climate goals.
EO N-79-20[340] - Moves the transportation sector toward a zero-emission future by requiring all in-state sales of new passenger cars and light-duty trucks to be zero-emission by 2035 and all medium- and heavy-duty vehicles operating in the state to be zero- emission by 2045, and all drayage trucks by 2035.
EO N-19-21[341] - Formalizes state agencies' partnership with the White House Administration's efforts to address state, national and global supply chain challenges, and directs state agencies to develop longer-term proposals that support port operations and goods movement for consideration in the January 10 Governor's Budget

State Plans and Policies

California has long been a leader in logistics and the movement of goods. The State understands how critical freight is to jobs and prosperity both within California and for the nation. California is home to the nation's largest container seaport, the San Pedro Bay Ports of Los Angeles and Long Beach, the largest agricultural production in the Central Valley, the largest logistics facilities cluster, and several of the largest population centers. California moves significant amounts of cargo on trains, planes, trucks – and more recently by automobiles, bicycles, pedestrians, and even robots. The following discusses the State's progress and policy experience and provides a launch point for the update of the State's Freight Mobility Plan.

CALIFORNIA TRANSPORTATION PLAN 2050[342]

The California Transportation Plan (CTP) is the state's long-range transportation and policy plan developed to address the state's future transportation needs and to support a statewide reduction in greenhouse gas emissions. The Plan serves as an umbrella document that integrates California's modal plans into a statewide multimodal transportation vision. The CTP includes strategies for improving mobility and accessibility across all modes, contributes to system preservation, supports a vibrant economy, improves public safety and security, promotes livable communities and social equity, and supports environmental stewardship. The CTP offers a high-level overview of the existing transportation network and includes an assessment of future transportation trends and challenges.

CALTRANS STRATEGIC MANAGEMENT PLAN 2020-24[343]

The Strategic Management Plan integrates sustainability principles across all goals, addressing people, planet, and prosperity comprehensively during implementation. The plan includes six goals, Safety First, Cultivate Excellence, Enhance and Connect the Multimodal Transportation Network, Strengthen Stewardship and Drive Efficiency, Lead Climate Action, and Advance Equity and Livability in all Communities. It also includes an outline of coordinated strategies to achieve success in the critical areas of each goal.

CLIMATE ACTION PLAN FOR TRANSPORTATION INFRASTRUCTURE 2021[344]

The Climate Action Plan for Transportation Infrastructure details a holistic investment framework and outlines accompanying strategies and actions on how the state should invest billions of dollars of transportation funding where state agencies play a role in project selection or nomination. The investment framework, strategies, and actions help the transportation sector aggressively combat and adapt to the climate crisis, while supporting public health, safety, and social equity goals. CAPTI maintains California's commitment to continue a "fix-it-first" approach to maintaining the state's highways, roads and bridges.

CALIFORNIA SUSTAINABLE FREIGHT ACTION PLAN 2016[345]

The California Sustainable Freight Action Plan (CSFAP) was developed jointly by Caltrans, the California Air Resources Board (CARB), the California Energy Commission (CEC), and the Governor's Office of Business and Economic Development (GO-Biz) under Governor's Executive Orders B-32-15, and B-30-15. The Plan provides a vision of utilizing a partnership of federal, State, regional, local, community, and industry stakeholders to move freight in California on a modern, safe, integrated, and resilient system that continues to support California's economy, jobs, and healthy, livable communities. Transporting freight reliably and efficiently by zero emission equipment everywhere feasible, and near-zero emission equipment powered by clean, low-carbon renewable fuels everywhere else.

The Plan is driven by the eleven guiding principles:

- Support local and regional efforts to improve trade facilities and corridors that achieve regional environmental, public health, transportation, and economic objectives consistent with statewide policy goals
- Grow the economic competitiveness of California's freight sector
- Grow the number of well-paying employment opportunities in the freight sector
- Eliminate freight-related deaths and serious injuries, and security threats
- Reduce or eliminate health, safety, and quality of life impacts on communities that are disproportionately affected by operations at major freight corridors and facilities. This includes reducing toxic hot spots from freight sources and facilities and ensuring continued net reductions in regional freight pollution
- Improve the state-of-good-repair of the multi-modal freight transportation system
- Invest strategically to improve travel time reliability and to achieve sustainable congestion reduction on key bottlenecks on primary trade corridors
- Apply innovative and green technology, along with accompanying infrastructure and applicable practices, to optimize the efficiency of the freight transportation system
- Invest strategically to accelerate the transition to zero and near-zero emission equipment powered by renewable energy sources, including supportive infrastructure
- Improve system resilience by addressing infrastructure vulnerabilities associated with expected climate change impacts and natural disasters, which may include exploring opportunities to utilize natural systems to improve water quality, reduce ecosystem damage, prevent flooding, and create a cooling effect
- Site freight projects to avoid greenfield development by enhancing existing freight infrastructure or targeting infill development near compatible land uses

INTERREGIONAL TRANSPORTATION STRATEGIC PLAN 2021[346]

The Interregional Transportation Strategic Plan (ITSP) provides a policy framework to guide Caltrans and partner agencies in developing comprehensive, multimodal corridor plans that lead to the development of transformative, innovative, and cost- effective projects. The ITSP provides direction to programs, districts, and partner agencies on the policies and strategies that should be considered when assessing the interregional transportation system and identifying improvements. The ITSP also provides policy direction for the development of the Interregional Transportation Improvement Program (ITIP).

CALIFORNIA STRATEGIC HIGHWAY SAFETY PLAN 2020-24[347]

The Strategic Highway Safety Plan (SHSP) is a statewide, coordinated safety plan that provides a comprehensive framework for reducing highway fatalities and severe injuries on all public roads. It identifies key safety needs and guides investment decisions towards strategies and countermeasures with the most potential to save lives and prevent injuries. This document relies on data to identify problems and develop solutions. California adopted the following measurable objective for the SHSP:

CALIFORNIA STATE RAIL PLAN 2018[348]

The State Rail Plan establishes a statewide vision of an integrated rail system, and describes a policy framework for working with, and guiding public and private investments that enhance freight movement while providing co-benefits with passenger services. The integrated vision is dependent on more efficient utilization of the existing rail system, expanding the coverage and mix of rail services in several corridors, scaling services to meet market demand, and facilitating network coordination through scheduling. For freight movements, this integrated system means better system reliability and a clear pathway to growing capacity. Improvements in rail freight reliability result in the form of economic benefits that reverberate locally, regionally, and nationally. By improving rail infrastructure to attract additional long-distance freight movement, extra capacity is created on highways for passengers and short-distance freight travel. The improvements identified in the Rail Plan are designed to either preserve rail freight capacity, or to provide for rail freight enhancements in certain high traffic corridors, particularly intercontinental trade corridors that provide rail connections to ports. The improvements are categorized in six major areas of need and opportunity:

- Trade corridor improvements
- Economic development and short lines
- Grade-crossing improvements
- Additional terminal and yard capacity
- Short-haul rail improvements
- Advancement of zero- and near-zero- emissions technologies

2022 INTEGRATED ENERGY POLICY REPORT UPDATE

The California Energy Commission's (CEC) 2022 Integrated Energy Policy Report update covers a broad range of topics, including integrated resource planning, distributed energy resources, transportation electrification, solutions to increase resiliency in the electricity sector, energy efficiency, transportation electrification, barriers faced by disadvantaged communities, demand response, transmission and landscape-scale planning, the California Energy Demand Preliminary Forecast, the preliminary transportation energy demand forecast, renewable gas, updates on Southern California electricity reliability, natural gas outlook, and climate adaptation and resiliency. This report also provides extensive information about natural gas pipeline infrastructure and the ability to fuel transportation with our existing assets.

CALIFORNIA'S DEPLOYMENT PLAN FOR THE NATIONAL ELECTRIC VEHICLE INFRASTRUCTURE PROGRAM (2022)

The plan describes how California will strategically deploy EV charging infrastructure and establish an interconnected network to facilitate data collection, access, and reliability. The Plan is used as a tool to guide the state in allocating its $384 million share of federal NEVI funds to build out a network of modern, high-powered DC fast chargers along Interstates and National Highways throughout California.

SAFEGUARDING CALIFORNIA: REDUCING CLIMATE RISK UPDATE (2017)

The California Natural Resources Agency's Climate Adaptation Strategy identifies vulnerabilities throughout California and identifies strategies to mitigate them.[349] Climate change impacts from sea-level rise, storm surge, and coastal erosion have been identified as imminent threats to highways, roads, bridge supports, airports at or near sea level, seaports, and some transit system and rail lines. Shifting precipitation patterns, higher temperatures, wildfire, and an increased frequency of extreme weather events threaten transportation assets at varying locations across the state.

Regional Freight Policies and Plans

CALTRANS DISTRICTS FREIGHT PLANS

District 3 Goods Movement Study (2015)

This study includes a comprehensive list of freight flows by all modes moving in and through the Sacramento region, an evaluation of projects on the State Highway System and intermodal connectors, and recommends strategies for addressing congestion, safety, efficiency, and ongoing operations and maintenance concerns. The study provides an overview of funding mechanisms and recommendations for prioritization and implementation.

District 9: Eastern Sierra Corridor Sustainable Freight Strategies Study (2019)

The Eastern Sierra Corridor Sustainable Freight Strategies Study, completed in 2019, is taking a fresh look at issues along U.S. 395 generally between I-40 on the south and I-80 on the north. Key issues included identifying and addressing truck parking shortages, as well as operational improvements for trucks.

District 9: Goods Movement Study for US 395 Corridor (2006)

Caltrans District 9 commissioned this study to investigate truck traffic origins and destinations on U.S. 395. The study involved paper surveys and interviews of truck drivers along the corridor to gain a better understanding of why trucks use U.S. 395, and to also understand how the drivers feel about the conditions of the roads and to seek comments and input. The Eastern Sierra Corridor Sustainable Freight Strategies Study provided an update to this effort.

REGIONAL/COUNTY FREIGHT PLANS

California-Baja California Border Master Plan (2014)

The California-Baja California Border Master Plan, completed in 2014, was a bi-national effort to coordinate planning and delivery of projects at land port of entries and the transportation infrastructure serving them. The primary objectives of the California-Baja California Border Master Plan were to increase the understanding of Port of Entry (POE) and transportation planning on both sides of the border and create a plan for prioritizing and advancing POE and related transportation projects.

Based on the outcomes of this pilot bi-national planning process, the California-Baja California approach could be expanded to other border states and customized to address their needs, resulting in a master planning process for the entire U.S.-Mexico border.

Regional Transportation Plans (RTP), Goods Movement Sections

California's 18 MPOs and 26 RTPAs are responsible for developing Regional Transportation Plans (RTP) for their respective areas. Pursuant to federal and state statutes and regulations, each RTP must address goods movement. The RTP guidelines list 11 items that must be addressed in the RTPs for both MPOs and RTPAs. As stated in the RTPA RTP Guidelines:

"RTPAs must plan for the goods movement infrastructure in the same way they plan the transportation infrastructure for the movement of people to support projected population growth and economic development."[350]

The most urban regions began preparing goods movement plans in the mid-2000s, such as SCAG and MTC. All the current RTPs for the MPOs and RTPAs include a list of freight projects, programs, and needs. These projects are incorporated into the CFMP. In addition to the regional transportation plans, regional planning agencies have commissioned the following freight plans:

Alameda County Goods Movement Plan (2016)

This countywide goods movement plan, a first for Alameda County, took a holistic view of freight from an industry and a neighborhood perspective.[351] The plan stemmed from the MTC Goods Movement Plan, but locally, this plan focused on congestion, truck parking, air quality, and conflicting land uses, whereas regionally and nationally, it focused on rail and road connections. The Plan identified performance measures, analyzed existing and future conditions, identified needs, and provided a comprehensive strategy for funding the County's freight infrastructure needs.

US 101 Central Coast California Freight Strategy

This study of US 101 from San Benito County to the North to Santa Barbara County to the south includes a set of freight performance metrics and weights to prioritize funding for projects, identifies projects that will improve the movement of goods along US 101 and key connecting routes, and established strategies for implementation. This plan set a precedent for interregional cooperation on freight planning and provided a path forward for lobbying on freight issues to capture its fair share of freight funding.

I-5/SR 99 Freight Corridor Study (2017)

The I-5/SR 99 study covered the 200-mile stretch of the I-5 and SR 99 corridors from the southern limit of Kern County to the northern limit of San Joaquin County in the Central Valley. This study identified freight and logistics clusters and the origins/destinations of a sample of trucks stopping at these freight clusters. This information was used to identify truck patterns in the region and correlate them with truck-involved crashes, speeds, and congestion along the corridors to guide the development and implementation of strategies to improve truck flows and travel time reliability.

Central Valley Sustainable Goods Movement Study (2017)

The Central Valley Sustainable Goods Movement Study is closely related to the I-5/SR-99 study, prepared during the same timeframe, and used some of the same data sources. This study Plan focuses on first- and last-mile connectors to freight clusters and investigated potential Critical Rural Freight Corridors (CRFC).

Goods Movement Border Crossing Study (SANDAG, 2012)

This study focused on the inter-relatedness of the U.S. and Mexican economies along California's southern border.[352] The purpose of this study was to focus on identifying infrastructure improvements that would improve logistics and create economic benefits. The study identified the importance of the SCAG and SANDAG regions to the Mexicali, Mexico region, and vice-versa through a high-level characterization of the supply chains for large, multinational firms that heavily rely on cross-border transportation.

Multi-County Goods Movement Action Plan (MCGMAP) (SCAG, 2004)

MCGMAP is the Southern California's master plan for goods movement and guides preparation of state, regional, and local transportation plans. The objectives of the MCGMAP is to develop strategies and projects that: 1) address the goods movement infrastructure capacity needs of the region; 2) reduce goods movement emissions to help achieve air quality goals; and 3) improve the quality of life and community livability for Southern California residents.[353] The MCGMAP was developed by LA Metro, OCTA, RCTC, SBCTA (Formerly SANBAG), SANDAG, VCTC, SCAG, and Caltrans Districts 7, 8, 11, and 12.

On the Move, Southern California Delivers the Goods (2012)

In 2012, SCAG updated MCGMAP with new information, including an updated cargo forecast from the San Pedro Bay Ports, updated industrial warehouse demand and capacity estimates, and the latest environmental policies, programs and strategies for addressing the impacts of goods movement in the region.[354] SCAG incorporated recommendations from this study into the 2012 RTP/SCS.

Los Angeles County Strategic Goods Movement Arterial Plan (CSTAN, 2015)

The CSTAN is a planning tool that is intended to accomplish six goals:

- Identify truck arterial system needs and connectivity gaps
- Prioritize funding to projects showing the greatest expected benefits
- Minimize truck and pedestrian/bicycle conflicts
- Establish a database of arterial truck data that can be used by industry as well as for planning purposes
- Assist the trucking industry in identifying designated truck routes
- Support the development of the Federal PFN

Appendix C. California's Competitive Position

California's competitiveness is vital to both public agencies and private stakeholders. Losses of commerce, businesses, and jobs to other states or nations are keenly felt throughout the state and across sectors. Increasing statewide competitiveness is a key priority for the State; this section connects the role, and potential growth, of efficient goods movement in California's competitiveness and achieving this goal.

Losses of economic activity due to interstate and international competition vary in scope and effect. Losses are highly visible and tangible when businesses move away from California or when businesses that might have located in California choose a competing location instead. Other economic losses are less obvious or immediate, such as gradual shifts in business activity away from California or closures of California businesses. Yet, these less obvious losses can be equally important to California's aggregate economy and affect some communities disproportionately. Increasing competitiveness across the state can contribute to local and state economic development by making California the preferred choice of developers, businesses, and transportation providers.

"Competitiveness" is often defined in general terms but is typically grounded in economic activity and attraction. Key definitions of "competitiveness" are included below:

- "A competitive region is one that can attract and maintain successful firms and maintain or increase standards of living for the region's inhabitants. Skilled labor and investment gravitate away from 'uncompetitive' regions towards more competitive ones."[355]
- "Competitive regions provide conditions under which companies can compete successfully on national and international markets while paying wages that can support a high standard of living to citizens."[356]

Few discussions of competitiveness specify over what states are competing for, which business entities or sectors are competing, or how freight transportation affects winning or losing. There are few available comparisons of freight transportation performance between regions, states, or nations. This chapter serves to address the nature of competition between locations and the role of goods movement in that competition.

The state and its communities, transportation providers, and businesses compete in several ways:

- The State of California and California municipalities compete for business locations, including production facilities, distribution centers, and offices.
- California producers, manufacturers, distributors, and wholesalers compete for business and market share with their domestic and foreign counterparts elsewhere and may also compete for business within their own firms.
- California seaports, airports, and freight carriers compete with their counterparts in other states and nations for freight transportation business.

This section examines these different types of competition and the factors that affect California's competitive position in each.

The role of freight transportation in economic competitiveness is usually assumed to be a function of freight system capacity, performance, and efficiency. In most discussions of competitiveness, quantitative or qualitative shortfalls in freight capacity, cost, service frequency, transit time, reliability, safety, etc. are presumed to diminish economic competitiveness.

Beyond freight transportation costs and services, California's competitiveness is affected by several factors cited in the industry focus groups conducted for the CFMP 2020. These factors include:

- **Workforce availability and cost of living--** Production and distribution facilities have reported difficulty in obtaining qualified workers and truck drivers in California. California's cost of living, particularly housing costs, makes it difficult for workers to make ends meet on typical wages.
- **Land and development costs and uncertainty--** The difficulty and cost of securing land and developing facilities in California are frequently cited as handicaps in California's competitiveness. The length and uncertainty of the development approval process contribute to this problem.
- **Environmental regulations--** California's environmental regulations, and the cost of compliance, are frequently cited as decreasing the state's competitiveness. Uncertainty over future regulations is also a significant factor.
- **Lack of linkage between goods movement and economic development efforts--** Stakeholders feel that California's economic development efforts lag behind other states and are not effectively linked to the goods movement industry or its capabilities.

This section provides a high-level perspective on the potential role of goods movement in California's national and international competitiveness and identifies factors that may be of concern to non-transportation agencies. The section addresses the following subjects:

- Competition for:
    - Business locations
    - California products and production
    - Distribution centers
    - Seaport business
    - Air cargo business
- Cost differences in:
    - Freight transportation
    - Labor and supply
    - Land
    - Energy and utilities
- Perceptions of California's business climate
- Competitive economic development efforts
- Implications for competitiveness and potential growth

Competition for Business Locations

The focus of most regional and state competitiveness discussions is competition for locations of new production, distribution, or transportation facilities. These facilities generate jobs, tax revenue, and positive economic impacts within communities. Californians are concerned over the potential loss of businesses, and over facilities that close due to out-of-state competition or relocate to outside of the state. For this discussion, it is critical to first understand how companies are making various location decisions.

Types of location decisions - Although there are many possible variations and combinations, most location decisions fall under a few basic types:

- Choosing a location for a new production or distribution facility
- Choosing whether to expand, contract or close an existing location
- Choosing how much production or distribution activity to allocate among locations

Location Decision Factors - Key factors in location decisions commonly include:

- Access to target markets
- Availability of suitable sites, buildings, or other facilities, with appropriate zoning
- Fit within existing or planned production, supply chain, and distribution networks
- Development timeline (e.g. permitting, construction, EIRs)
- Land cost and zoning
- Cost of doing business (other than transportation)
- Local regulations and other restrictions
- Workforce availability
- Proximity to suppliers, intellectual capital, and other inputs
- Freight transportation capacity and reliability
- Freight transportation service and cost

California's consumer population and direct access to international markets via ports on the Pacific Rim give the state a competitive edge to the first factor- access to target markets. Few businesses have a major presence in the California market without a physical location in California.

Some of these factors, such as site availability and access to inputs, can eliminate a given location from further consideration. If there are no suitable sites available or if critical inputs cannot be obtained, other factors do not matter. Similarly, if freight transportation capacity and reliability needs cannot meet in a given location, the business will locate elsewhere.

While freight transportation capacity (e.g. highway, port, rail, or air cargo capacity) can usually be taken for granted, this is not always the case. Facilities that require or produce large volumes of marine bulk cargo (e.g. export grain elevators) or specialized cargo (e.g. import autos) need specialized terminals with sufficient capacity. Reliability can usually be achieved, but sometimes at a higher cost. If fleet operators must add drivers, add equipment, or allow extra time to overcome local problems, then costs can increase significantly. Notably, some parts of rural California have limited STAA truck access, which can reduce the ability of those areas to compete for new facilities.

While cost differences are relatively easy to quantify, reliability differences are not. There is a relationship between reliability and inventory levels (e.g., the need for larger or smaller "safety" stocks), but in most cases, the greater concern is the ability to meet corporate and customer requirements consistently. Recurrent congestion reduces productivity and can affect reliability if the parties cannot anticipate and accommodate expected delays.

Non-recurrent delays and congestion are a more serious reliability problem. As California transportation facilities of all kinds – highways, arterials, ports, airports, railroads – operate closer to their capacity, the frequency and severity of non-recurrent congestion tend to rise. In some parts of California, notably the San Francisco Bay Area, usable corridors are restricted by geography. Often, there are no practical alternatives to congested routes.

Manufacturing plants may have flexibility in their location decision, either within California or in other states. Manufacturing plants that use easy-to-transport inputs (e.g. electrical components) or widely available inputs (e.g. paper or basic metals) may take the full list of location factors above into account. If all other factors are equal, goods movement may become the deciding factor. However, the ability of the facility to locate in a wide variety of locations implies that either goods movement differences are not likely to be critical, or that there are few significant goods movement differences between locations.

Where more generic inputs such as semi-skilled labor, space, or electrical power are a major part of production expenses, the costs of those inputs will have a greater impact on location decisions. In this case, California's higher labor, land, or power costs – or perceptions of higher costs – may place the state at a competitive disadvantage. These perceptions are discussed further in the Perceptions of California's Business Climate section of this section.

Local Market Facilities - Many goods movement and freight-dependent industry facilities must be located close to the market that they serve or the sources on which they rely. California does not need to compete for these local market facilities, although there may be competition between cities and counties within California. For example:

- Suppliers of basic building materials (aggregates, cement, lumber) need to be close to construction projects. Consequently, these facilities are spread widely throughout the state.
- Processors of perishable inputs (wine grapes, tomatoes, strawberries) need to be close to the source to maintain quality without excess transport and handling costs.
- Suppliers of inputs to true "just in time" manufacturing (e.g. auto assembly plants) must be located close to their customers to maintain the required responsiveness.
- Facilities that require specific work force skills (e.g. high-tech product development, software engineering) usually located near sources for those skills (e.g. major universities) or other facilities that need those skills (e.g. Silicon Valley).

These local market examples are cases where California does not need to compete for the production or distribution function. Cement batch plants, for example, are distributed throughout the state to serve local markets, and cannot serve California cities from other states. Likewise, sand and gravel producers – quarries, etc. – cannot locate away from the underlying resource. In general, fungible commodities with high transportation costs relative to their value cannot be shipped very far and still compete with nearer suppliers.

Competition for California Products and Producers

California producers and their products compete with producers and products from other states and nations. The extent and nature of that competition depend on commodity type. For example, some California products are differentiated by source or brand, such as Napa Valley wines, California raisins, or Tesla autos. Since customers may not see wines, raisins, or autos from elsewhere as perfect substitutes, differentiated products can often command a somewhat higher price and have a greater ability to absorb transportation cost differences without losing market share. Other California products dominate their industry due to production volume and are somewhat shielded from competition because other sources cannot satisfy the market demand. However, California products that are not differentiated by source or brand must compete on delivered price and reliability of supply. Examples discussed below to illustrate the differences in competition between products and markets.

MEDIUM-GRAIN RICE

California medium-grain rice is an example of a product that is slightly differentiated but must also compete on delivered price. Medium-grain rice produced in and milled in California (e.g. Sutter County), for example, must compete in domestic and foreign (Asian) markets with medium-grain rice of equivalent grades from elsewhere in the U.S. or from other countries. Medium-grain rice generally competes with other types of rice, including long-grain and basmati rice, also produced in California and elsewhere. Within the U.S., Arkansas is the leading rice production state and is a competitor to California's rice industry. Some California rice varieties, such as the Calrose variety, and its commercial descendants, are favored for their texture in sushi and other Asian cuisines, and therefore can command a somewhat higher price in those markets.

Within the medium-grain rice export production and shipping process, freight transportation efficiency would affect:

- Transportation of rice seed, fertilizer, and equipment to fields
- Transportation of harvested rice to rice mills
- Transportation of milled rice in bags or bulk to seaports
- Transportation of rice by ship to foreign markets

Medium-grain rice growers in one part of California (e.g. Sutter County) may compete with growers in other areas (e.g. Glenn and Butte Counties). If growers in both areas receive the same delivered price at the mill, the grower with the lower trucking cost will have higher net revenue. The difference in total trucking cost is likely to be small, however, and the difference in trucking efficiency (e.g. cost per mile) within California is likely to be smaller yet.

The delivered cost of California medium-grain rice in Hong Kong would include:

- California production, milling, and distribution costs
- Trucking costs in California
- Shipping costs (including port costs) from California to Hong Kong
- Distribution and delivery cost in Hong Kong

Due to the short distances involved, internal California transportation costs would have a relatively minor role in the delivered cost of California medium-grain rice and its competitiveness in world markets. For a given and competitively determined delivered price in Hong Kong, the rice wholesaler or broker will realize a greater net profit if transportation costs are lower. Within California, there may be competition for the location of new rice milling or storage facilities. That location may be influenced by the condition of local roads and access to rail service, but it is more likely to be determined by land costs and distance to growers and ports.

ALMONDS

California almond production is shielded from domestic and foreign competition, due to both sheer production volume and product differentiation. In 2016, California produced about 80 percent of the world's almonds and 100% of the U.S. commercial supply. California also produced about 65 percent of the world's almond exports to more than 90 countries worldwide.[357] As a result, California almonds face very little competition.

Depending on market conditions, higher transportation costs will either raise the delivered cost or reduce the producer's profit. In the case of almonds, California dominates world trade. If foreign consumers want more almonds than are available locally, they must pay California prices. The risk to California almond producers is that foreign consumers will buy fewer almonds if prices become too high or if the delivery becomes unreliable.

For almonds, California goods movement efficiency would have a little competitive impact. The almond industry cannot readily move to another state, nor can other producers quickly increase production to displace California almonds.

Competition for Distribution Centers

Distribution centers (DCs) can be national (NDCs), serving the entire nation, regional (RDCs, serving a region within the nation), or local in scope. There may also be separate import distribution centers (IDCs), handling imported goods separately from domestic goods. A state or a sub-region may compete as a potential location for a national, regional, or import DC. RDCs in the state may also "compete" for coverage with RDCs in other states.

Large retail chains, manufacturers, and wholesalers may adopt one of several distribution center strategies to access their customers:

- A single national distribution center (NDC)
- A series of regional DCs (RDCs)
- A tiered system of an NDC feeding multiple RDCs

Firms may progress through different strategies:

- Starting with a single NDC, often at the point of production or near a port
- Establishing additional RDCs as a volume in regional markets grows
- Establishing additional IDCs as import volumes justify multiple entry ports

Large, well-known retail chains typically have multiple RDCs. For example, the following retail chains have RDCs in California:

- Target – Woodland, Rialto, Shafter
- Home Depot – Lathrop, Mira Loma
- Crate & Barrel – Tracy, Santa Fe Springs
- Rite Aid – Woodland, Lancaster
- Safeway – Tracy, Santa Fe Springs, Norwalk
- J.C. Penney – Stockton
- Walmart – Porterville, Mira Loma
- IKEA – Lebec

- Kohl's – Patterson, San Bernardino

California is such a large market that it is unlikely that a major retail business would serve the state without at least one RDC there. As noted, many DCs are already here. However, the activity level of California's DCs may be subject to "competition" within the supply chain of various types:

- **Competition for existing territory** – how much of California, or the western states, will be served from California DCs, as opposed to DCs elsewhere?
- **Competition for expansion** – will the firm choose to expand stores or sales in the state, thus increasing volume at the state DC, or elsewhere?
- **Competition for the new territory** – as a producer, importer, or retail chain expands into new markets, will those markets be served from California DCs, from existing DCs elsewhere, or from new DCs elsewhere?

For example, an importer with growing volume at a single Inland Empire facility might choose: 1) to expand that facility and continue to serve the whole country from a single point; or 2) to establish a second import facility in Georgia, served by the Port of Savannah. In the first case, California lost a second facility and all the additional jobs and tax revenue from that decision, but in the second case, the state loses volume, expansion potential, jobs, and tax revenue. In this type of planning, the importer must weigh the total cost of serving a mid-continent market (Kansas City, for example) from the Inland Empire versus from Georgia. The relevant costs would include:

- Ocean transportation costs from the source to the U.S. port
- Inland transportation (truck) to the port-area DC
- Inland transportation to the store or customer in Kansas City

Port handling costs do not figure directly into the importer's calculations, because those costs are part of the ocean transportation expense. However, the importer may see additional clean trucks and PierPass/Off Peak fees at Southern California ports.

In the example above, the importer may pay for truck drayage between the port and the DC, and between the DC and an intermodal rail terminal for the trip to Kansas City.

California ports "compete" for this business but have no direct influence over the costs and services involved, except for their own fees.

CFMP outreach and interviews with importers and other parties revealed that transportation cost is only one factor in the DC location decision, and perhaps not the deciding factor. Many stakeholders regard it as significantly more difficult, more time consuming, costlier, and less certain to build or expand a facility in California than elsewhere. This perception – whether it is true or not in every case – tends to tip the scale in favor of locations in other states. Other consequences and effects of perceptions are discussed further in the Perceptions of California's Business Climate section.

Competition for California Seaport Business

While there has been much commentary on the efficiency of U.S. and West Coast ports compared to leading Asian and European ports, a realistic view of the role of ports in state competitiveness is much narrower.

California has 12 deep water port complexes, each specializing in a different mix of major cargo types, commodities, and service territories:

- The Ports of Los Angeles, Long Beach, and Oakland are best known as container ports, but the San Pedro Bay ports also handle autos, break-bulk cargo, dry bulks, and liquid bulks (chiefly petroleum and petroleum products)
- The Port of Hueneme handles fresh fruit in refrigerated containers and autos
- The Port of Richmond handles autos, vegetable oils, and break-bulk cargo
- The Port of Benicia handles autos
- The Port of Redwood City handles bulk commodities
- The Port of Humboldt Bay handles forest products and fuels
- The Port of San Francisco handles bulk commodities and autos
- The Ports of West Sacramento and Stockton handle bulk commodities and break-bulk cargo

California also has numerous private terminals that handle liquid and dry bulk commodities, such as petroleum products, gypsum, and scrap metal.

Container Port Competition

As container ports, Los Angeles, Long Beach, and Oakland compete for different trade flows in different ways.

The San Pedro Bay ports handle essentially all dry containerized cargo moving to and from Southern California, with incidental amounts moving via Oakland or Mexican ports. To some extent, the Ports of Los Angeles and Long Beach compete with the Ports of San Diego and Hueneme for refrigerated cargo. Port of Hueneme and San Diego, however, are served by specific carriers in the refrigerated fruit trade that does not call at San Pedro Bay, so the primary competition is between carriers, while the ports may compete for carrier calls.

The Port of Oakland handles nearly all containerized imports and exports for Northern California, as well as some intermodal cargo moving to and from inland points.

California container ports compete with other U.S. and North American ports in two ways:

1. California ports compete for “discretionary” container traffic that can move by rail to other regions through any one of several ports. For example, Los Angeles or Long Beach compete for Asian imports to Midwestern consumer markets with the Ports of Oakland, Vancouver, Prince Rupert, New York-New Jersey, Baltimore, and Norfolk.
2. California ports compete with other regions for the location of import DCs and their inbound trade flows. For example, Riverside County might compete with Georgia for a new import DC that would bring in goods through either Los Angeles/Long Beach or Savannah.

In the case of discretionary cargo, economic activity and employment, both at the port and in the transportation network, are at risk due to competition with other ports. In the case of import DC location, economic activity and employment at the DC itself are also at risk due to competition with other regions.

The large local and regional markets in Southern California draw first inbound vessel calls to Los Angeles and Long Beach. Inland importers use these vessel schedules to get the fastest service from Asia. However, Pacific Northwest and British Columbia ports have faster sailing times from ports in North Asia (e.g. Korea, japan, Northern China), giving these ports a transit time advantage over California ports for discretionary intermodal imports.

For exports, Oakland's geographic position near California agricultural production gives it an advantage. Oakland is also often the last port of call before vessels return to Asia, providing a faster shipping option for exporters. As a result, Oakland is one of few U.S. ports where containerized exports exceed imports.

There is an overlap between the Los Angeles, Long Beach, and Oakland markets in the Central and Southern San Joaquin Valley. There, importers and exporters may choose ports based on relative trucking ocean costs and timing of vessel schedules.

Port Market Shares

Table C.1 and **Figure C.1** show the Pacific Coast ports combined had a 55 to 58 percent share of the loaded U.S. import container trade from 2000 through 2012. Starting in 2012, that share declined to 49 percent in 2017[358]. Since 2012, the Atlantic port share has risen from 40 to 45 percent and the Gulf port share from 5 to 7 percent. This apparent loss of market share, shown graphically in **Figure C.1** has prompted concerns over the competitiveness of California's container ports.

Table C.1: Coastal Shares of Loaded Import TEU, 2000-2017

Year	Pacific	Atlantic	Gulf
2000	58%	37%	5%
2001	57%	38%	5%
2002	57 %	38%	5%
2003	56 %	38%	5%
2004	57 %	38%	5%
2005	57%	38%	5%
2006	58%	37%	5%
2007	57%	38%	5%
2008	55%	39%	5%
2009	55%	40%	5%

2010	56%	39%	5%
2011	55%	40%	5%
2012	54%	40%	5%
2013	53%	41%	6%
2014	52%	42%	6%
2015	50%	44%	6%
2016	50%	44%	6%
2017	49%	45%	7%
Source: American Association of Port Authorities			

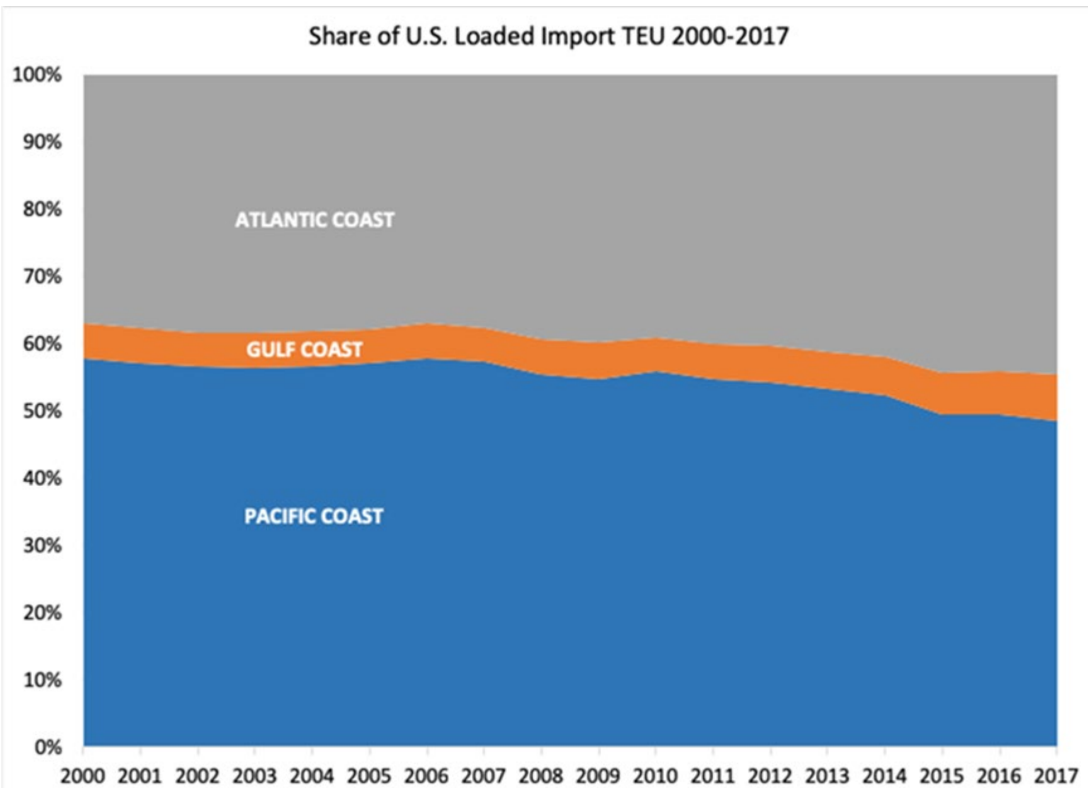

Figure C.1: A Shift in Coastal Import Shares (Source: American Association of Port Authorities)

As **Figure C.1**. reveals, however, the market share shift did not result from net cargo loss at California or Pacific Coast ports, but from faster growth at Atlantic and Gulf Coast ports. Imports on all three coasts grew rapidly up to a peak in 2006-2007, then fell off during the 2008-2009 recession. After the recession, growth resumed on all coasts (although interrupted on the West Coast by the labor-management dispute of late 2014 and early 2015). **Figure C.2** shows the U.S Loaded Import TEU by Coast, 2000-2017. [359]

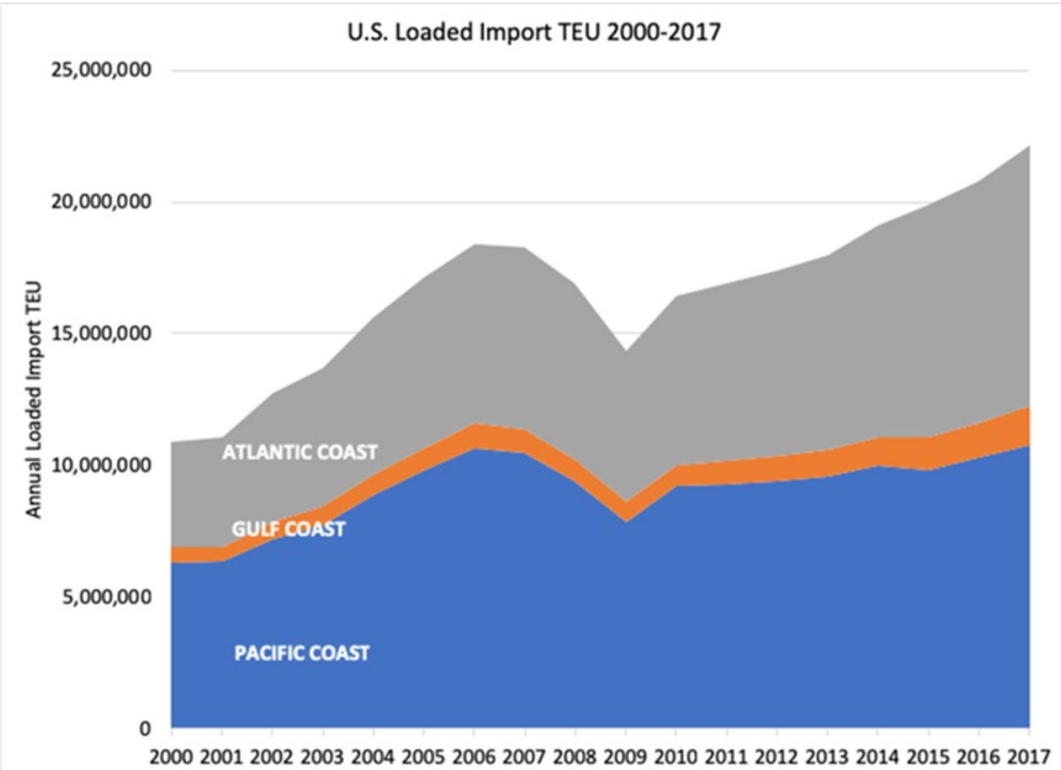

Figure C.2: U.S. Loaded Import TEU by Coast, 2000-2017 (Source: American Association of Port Authorities)

There was faster growth on the Atlantic and Gulf coasts for several reasons identified in the literature and trade press:

- Strong growth in the transatlantic/European and Caribbean/South American trades served by the Atlantic and Gulf ports
- Increased use of Suez Canal routings from Southeast Asia to the U.S., driven in part by a shift of manufacturing and sourcing from China to Southeast Asia and the Indian subcontinent
- Increased adoption of "three corners" and "four corners" logistics strategies by large importers (notably large retail chains), which dispersed import flows from the major Southern California gateway [360][361]
- A reduction in Southern California import transloading
- An increase on rail intermodal service, leading ocean carriers to replace rail movements from Southern California to some inland markets with truck or rail moves from other ports

- Rising costs of locating and operating distribution and manufacturing facilities in California, versus aggressive economic development efforts in other states
- Modernization and increased capacity at Atlantic and Gulf ports
- New Panama Canal locks permitting larger, more efficient vessels on that route
- Increased cost at Southern California ports (and California ports in general) due to "clean truck" requirements, PierPass/Off Peak fees, and rising drayage costs from port and highway congestion
- Concern over West Coast labor relations stability after the lengthy 2014-2015 dispute and accompanying shipping disruption

Of these factors, only the last two are specific to California ports; the others are shifts in trade patterns and in the economic context in which California ports must compete.

There is virtually no publicly available information on relative costs at different container ports. The fees that marine terminal operators charge their ocean carrier customers are negotiated and embodied in confidential contracts. The rents that port authorities charge marine terminals operators are likewise negotiated and confidential.

Table C.2 provides a key perspective on the relative growth of California's container port volumes. [362] In the rapid growth era of 1990-2007, Southern California ports outperformed the nation. Much of the cargo and share growth in that period was attributable to the rapid expansion of rail intermodal container movements through San Pedro Bay in response to the introduction and adoption of double-stack rail cars. This period also saw an increase in the practice of import transloading: bringing in international containers of imported merchandise and transferring the goods to domestic containers or trailers in Southern California. Finally, this period also saw dramatic growth in U.S. imports from China, with Southern California as the leading gateway. The Port of Oakland did not benefit as much from the expansion of intermodal traffic or transloading, and Northern California TEU totals did not grow as fast.

Table C.2: Container Port Cargo Growth Rates 1990-2017

Compound Average Growth Rate	1990-2007	2007-2009	2009-2017
U.S	6.4%	-6.1%	4.4%
California	7.9%	-8.4%	4.3.%
Southern California	8.9%	-8.9%	4.6%
Northern California	3.8%	-5.0%	2.1%
Pacific Northwest	3.6%	-8.1%	1.4%
British Columbia	11.7%	-1.3%	7.1%
Source: American Association of Port Authorities			

U.S. container ports were hit hard by the recession, with Southern California losing 24 percent of its 2007 peak volume by 2009. Following the recession, the Southern California ports rebounded slightly faster than the nation. Oakland's volume dropped by 14 percent during the recession but did not grow as quickly after partial recovery in 2010. The labor-management issues in late 2014 and early 2015 hampered recovery for all U.S. West Coast ports.

Table C.2 also highlights one other critical factor: the rapid growth of the British Columbia ports as a gateway to both Canadian and U.S. markets. Before the recession, the Port of Vancouver began working with the Canadian railroads to offer highly competitive rail intermodal service to both markets. This effort, backed by Transport Canada's Asia-Pacific Gateway and Corridor Initiative, infrastructure funding, and the extension of Canadian railroads into U.S. markets through merger and acquisition, led to notable market share growth. The opening of Prince Rupert's Fairview terminal in 2007 created a second British Columbia rail intermodal gateway. Much of the market share gained by the British Columbia ports has come at the expense of U.S. Pacific Northwest ports (as suggested by their slow post-recession growth in **Table C.2**), but the success of Vancouver and Prince Rupert has restrained Southern California's growth as well.

Figure C.3 shows this shift of Pacific Coast shares graphically. The share going to California ports peaked in 2001 at 73.4 percent. [363i] The post-recession California share has varied from 70.2 to 71.5 percent, where it stood in 2017. In contrast, the Pacific Northwest ports dropped from a high of 29.7 percent in 1990 to 13.2 percent in 2017. Portland has not handled significant container business since 2014. Seattle and Tacoma have joined forces as the Northwest Seaport Alliance, partly to rationalize infrastructure investment and reinforce marketing efforts.

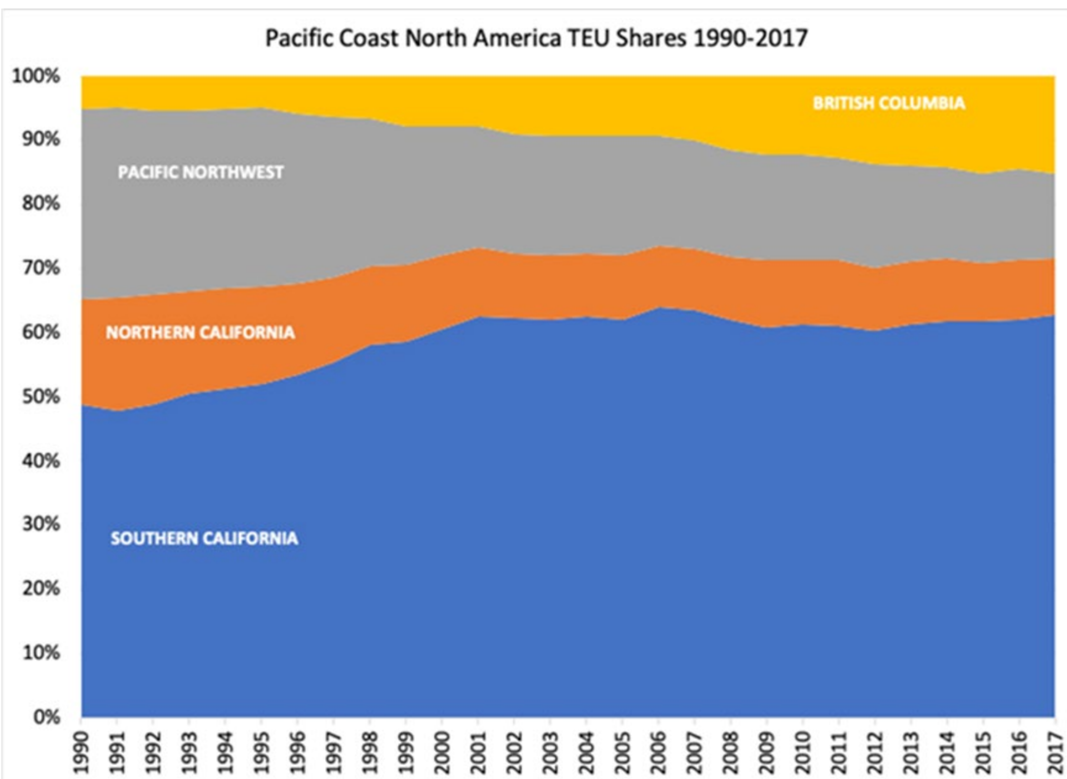

Figure C.3: Pacific Coast North America TEU Shares 1990-2017 (Source: American Association of Port Authorities)

Ro-Ro Trade

For roll-on/roll-off (Ro-Ro) trade, mainly automobiles and vehicles, the Ports of San Diego, Long Beach, Hueneme, San Francisco, and Richmond all participate and compete. Ro-Ro facilities are the principal of two types: brand-linked (such as the Toyota import facility at Long Beach) and operator-based (such as the Pasha facilities at San Diego and San Francisco). Ports and terminal operators compete for multi-year contracts with major auto importers and on a shipment-by-shipment basis for other flows. The key factors in this competition are:

- Fit within the importer's international market strategy
- Access to major consumer markets
- Costs of ocean shipment, port handling, and vehicle processing
- Trucking costs to local and regional markets
- Rail access, service, and cost to intrastate markets

From the above factors, most often geography and market access are primary factors, and transportation cost is a secondary factor.

The Ports of Richmond and Benicia are entry and distribution points for imported autos, and Pasha has recently started up auto operations at the Port of San Francisco. Each manufacturer/importer tends to choose one or more ports as entry points for multi-year commitments. Ports and auto terminal operators, therefore, tend to compete for these long-term commitments rather than shipment-by-shipment. Other major West Coast auto import ports include Long Beach and Portland. To the extent that one importer may bring in autos to more than one port, the port terminal operators may compete for volume and territory, as do distributors of other goods.

Break-bulk Trade

"Break-bulk" trade, also called "general cargo", includes non-bulk, non-containerized commodities such as structural steel, lumber, and machinery. "Project cargo" is a key subcategory of break-bulk trade, and includes goods such as bridge components, refinery assemblies, subway car shells, and other goods requiring special handling to support a near-term local or regional project. Wind farm generator towers and blades are an important project cargo at many ports. Occasional project cargo shipments may be handled through special stowage on container vessels and handled at container terminals.

Project cargo and break-bulk cargo, in general, are typically handled at multi-purpose terminals at Los Angeles, Long Beach, Stockton, or West Sacramento. Handling and inland transport costs are high for items such as windmill blades, steel shapes, or transit cars, so shipments typically move through the closest port. California ports would thus compete with other California ports. The only significant area of overlap may be Northern California and Southern Oregon. Oakland, Stockton, West Sacramento, and other Northern California ports do not compete with other ports for shipments to and from Northern California. Northern California importers and exporters do not regularly use the Southern California or Pacific Northwest ports unless they require a specific service that is not available in Northern California.

Bulk Commodities

There is also limited competition between regional ports for bulk commodity exports. The Port of Stockton and Levin Richmond Terminals have handled export coal and iron ore movements, primarily from Utah to China. These movements might have been handled through the bulk export terminal at the Port of Long Beach.

Southern California ports have major flows of petroleum products for local refineries and markets. The San Francisco Bay Area refineries act as petroleum import ports. They compete with other refineries for imports to the extent that they compete for inland markets (e.g. in the San Joaquin Valley) with refineries elsewhere (e.g. in Southern California).

COMPETITION FOR CALIFORNIA AIR CARGO BUSINESS

Like seaports, the competitive position of California's cargo airports is largely determined by their geographic position relative to major markets.

Because both domestic and international air cargo tends to be time-sensitive, shippers commonly choose airports based on the combination of ground and air transit time. As a practical matter, the ground transit time to and from the airport may differ more than the air transit time, especially where carriers offer equivalent service from multiple airports. A shipper or air freight forwarder in the San Joaquin Valley might, therefore, choose between San Francisco (SFO) and Los Angeles (LAX) for an export shipment based on the truck time and cost to the airport, rather than on airport or air service characteristics.

Direct competition for air cargo business is largely regional, as outlined below:

- Oakland (OAK) and SFO compete for Bay Area air cargo, with OAK prevalent in domestic and SFO in international. San Jose (SJC) has a much smaller air cargo business at present
- Sacramento (SMF) and Mather (MHR) compete for air cargo business in the Sacramento area (DHL and UPS serve MHR)
- LAX and Ontario (ONT) compete for air cargo in Southern California with LAX having the dominant share. San Diego (SAN) competes for the southern portion of the market
- The numerous other California airports (Stockton, Modesto, Merced, Fresno, etc.) are served by feeder connections to the major airports. Stockton (SCK) has recently added service by Amazon flights

California airports compete with other states for hub status and for transfer/interchange freight. Hub airports host a larger number of feeder flights to and from regional airports, as well as a full schedule of flights serving other major airports and markets. At present, California has the following hub relationships:

- LAX – DHL, FedEx, UPS
- ONT – UPS, FedEx
- SFO – FedEx (International)
- OAK – FedEx, UPS
- MHR – DHL, UPS

The competition for West Coast hub status is primarily within California, the nearest alternatives being Portland or Las Vegas. The size of the Northern and Southern California markets, however, will keep major air cargo hub locations within the state.

Major hubs may also compete for air cargo transfer/transshipment business between foreign and domestic carriers. For this market, all major West Coast international airports can be in contention: Anchorage, Seattle-Tacoma, San Francisco, Vancouver, and Los Angeles. The outcome of this competition is affected by on-airport costs and network connections, not by ground transportation issues.

Air cargo is increasingly dominated by the integrated carriers, chiefly FedEx, UPS, and DHL. To use these carriers the customer tenders the shipment locally, and the carrier chooses the routing and the airports. UPS, for example, uses OAK but not SFO. California airports, therefore, compete mostly for the business of the integrated carriers rather than for the underlying customer choices. Passenger airlines continue to carry substantial volumes of "belly cargo". These air cargo services may be sold directly to the customer or through an air freight forwarder.

Relatively few producers or businesses rely heavily on on-air cargo due to the high cost. E-retailers such as Amazon make strenuous efforts to develop and manage regional and local distribution centers to minimize air cargo use. Businesses that do rely heavily on on-air cargo, particularly repair parts suppliers, are likely to locate next to a major national hub, or even on airport property. LAX, SFO, or OAK could compete for such businesses with other major hubs.

Key factors in airport competition include:

- Availability of takeoff/landing windows at key flight times
- Availability of gates and gate time slots for passenger services
- Airport landing and gate fees

Except for the air cargo transloading segment, which stays on the airport footprint, California's airports are not in close competition with those in other states. Goods movement mobility within the state is unlikely to affect the competitive position of California airports either nationally or internationally.

California Cost Differences – Freight Transportation Costs

TRUCKING COSTS

Table C.3 shows average U.S. marginal trucking costs per mile for 2009–2017, as computed by the American Transportation Research institute.[364365i] As of 2017, the average U.S. marginal cost per mile was estimated at $1.691.

Table C.3: Average Marginal Costs per Mile, 2009-2017 (ATRI 2018)

Motor Carrier Costs	2009	2010	2011	2012	2013	2014	2015	2016	2017
				Vehicle-Based					
Fuel Costs	$0.405	$0.486	$0.59	$0.641	$0.645	$0.583	$0.403	$0.336	$0.368

Truck/Trailer Lease or Purchase Payments	$0.257	$0.184	$0.189	$0.174	$0.163	$0.215	$0.23	$0.255	$0.264
Repair & Maintenance	$0.123	$0.124	$0.152	$0.138	$0.148	$0.158	$0.156	$0.166	$0.167
Truck Insurance Premiums	$0.054	$0.059	$0.067	$0.063	$0.064	$0.071	$0.074	$0.075	$0.075
Permits and Licenses	$0.029	$0.040	$0.038	$0.022	$0.026	$0.019	$0.019	$0.022	$0.023
Tires	$0.029	$0.035	$0.042	$0.044	$0.041	$0.044	$0.043	$0.035	$0.038
Tolls	$0.024	$0.012	$0.017	$0.019	$0.019	$0.023	$0.020	$0.024	$0.027
Driver-Based									
Driver wages	$0.403	$0.446	$0.460	$0.417	$0.440	$0.462	$0.499	$0.523	$0.557
Driver benefits	$0.128	$0.162	$0.151	$0.116	$0.129	$0.129	$0.131	$0.155	$0.172
Total	**$1.451**	**$1.548**	**$1.706**	**$1.633**	**$1.676**	**$1.703**	**$1.575**	**$1.592**	**$1.691**
Source: American Transportation Research Institute (ATRI) 2018									

As **Table C.4** shows, the costs vary by the trucking sector. Less-than-truckload (LTL) costs were higher at $1.84 per mile due to last mile pickup and delivery costs and terminal handling costs.[366] Truckload (TL) costs were lower at $1.49 per mile.

Table C.4: Average Total Marginal Costs by Sector, 2009-2017 (ATRI 2018)

Sector	2009	2010	2011	2012	2013	2014	2015	2016	2017
LTL	$1.43	$1.76	$1.93	$1.79	$1.84	$1.83	$1.60	$1.74	$1.84
Other	$1.67	$1.61	$1.79	$1.73	$1.67	$1.85	$1.72	$1.83	$1.95
TL	$1.36	$1.43	$1.57	$1.51	$1.60	$1.58	$1.50	$1.42	$1.49
Source: American Transportation Research Institute (ATRI) 2018									

The share data in **Table C.5** indicate that fuel accounts for 22 percent and driver wages and benefits are 43 percent of average marginal cost.[367]

Table C.5: Share of Total Average Marginal Cost, 2009-2017 (ATRI 2018)

Motor Carrier Costs	2009	2010	2011	2012	2013	2014	2015	2016	2017
Vehicle-based									
Fuel Costs	28%	31%	35%	39%	38%	34%	26%	21%	22%
Truck/Trailer Lease or Purchase Pay ments	18%	12%	11%	11%	10%	13%	15%	16%	16%
Repair & Maintenance	8%	8%	9%	8%	9%	9%	10%	10%	10%
Truck Insurance Premium	4%	4%	4%	4%	4%	4%	5%	5%	4%
Permits and Licenses	2%	3%	2%	1%	2%	1%	1%	1%	1%
Tires	2%	2%	2%	3%	2%	3%	3%	2%	2%
Tolls	2%	1%	1%	1%	1%	1%	1%	2%	2%
Driver-based									
Driver wages	28%	29%	27%	26%	26%	27%	32%	33%	33%
Driver benefits	9%	10%	9%	7%	8%	8%	8%	10%	10%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
Source: American Transportation Research Institute (ATRI) 2018									

Fuel economy ranges from 4.9 to 6.3 mpg, as shown in **Table C.6**[368] At a mid-range value of about 6.8 mpg, California's recent $0.12 per gallon diesel fuel tax increase would add about $0.02 per mile to trucking costs.

Table C.6: Respondent Reported Fuel Economy Compared to Typical Operating Weight (ATRI 2018)

Typical Operating Weight	MPG
Less than 20,000 lbs	6.3
20,001-40,000 lbs	6.8
40,001-60,000 lbs	7.2
60,001-80,000 lbs	6.3
Greater than 80,000 lbs	4.9
Source: American Association of Port Authorities	

Table C.7 below shows that the West has an average marginal cost of about $1.616 per mile – higher than most regions, but lower than the Northwest.[369] If the Southeast and Southwest are regarded as the West's key competitors, their average trucking costs are about 4 to 5 percent lower.

Table C.7: Average Marginal Cost per Mile by Region, 2017 (ATRI 2018)

Motor Carrier Costs	Midwest	Northeast	Southeast	Southwest	West
Vehicle-based					
Fuel Costs	$0.350	$0.336	$0.327	$0.314	$0.377
Truck/Trailer Lease or Purchase Payments	$0.238	$0.300	$0.242	$0.253	$0.230
Repair & Maintenance	$0.158	$0.163	$0.145	$0.128	$0.180
Truck Insurance Premiums	$0.077	$0.071	$0.061	$0.064	$0.078
Tires	$0.024	$0.025	$0.018	$0.021	$0.028
Tolls	$0.027	$0.040	$0.022	$0.023	$0.014
Driver-based					
Driver wages	$0.530	$0.575	$0.543	$0.564	$0.498
Driver benefits	$0.150	$0.194	$0.160	$0.129	$0.172
Total	**$1.591**	**$1.735**	**$1.553**	**$1.536**	**$1.616**
Source: American Association of Port Authorities					

It should be noted, however, that firms shipping to and from California locations do not necessarily pay the higher costs incurred by California-based motor carriers for the following reasons:

- National truckload carriers may be based anywhere in the U.S., and their cost structure may reflect a mix of labor, fuel, and other costs across many locations
- Large carriers recruit and pay drivers nationwide
- With fuel tanks holding up to 250 gallons, long-haul trucks can often avoid buying fuel at California prices

California's higher operating costs are therefore more likely to affect trucking within California, rather than affecting trucking to or from California. Out-of-state carriers do, however, compete for trips within California.

In the industry focus groups, Californian carriers expressed concern about competition from out-of-sate carriers with lower cost structures. These higher cost factors are 1) the higher fuel costs (noted above), 2) the higher costs of "clean" trucks to meet CARB requirements, and 3) congestion in California cities. However, out-of-state carriers must use CARB-compliant trucks when operating in California, and large cities in other states are also congested.

Within California, motor carriers are deeply concerned about highway and facility congestion that reduces driver productivity, vehicle productivity, and effective capacity. This issue has received the most attention in connection with port container drayage, where longer times spent in terminals, and on congested highways to and from the terminals reduce the number and length of the trips a driver can make within HOS limits. These issues are not unique to California or to port drayage, as busy Pacific Northwest and East Coast ports have similar problems, and urban congestion affects all trucks. When in competition with less congested regions and ports such as Savannah or Charleston, however, these costs place California at a disadvantage. The higher cost of port drayage in California is likely to be a significant factor in choosing the location for import distribution facilities or export-oriented businesses, offsetting California's advantage in being closer to Asian sources and markets.

Potential State Actions

These observations imply that California public agencies can improve the state's competitiveness on trucking costs by:

- Increasing capacity on state highways and local roads to reduce congestion
- Deploying ITS technologies to reduce congestion and lower trucking costs
- Easing emissions limits, clean truck requirements, and fuel taxes (contrary to environmental objectives)
- Acting, where possible, to reduce truck driver time spent at marine terminals and other freight facilities
- Improving truck driver training to increase the supply of drivers

RAILROAD COSTS

California is served by two Class 1 railroads: BNSF and Union Pacific. The two railroads have extensive networks across the Western states with connection to other railroads at Midwestern gateways, to Canada, and to Mexico. California's short line railroads operate within the state. Their rates and service would not ordinarily affect California's competitiveness with other states. It is not ordinarily possible to compare railroad rates charged to California customers or for routes through California ports with rates elsewhere. Since economic deregulation in 1980, most railroad traffic has travelled under confidential, negotiated contract rates rather than under published tariffs. Those contracts may include annual volume commitments, rate tiers, fuel surcharges, or rebates that are not reflected in any public records.

Railroad operating costs may be slightly higher in California than in other states. There has been a series of CARB actions designed to reduce emissions from both line-haul and yard operations, including:

- Increased use of low-sulfur fuel
- Introduction of low-emission, high-efficiency road locomotives
- Introduction of hybrid and other low-emission switching locomotives

In many respects, the CARB actions simply accelerate requirements eventually implemented by the U.S. EPA. Recently, the railroads have been acquiring low-emission locomotives for use across their systems. Over time, any higher costs in California will thus tend to equalize.
Railroad rate making is driven by three objectives that sometimes conflict:

- Maximizing business volume
- Maximizing profits

- Maximizing infrastructure, equipment, and labor utilization

Where railroads face effective competition from other railroads, rates tend to be lower and railroads will accept lower profits. Where railroads have available capacity, they will set rates more competitively to fill that capacity. Where demand is higher, and capacity is tight, railroads will set rates higher to maximize profit.

Recent downturns in key rail traffic volumes may lead BNSF and UP to encourage intermodal and other traffic to and from California. With the advent of fracking, lower-cost natural gas has replaced coal as a fuel for many electric power plants. The resulting decline in railroad coal traffic has reduced profits and created excess capacity in many places. While BNSF and UP lines in California were not dramatically affected, system traffic levels and profitability on both railroads declined. Both railroads have been seeking to expand other traffic sources, which may benefit current and potential rail customers in California, as well as in other states.

Differences in railroad costs and service may affect the ability of California ports to compete for discretionary intermodal shipments with Pacific Northwest and British Columbia ports. As described earlier, in Canada's Pacific Gateway Initiative, Canadian railroads have cooperated with British Columbia ports and the Canadian government to improve rail access, capacity, and service in competition for discretionary cargo. It is generally believed in the shipping industry that the Canadian railroads have also engaged in aggressive rate setting in competition with U.S railroads – specifically BNSF and Union Pacific. These initiatives have contributed to the shift in market shares between U.S. and British Columbia ports on the West Coast of North America.

In at least one instance, the difficulty of developing facilities in California has prevented a railroad from improving service and lowering costs. BNSF's proposed Southern California Intermodal Gateway terminal (SCIG) would be located near the Ports of Los Angeles and Long Beach. Development of SCIG would add new, efficient intermodal transfer capacity to the port rail system and divert thousands of annual truck trips from I-710. SCIG development was initially proposed prior to 2011, but BNSF has so far been prevented from building the facility due to local opposition. Costs have risen to the point where BNSF may no longer find the project desirable. If SCIG is not built, then the competitiveness of the Ports of Los Angeles and Long Beach may decrease in the future.

Precision Scheduled Railroading

The advent of "Precision Scheduled Railroading" (PSR) may lead railroads to shed less profitable traffic while improving service to more profitable sectors. PSR generally consists of improving rail service by pairing complex and less profitable services to simplify and speed up more profitable operations, permitting the railroad to improve overall service and profitability.

Railroad industry investors and financial analysts tend to judge railroads by their operating ratio, the ratio of operating costs to revenue. UP, which historically enjoyed the industry's best operating ratio, produced a third quarter 2018 operating ratio of 61.7 percent, the same as in 2017. In comparison, railroads that had implemented PSR had operating ratios below 60 percent.

UP's Unified Plan 2020 (UP 2020), a new operating plan that implements PSR principles, was launched on October 1, 2018. The goal of UP 2020 is to help UP achieve a 60 percent operating ratio goal by 2020, on the way to eventually achieving a 55 percent operating ratio. UP 2020 is scheduled to be implemented in California in 2019. UP 2020 anticipates layoffs, some of which have already occurred, and more of which are planned. The strong economy and truck driver shortage is facilitating this strategy. Under this system, UP's financial hurdle for the continuation of any existing business or the addition of any new business will be much higher than in the past.

OCEAN SHIPPING COSTS

The ocean shipping rates paid by customers include the cost of vessel operations, the cost of terminal operations, fees assessed by ports, canal tolls, and ocean carrier overhead.

The current, highly competitive container shipping environment has resulted in very low rates for California shippers. Since the recession, containerized U.S. and world trade have grown slower than ocean carrier capacity. The capacity increase has been driven by carrier acquisition of larger container vessels to secure economies of scale. Faster growth in capacity than demand has resulted in persistent industry-wide overcapacity. Under these conditions, intense competition has driven down shipping rates to the point of widespread financial losses among the carriers.

The rate differences between California ports and their competitors are likely to be small and based on small differences in underlying cost. Container shipping at all U.S. and Canadian ports are dominated by the same carriers and carrier alliances. Many of the terminal operating costs are similar between California ports and competing ports elsewhere. All West Coast port terminals in North America are covered by the same basic labor contract, and many are operated by the same firms. The ports' own charges tend to be highly competitive. Vessels calling California ports do incur slightly higher costs for low-sulfur fuel and cold-ironing.
The opening of new, wider Panama Canal locks has enabled carriers to use large ships through the canal. The new locks can thereby reduce unit costs for Asia-East Coast voyages, competing with the combination of Asia-West Coast voyages and cross-country rail service. Some of the savings are captured in higher Panama Canal tolls, and moreover, the West Coast option is faster. The net result has been a minor shift in market share, as discussed in the section on port competition.

Almost all the relevant rates and fees are contained in confidential, negotiated contracts. It is not possible to assemble a quantitative comparison from available data.

AIR CARGO COSTS

The air cargo industry is dominated by the integrated carriers, Fedex and UPS, trailed by smaller air freight forwarders and airlines offering belly cargo space on passenger flights. Air cargo operations in California have similar costs as in other states, and California customers likely face similar rates for air cargo service.

LABOR COSTS

As **Figure C.4** shows, the differences in labor costs, reflected in median earnings and living wage levels, can vary.[370] [371]California's median earnings for the transportation and material moving occupations and production occupations are comparable or even lower than in some competing regions. In the construction trades, California earnings are higher, likely due to higher housing demand and prices, and the strength of organized labor in public sector construction. High housing and living costs in California create a higher threshold for "living wage" earnings than in some competing regions. The differences in these costs vary from about 7 to 20 percent.

Because transportation occupations do not pay more in California and living costs are higher, transportation workers may enjoy a better standard of living in other states. This disparity makes transportation and materials handling jobs in California relatively less attractive than they are in other states.

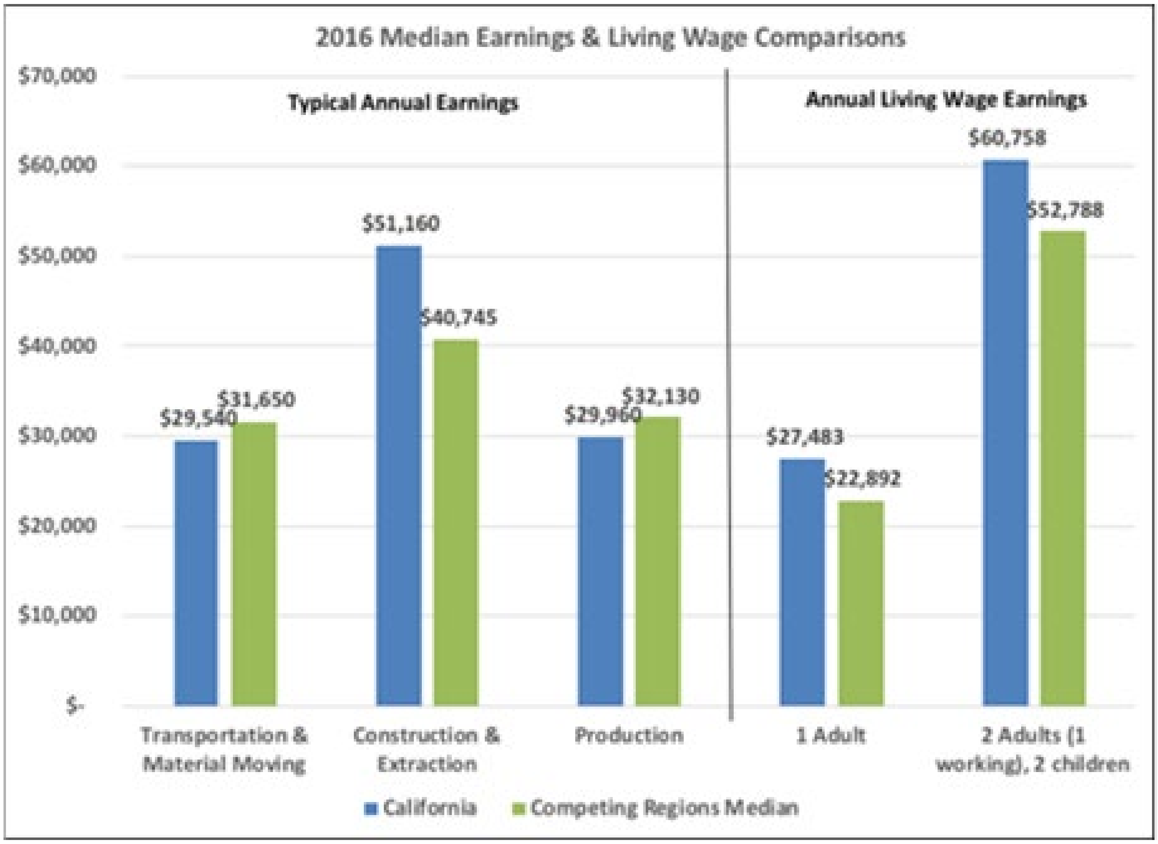

Figure C.4: 2016 Median Earnings & Living Wage Comparisons (Source: Massachusetts Institute of Technology Living Wage Calculator) (Source: Massachusetts Institute of Technology Living Wage Calculator)

LAND COSTS

Land cost is a significant factor for businesses with multiple alternatives for production locations. Within states, business location is central and fundamental to the cost of commercial land. Lands in central business districts of dense urban areas cost many times more than the same commercial or industrial land area in undeveloped rural areas. Land costs become more significant as facility sizes, and ensuing land requirements, increase. Modern distribution centers typically occupy at least 100,000 square feet, and facilities over 1,000,000 square feet are common.

For investors who use commercial land and properties as investments, high land values can be attractive. California ranks first in a national study of total land valuation by an economist at the U.S. Bureau of Economic Analysis. [372] That study estimated the combined value of all land in the country, finding that California accounts for 17 percent of the total value of the land in the 48 contiguous states. States with generally larger rural areas tend to have lower commercial land values relative to their size, while states with more densely populated areas, especially along the coasts, tend to have the highest estimated value per acre. Land use policies and zoning affect commercial land valuation as well, with undeveloped land generally having lower value per acre, while improved, commercially zoned properties with good transportation access have generally higher land values.

In a populous state such as California, possible alternative land uses affect current land values, especially where undeveloped commercial land in metropolitan areas is scarce. In those cases, land values for residential use influence commercial land values where the potential conversion of commercial space for housing use or mixed-use development competes with continued commercial use. Thus, an understanding of more readily available residential land valuation can provide context to understand commercial land valuation market pressures.

In California, residential land prices have been increasing for decades, even in comparison to the values of the buildings on the land. In a national study of property values by the Lincoln Institute, California residential land values as a percentage of total property values have increased substantially over the last 40 years.[373] Compared with 1976, the land value as a share of total property value increased from 36 percent to 61 percent. California ranks second nationally for this land value share, behind only Hawaii. This trend reflects the relatively high average cost of the land itself in California. Location matters, and the lower land values are found in many rural California areas with have led to the dispersion of businesses, especially distribution centers, into formerly rural areas near population centers. The Inland Empire in Southern California's San Bernardino and Riverside Counties is the best-known example, while the area of San Joaquin and Stanislaus Counties are known as the "Tracy Triangle" is a growing Northern California example.

ENERGY AND UTILITY COSTS

There are several energy source price metrics that affect California's competitiveness for business locations and freight movement, including the prices of petroleum gas, diesel, natural gas, and electricity.

Energy and utility costs, including electricity and water, can be prominent factors in facility operating costs and therefore in competition for such facilities between states. These factors become more important for facilities that use electric power for lighting, climate control, and production equipment, and water for processing. These costs also affect the cost of living for employees.

California's average commercial, industrial, and residential electric power rates are high compared with most other states. In 2018, according to the U.S. EIA, California had the fifth highest average commercial electricity rates, the sixth highest average industrial electricity rates, and the seventh highest average residential electricity rates. In studying a year of California's average commercial electricity rates, rates proved 59 percent higher in California than the US average for all other states. California's average industrial electricity rates for the same period were 100 percent higher than the average of all other states. California's average residential electricity rates were 49 percent higher than the average of all other states for this period.[374]

Average retail gasoline prices in California are higher than in other states; only Hawaii typically has higher gas prices than California. The difference is significant. For example, in September

2018 the price difference was $0.87 per gallon or 31 percent of the U.S. average gas price.[375i] Gas price comparisons should be considered in the context of environmental regulations that require motor gasoline grades sold in California to create fewer emissions than in gasoline grades sold for less in other states.

Diesel fuel prices are an especially important factor in freight transportation, which currently still depends on diesel-powered trucks and rail locomotives. Compared with other states, California's average diesel fuel prices are commonly ranked second-highest, behind only Hawaii. In September 2018, for example, the average diesel fuel price in California was $0.86 higher than the average for the other states, a 27 percent difference.[376]

Another energy source price metric used as a competitiveness measure is natural gas. Average natural gas prices for transportation and for building heating and industrial process use are higher in California than in other states. The U.S. EIA reports that for the 12 months ending July 2018, California's average residential natural gas rates were 16 percent higher than the average for other states. In the same period, California's average natural gas rates for commercial customers were seven percent higher than the average for the rest of the U.S., while industrial natural gas customers in California paid an average natural gas rate 77 percent higher than the average for the rest of the country.

The energy price averages across the state mask local variations in a state as large as California. In California, regions are subject to various levels of regulation; therefore, there are specific prices for electricity and natural gas utilities, and the gasoline and diesel in each market across the state. As one example, in September 2018 the difference in average regular gasoline prices in California compared to the average for the rest of the U.S. varied from $0.77 in the Sacramento Region up to $0.97 in the Central Sierra Region.[377]

COMPARATIVE DISTRIBUTION CENTER COSTS

The combined impact of these various cost factors is evident in overall operating costs for distribution centers or other industrial facilities. The comparisons in this section were derived from *Comparative Distribution Warehousing Costs in Port and Intermodal-Proximate Cities*, a 2015 report by The Boyd Company, Inc. The Boyd study estimated costs for 25 potential distribution center locations, including Patterson and Tracy in Northern California and Hesperia, Apple Valley, Victorville, and Mira Loma in Southern California. Warehouse operating costs were scaled to a hypothetical 500,000 sq. ft. facility employing 150 nonexempt workers and shipping over-the-road to the nearest intermodal and port city.

As **Table C.8** indicates, California locations had the highest annual combined costs except for points in the Northeast and Idaho. [378] The estimate for Tracy, for example, was 16% higher than in Cordele, GA, and the company would save $1.85 million annually by choosing Cordele over Tracy.

Table C.8: Distribution Center Operating Cost Ranking, 2015

Total Annual Geographically-Variable Operating Cost Ranking	
Distribution Warehouse Location	**Total Annual Operating Costs**
Stoughton, MA	$15,081,230
Meadowlands, NJ	$14,631,975
Idaho Falls, ID	$14,576,733
Bordentown, NJ	$14,273,497
Newburgh, NY	$13,660,758
Tracy, CA	$13,302,372
Patterson, CA	$13,104,947
Hesperia, CA	$12,937,809
Apple Valley, CA	$12,923,646
Victorville, CA	$12,913,886
Mira Loma, CA	$12,912,925
Bethlehem, PA	$12,894,630
Casa Grande, AZ	$12,694,040
Miramar, FL	$12,573,879
Kent, WA	$12,490,728
Mequite, NV	$12,490,074
York, PA	$12,120,409
Kingman, AZ	$11,936,644
Springfield, OR	$11,935,905
Fernley, NV	$11,899,135
Columbia, SC	$11,728,259
Humble, TX	$11,661,803
Cordele, GA	$11,450,594
Ritzville, WA	$11,351,481
Chesterfield, VA	$11,289,491
Source: Comparative Distribution Warehousing Costs in Port and Intermodal-Proximate Cities	

Table C.9 breaks down the operating cost estimates for locations in Southern California and competing locations in Arizona. Labor, electric power, and amortization (construction) costs are markedly higher in California, while property and sales tax costs are higher in Arizona.[379] The much higher transportation cost to reach Arizona is a tradeoff for the otherwise lower operating costs. Even with the offsetting transportation costs, Kingman is about a million dollars less annually than the Southern California locations.

Table C.9: Annual DC Operating Costs, California vs. Arizona

Comparative Annual Operating Cost Simulation Summary	Casa Grande	Kingman	Apple Valley	Hesperia	Mira Loma
	AZ	**AZ**	**CA**	**CA**	**CA**
	Metro Area	**Metro Area**	**Metro Area**	**Metro Area**	**Metro Area**
Nonexempt Labor					
Weighted Average Hourly Earnings	$13.90	$12.55	$16.42	$16.70	$16.85
Annual Base Payroll Costs	$3,969,840	$3,584,280	$4,689,552	$3,769,520	$4,812,360
Fringe Benefits	$1,349,746	$1,218,655	$1,594,448	$1,621,637	$1,636,202
Total Annual Labor Costs	$5,319,586	$4,802,935	$6,284,000	$6,391,157	$6,448,562
Electric Power Costs	$581,892	$655,200	$837,888	$837,888	$837,888
Amortization Costs	$3,143,710	$3,121,886	$3,984,366	$3,994,324	$4,072,557
Property and Sales Tax Costs	$1,662,052	$1,596,576	$1,234,805	$1,237,025	$1,260,146
Shipping Costs	$1,986,800	$1,760,047	$582,587	$477,415	$293,772
Total Annual Geographically-Variable Operating Costs	**$12,694,040**	**$11,936,644**	**$12,923,646**	**$12,937,809**	**$12,912,925**
Source: Comparative Distribution Warehousing Costs in Port and Intermodal-Proximate Cities					

Table C.10 shows the construction cost and land cost differences that drive the amortization costs higher in California. [380] With higher land and construction costs, the same warehouse in California would cost roughly $15 million or approximately 27 percent more in California than in Arizona.

Table C.10: Warehouse Construction and Amortization Costs, California vs. Arizona

Warehouse Construction and Amortization Costs	Casa Grande	Kingman	Apple Valley	Hesperia	Mira Loma
	AZ	AZ	CA	CA	CA
	Metro Area	Metro Area	Metro Area	Metro Area	Metro Area
Site Acquisition: No. of Acres	35	35	35	35	35
Cost per Acre	73,500	$57,500	$298,500	$303,500	$322,500
Site Improvement Cost	-	-	-	-	-
Total Land Cost	$2,572,500	$2,012,500	$10,447,500	$10,622,500	$11,287,500
Construction Cost	$32,677,230	$32,853,690	$39,576,510	$39,576,510	$40,286,430
Machinery and Equipment	$20,000,000	$20,000,000	$20,000,000	$20,000,000	$20,000,000
Total Project Investment	$55,249,730	$54,866,190	$70,024,010	$70,199,010	$71,573,930
Project Amortization					
Cost of Funds (Interest)	3.0%	3.0%	3.0%	3.0%	3.0%
Payment Factor	0.0569	0.0569	0.0569	0.0569	0.0569
Total Annual Amortization Cost	**$3,143,710**	**$3,121,886**	**$3,984,366**	**$3,994,324**	**$4,072,557**
Source: Comparative Distribution Warehousing Costs in Port and Intermodal-Proximate Cities					

Table C.11 breaks down the operating cost estimates for locations in Southern California and competing locations in the Southeast.[381] Labor, electric power and amortization (construction) costs are again markedly higher in California. Property and sales tax costs can be either lower or higher in the Southeast. The transportation cost differences are minimized by the proximity to the South Atlantic ports. Overall, the Southeast locations can be about $0.5 million to $1.8 million lower annually than the California locations.

Table C.11: Annual DC Operating Costs, California vs. Southeast

Comparative Annual Operating Cost Simulation Summary	Patterson	Tracy	Victorville	Miramar	Cordele
	CA	CA	CA	FL	GA
	Metro Area	Metro Area	Metro Area	Metro Area	Metro Area
Nonexempt Labor					
Weighted Average Hourly Earnings	$16.99	$17.00	$16.52	$15.05	$14.13
Annual Base Payroll Costs	$4,852,344	$4,855,200	$4,718,112	$4,298,280	$4,035,528
Fringe Benefits	$1,649,797	$1,650,768	$1,604,158	$1,461,415	$1,372,080
Total Annual Labor Costs	$6,502,141	$6,505,968	$6,322,270	$5,759,695	$5,407,608
Electric Power Costs	$702,000	$958,368	$837,888	$520,788	$477,360
Amortization Costs	$4,212,951	$4,245,771	$3,992,332	$3,721,880	$3,075,686
Property and Sales Tax Costs	$1,208,857	$1,292,371	$1,236,581	$1,584,364	$1,123,754
Shipping Costs	$478,998	$299,894	$524,815	$987,152	$1,366,186
Total Annual Geographically-Variable Operating Costs	**$13,104,947**	**$13,302,372**	**$12,913,886**	**$12,573,879**	**$11,450,594**
Source: Comparative Distribution Warehousing Costs in Port and Intermodal-Proximate Cities					

Table C.12 shows the construction cost and land cost differences that drive the amortization costs higher in California.[382] With higher land and construction costs, the same warehouse in California would cost roughly $5 to 20 million more in California than in Georgia or Florida.

Table C.12: Warehouse Construction and Amortization Costs, California vs. Southeast

Warehouse Construction and Amortization Costs	Patterson	Tracy	Victorville	Miramar	Cordele
	CA	CA	CA	FL	GA
	Metro Area	Metro Area	Metro Area	Metro Area	Metro Area
Site Acquisition: No. of Acres	35	35	35	35	35
Cost per Acre	348,000	$358,500	$302,500	$315,500	$76,500
Site Improvement Cost	-	-	-	-	-
Total Land Cost	$12,180,000	$12,547,500	$10,587,500	$11,042,500	$2,677,500
Construction Cost	$41,861,310	$42,070,617	$39,576,510	$34,368,390	$31,376,730
Machinery and Equipment	$20,000,000	$20,000,000	$20,000,000	$20,000,000	$20,000,000
Total Project Investment	$74,041,310	$74,618,117	$70,164,010	$64,410,890	$54,054,230
Project Amortization					
Cost of Funds (Interest)	3.0%	3.0%	3.0%	3.0%	3.0%
Payment Factor	0.0569	0.0569	0.0569	0.0569	0.0569
Total Annual Amortization Cost	**$4,212,951**	**$4,245,771**	**$3,992,332**	**$3,721,880**	**$3,075,686**
Source: Comparative Distribution Warehousing Costs in Port and Intermodal-Proximate Cities					

These comparisons resonate with comments made by industry stakeholders in the CFMP workshops. The cost advantages of the Southeast states also align with the market shares gains made by Southeast ports at the expense of California ports.

PERCEPTIONS OF CALIFORNIA'S BUSINESS CLIMATE

Many of the freight industry stakeholders contacted for this study perceive an "anti-business" attitude in California, and see that attitude manifest in environmental regulations, high taxes and fees, and opposition to facility development.

Opinions and concerns over California's friendliness to business are evident in state rankings on the ease of doing business, or as places to start a business. For example, WalletHub used a variety of statistics to rank states as places to start a business (**Table C.13**).[383] Although California ranked eighth overall, it lagged behind states such as Texas and Georgia that are making strong efforts to attract firms. It is notable that California ranked forty-seventh in business costs. In addition, below are three other related publications regarding California's business climate.

- A ranking by USA Today placed California 15th among the best states in which to do business.[384]
- Similarly, a 2018 CNBC poll placed California 25th among "America's Top States for Business".[385] California was ranked:
  - 12th on workforce
  - 24th on infrastructure
  - 48th on the cost of doing business
  - 11th on the economy
  - 21st on quality of life
  - 1st on technology
- A 2009 study by the Public Policy Institute of California compared multiple rankings and found that California typically ranks highly on productivity, but poorly in terms of taxes and costs (**Figure C.5**). [386][387]

Table C.13: WalletHub Ranking of Best States to Start a Business

Overall Rank (1=best)	State	Total Score	"Business Environment" Rank	"Access to Resources" Rank	"Business Costs" Rank
1	Texas	61.05	1	11	30
2	Utah	60.95	7	2	26
3	Georgia	58.12	5	17	13
4	North Dakota	57.68	2	19	32
5	Oklahoma	57.58	8	36	1
6	Florida	56.75	4	20	21
7	Arizona	54.39	9	12	29
8	**California**	**54.30**	**3**	**3**	**46**
9	Montana	53.71	11	30	8
10	Colorado	52.67	6	18	34
Source: WalletHub, 2019					

California is viewed by some sources as a magnet for high-tech research and product development, with superlative access to venture capital and expertise. These advantages, however, do not translate well for a wholesaler seeking to build a distribution center.

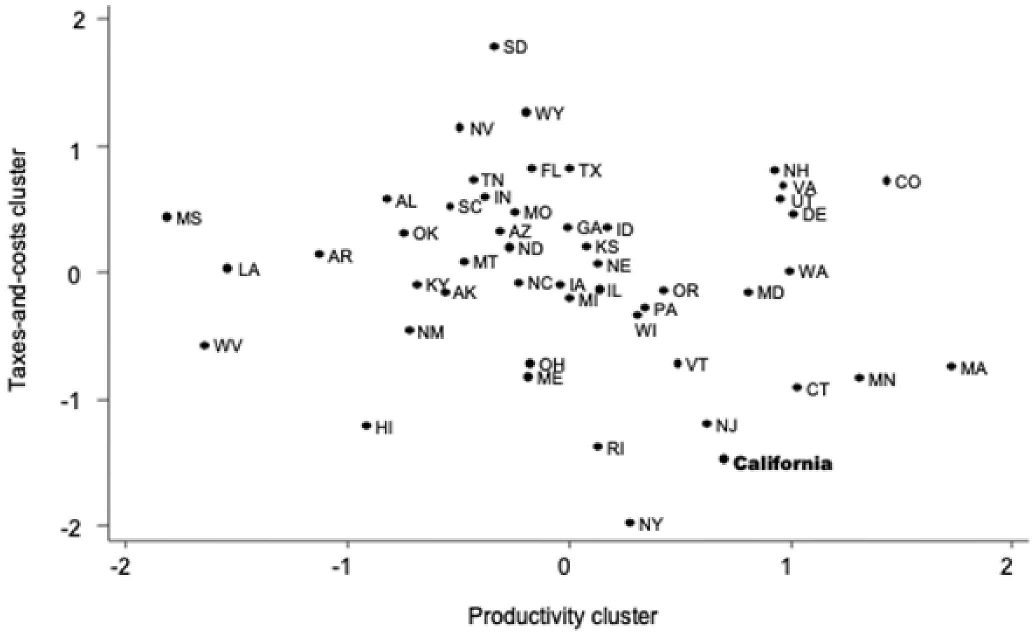

Figure C.5: California's Business Climate Rankings (Source: Public Policy Institute of California, 2009)

COMPETITIVE ECONOMIC DEVELOPMENT EFFORTS

Industry outreach efforts have revealed deep concerns over California's economic development efforts and the linkage of those efforts to goods movement, logistics, and freight transportation infrastructure.

Figure C.6 shows relative state spending on economic development and related functions, such as work force development, in Fiscal Year 2016, as compiled by the Council for Community and Economic Research. California ranked 48th among the 50 states.[388] As calculated by the Council for Community and Economic Research, the State spent only $173 per business establishment on economic development programs in Fiscal Year 2016. The only states that spent less were Massachusetts and Connecticut. **Table C.14** compares California's spending in Fiscal Year 2016 with major competing states.[389] The spending by the Southeast states is noteworthy and paralleled with strong economic development in that region.

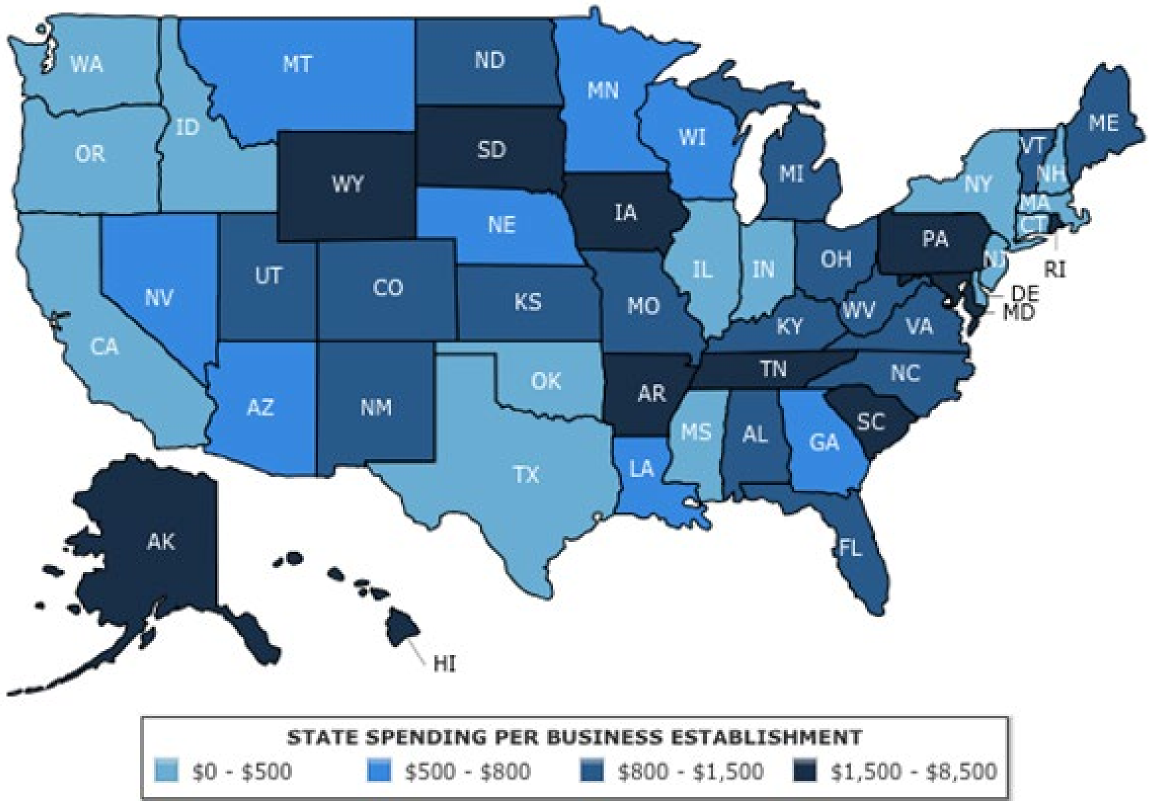

Figure C.6: State Economic Development Spending, Fiscal 2016 (Source: The Council for Community and Economic Research, 2016)

Table C.14: State Economic Development Spending

State	Fiscal 2016 Spending per Business
California	$ 173
Texas	$ 237
Arizona	$ 532
Nevada	$ 696
Georgia	$ 758
North Carolina	$ 988
Alabama	$ 988
Utah	$ 1,097
Florida	$ 1,113
South Carolina	$ 1,753
Source: Council for Community and Economic Research, 2016	

CONVENTIONAL VS. LOGISTICS-BASED ECONOMIC DEVELOPMENT

While conventional economic development practices and tools are widely known and used, logistics-based economic development efforts use slightly different tools and have different targets. Rather than seeking new corporate headquarters or manufacturing developments based on local cost advantages, logistics-based development expands the market to include transportation, distribution, and logistics facilities on the basis of supply chain efficiency. **Table C.15** highlights the differences between the two types of development. [390]

Table C.15: Economic Development and Logistics-Based Development Comparison

Economic Development	Logistics-Based Development
Goal: Attract beneficial businesses and organizations to the region.	Goal: Attract logistics-based businesses to the region.
Message: The region is an attractive, low-cost, and high-yield place to do business.	Message: The region/site offers specific logistical advantages (besides its general business advantages).
Anchor Tenants: Any business, but often manufacturers.	Anchor Tenants: Distribution centers, carrier facilities.
Issues and tools:	**Issues and tools:**
Location assistance	Freight transportation infrastructure (truck, rail, water, air)
Zoning and permitting	
Telecom & utilities	Location on trade lanes and corridors
Labor pool	Role in supply chains
Marketing assistance	Freight carrier participation
Financial assistance	Regional & national market access
Cost of doing business	Cost of logistics
Local business climate	Local receptivity to freight & logistics
Source: Tioga Group	

Conventional Economic Development

Economic development agencies typically have responsibility for attracting a wide range of desirable businesses and other organizations to the region. The target organizations and businesses can range from a franchise restaurant to a department store or an auto manufacturer. The basic message of economic development agencies is, "Our region is an attractive place for your organization." For businesses, the message tends to emphasize low capital and operating costs, a high-yield market, and various financial incentives. For headquarters offices, the agency is more likely to emphasize the quality of life and cultural advantages. In seeking an "anchor tenant" for a large development, an economic development agency is likely to seek a manufacturer, hotel, department store, or office building as appropriate. Economic development agencies will address transportation issues but tend to emphasize passenger transportation and access to regional markets.

Logistics-based Economic Development

By focusing on the freight transportation and logistics advantages of a candidate site, logistics-based developers bring additional tools and leverage to bear on location decisions. The Alliance Texas development, for example, is one of the earliest and best-known logistics-based developments. A critical distinction is that logistics-based advantages can complement and strengthen the basic attractions of a city, region or site, but cannot override the poor location. Logistics-based development is much more likely to succeed with the involvement of a specialized master developer, such as CenterPoint Properties (Joliet) or the Hillwood Group (Alliance Texas, Alliance California). Another key factor in successful logistics development is willing long-term commitments from trucking companies, ports, railroads, air cargo operators, or other carriers. The difference between logistics-based development and market-based development is illustrated by the emergence of trade and transportation corridors as DC candidates. DCs used to be located to serve a given local or regional market at the least cost, usually by locating them at or near the center of the market. A category of DCs is emerging, however, and is intended for forwarding distribution of transloaded or sorted goods to more distant points in a corridor. The two Wal-Mart DCs at Joliet, for example, are intended primarily to receive import loads from the Pacific Northwest and distribute sorted goods to points in Chicago and eastward.

Canada's Asia-Pacific Gateway Initiative

Canada launched the Asia-Pacific Gateway initiative in 2006, and the program is on-going: The primary objective of the Asia-Pacific Gateway and Corridor Transportation Infrastructure Fund is to address capacity challenges facing Canada's Asia-Pacific Gateway and Corridor transportation system. The Asia-Pacific Gateway and Corridor Transportation Infrastructure Fund provides funding for strategic infrastructure projects in British Columbia, Alberta, Saskatchewan, and Manitoba that enhance the competitiveness, efficiency, and capacity of Canada's multimodal transportation network focused on international commerce with the Asia-Pacific region.

The Asia-Pacific Gateway and Corridor Transportation Infrastructure Fund transfer payment program will result in the completion and advancement of strategic transportation infrastructure projects that contribute to the objectives of the Asia-Pacific Gateway and Corridor Initiative, including addressing bottlenecks, capacity constraints and other impediments to the flow of trade.[391]

Expenditures were $18.5 million in the Fiscal Year 2016–2017 and are planned for $32.6 million in the Fiscal Year 2017–2018.

In November 2018, Canada announced that it would invest $16.7 million in transportation infrastructure to improve the competitiveness of the Port of Prince Rupert. Fairview Terminal at Prince Rupert handles only discretionary rail intermodal cargo. As **Figure C.7** shows, Prince Rupert is connected to U.S. Midwestern and Eastern markets by rail.[392]

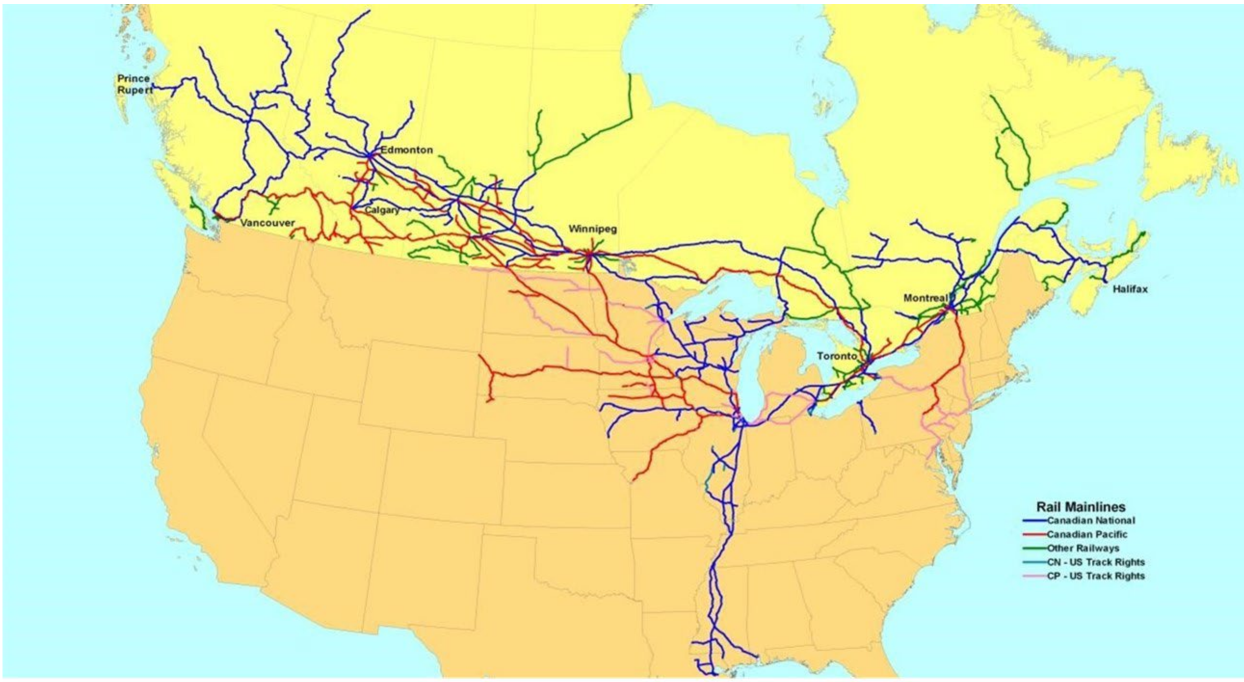

Figure C.7: Prince Rupert Rail Connections (Source: Port of Prince Rupert)

Prince Rupert has already attracted substantial cargo away from Southern California ports, and intends to attract more:

"Chicago remains the top destination for import containers from Asia," said Brian Friesen, Prince Rupert's director of trade development. "Toronto and Montreal are up there as is Memphis, a destination that has seen a lot of growth in the past few years. We are also seeing growth in Detroit and the Ohio valley. Much of that is driven by auto parts. On the way out, we are seeing agricultural products from the Midwest coming to Prince Rupert via the CN network which are then shipped to overseas markets."[393]

A key strength of the Asia-Pacific Gateway Initiative is its flexibility:

The targeted recipients are provinces and territories, including provincial and territorially-owned transportation entities; municipalities, including municipally-owned transportation entities; public sector organizations, including transit agencies, commissions and boards but excluding federal Crown corporations; not-for-profit organizations; and, industry-related organizations, including for-profit organizations and Canada Port Authorities (subject to Canada Marine Act amendments).[394] Funds have been used to support workforce programs as well as improving infrastructure.

From the freight industry's perspective, the construction of some major California network improvements requires a long lead time that needs to be accounted for. The I-710 Corridor project, for example, has been in progress for over 15 years with no tangible capacity improvements.

IMPLICATIONS FOR COMPETITIVENESS AND POTENTIAL IMPROVEMENTS

Competitiveness is a matter of degree rather than a dichotomy. California's competitiveness varies depending on the type of decision being made, the industry sector and products involved, and the location within California. California is highly competitive in sectors where its resources, products, markets, and capabilities are difficult to match elsewhere. Examples include unique agricultural products and high-technology research and development. Freight mobility is a minor factor in those sectors. California is much less competitive for businesses or functions that can be readily located elsewhere and that are vulnerable to high transportation, labor, land, or utility costs. Distribution is one such sector, and distribution centers that do not need to be near California markets or ports are increasingly likely to locate elsewhere. Freight mobility is a significant factor in such sectors.

Some of the perceived losses of economic activity and market share are resultant of exogenous logistics developments and strategies. Wider Panama Canal locks have reduced the cost of shipping from Asia to the East Coast versus the West Coast, and port market shares have shifted in response. As import volumes grow and import supply chains mature, importers have established multiple import routes and facilities, again reducing California's market share.

Many of the factors in state competitiveness are beyond the direct control of state government or state planning. Issues such as housing availability, cost of living, and market geography are driven by major long-term demographic and economic trends. While state government efforts may be warranted to blunt the most dramatic impacts on groups or industries at risk, the CFMP will not be able to reverse those demographic and economic trends. Workforce training is one area in which California can actively increase competitiveness.

Goods Movement Initiatives

The measures and initiatives that can improve California's competitiveness through increased capacity, reliability, and efficiency are:

- Highway capacity: Congestion in urban areas and on rural highways is the most frequently cited factor in poor California goods movement performance, and in freight transportation's impact on competitiveness. Innovative tools such as IT solutions may be considered instead of or in conjunction with traditional capacity expansion.
- Seaport Capacity: California's ports, particularly the major container ports, have regularly added to their capacity and increased their productivity with relatively little state involvement. Unlike in most competing states, California does not have a state-run port authority. Yet if California wishes to compete more vigorously with other states, there may be a need for greater state support.

Economic Development Programs

California may need to link port and state economic development efforts and fund them at competitive levels to meeting competitive challenges from other states. Beyond the issues of transportation and development costs, California has not kept pace with logistics-based, transportation-linked economic development initiatives in competing states and nations, as in the case of Canada. The Ports of Georgia, Virginia, South Carolina, and Houston are state agencies and have been highly effective in attracting cargo growth and regional economic development. As local entities, California's ports lack statewide development responsibility and statewide development resources.

Local and regional economic development agencies can play an effective role in facilitating industrial and commercial development. There may be room to augment their traditional tools of tax concessions, site location and preparation help, etc. There can be a downside when inter-jurisdictional competition for development leads to concessions with adverse long-term impacts, such as allowing higher floor area ratings (FARs) that relegate truck parking to public streets.

Business Climate

Competitiveness is a matter of perception as well as reality, and – compared to other states – California is perceived to have little interest in attracting or keeping business. Businesses making location, production, distribution, and routing decisions compare costs and other tangible factors. Yet, they also hold their own perceptions of indifference or even hostility from communities, and of the difficulty of locating and operating in California, as external sources and studies affirm. Changing these perceptions may require significant "public relations" efforts linked to economic development programs.

Environmental and Building Regulations

As part of the State's efforts to improve freight mobility and competitiveness, the State may wish to examine environmental and other regulations, and the processes governing commercial and industrial development, to see if they can be streamlined without compromising their goals or effectiveness. While the rules and processes may be formulated by the State, they are implemented at the local level, and it is frequently at the local level where delays and uncertainty appear.

The cost, time, and uncertainty of developing or expanding facilities in California are primarily local or regional issues rather than a state government issue. Many local communities are legitimately concerned with the growth of transportation and distribution activity. Localities typically welcome the potential employment and expansion of the local tax base, but those benefits can be offset by unintended environmental impacts, like new traffic, emissions, and noise. Businesses attempting to build facilities may be met with open arms in other states' communities while it may perceive or experience organized community opposition in California. One major California-based industrial development company reported that visits from governors of other states encourage projects there, in contrast to a perceived indifference or hostility to projects within California.

Regulatory Stability and Predictability

Many stakeholders expressed concerns over what they see as frequent and unpredictable changes in California's regulations, specifically environmental regulations. Stakeholders in this and other studies have cited progressively restrictive clean air action plans by the CARB and the San Pedro Bay ports, which stakeholders claim have made some previous compliance investments obsolete. Here, too, the issue may be as much perception as reality, but the effect on competitiveness is the same. The State may wish to consider changes in regulations less often or communicate the nature and need for change more clearly to industry (although industry bears some responsibility for following and understanding the regulatory process).

Trade-offs

There is an implicit balance between economic development and environmental objectives in California's policies and funding choices. The tradeoff between environmental quality and economic growth is difficult to negotiate. In enforcing and strengthening California Environmental Quality Act (CEQA) requirements, CARB regulations, and other related measures, the State and its communities have made an implicit choice to accept the costs of a better environment. Those costs necessarily diminish California's short-term economic competitiveness with less restrictive locations but produce a better quality of life for Californians. That quality of life must be balanced against the need for employment and earnings security with California's high cost of living. California has many areas of high poverty, which are often very areas with environmental justice issues from nearby transportation activity.

California is not alone in environmental concerns. Federal emissions standards lag behind California's but have moved in the same direction. Congested urban areas throughout the country face emissions issues and will need to act. Other port areas now require clean trucks, and more will likely follow. In this regard, some of California's higher costs may be regarded as only near-term competitive disadvantages that may be reduced in the long run.

Appendix D. National Highway Freight Network Mileage

Table D.1: California Primary Highway Freight System (PHFS) Route

Route	Start Point	End Point	Length (Miles)
Figueroa St	CA30P	I110	0.17
I-10	I405	I5	12.93
I-10	I710	CA/AZ Line	221.73
I-105	CA3A	I605	17.32
I-110	S47	I10	20.45
I-15	I8	CA/NV Line	287.32
I-205	I580	I5	12.98
I-210	I5	I10	44.67
I-215	I15	S30	46.24
I-238	I880	I580	2.18
I-305	CA34P	I80	1.25
I-305	I5	S99	2.13
I-40	I15	CA/AZ Line	154.61
I-405	I5	I5	72.41
I-5	W Grape St	I8	3.21
I-5	I805	CA/OR Line	766.06
I-580	U101	I80	13.06
I-580	I238	I205	30.6
I-605	I405	I210	27.59
I-680	CA40P	I780	1.44
I-680	U101	I580	31.01
I-710	CA29P	I10	21.25
I-780	CA40P	I80	6.8
I-8	I5	0.17 Miles East of S67	16
I-8	S111	S7	6.83

I-80	U101	CA/NV Line	203.8
I805	S905	I5	26.73
I-880	U101	I80	41.93
Miramar Rd	I805	I15	5.27
SR-111	I8	S78	14.31
SR-118	I405	8.19 Miles West of I405	8.14
SR-120	I5	S99	6.38
SR-134	I5	2.39 Miles East of I5	2.62
SR-14	I5	23.45 Miles Northeast of I5	23.19
SR-170	U101	I5	6.05
SR-22	I405	I5	9.89
SR-23	U101	6.85 Miles North of U101	6.8
SR-4	I5	S99	4.11
SR-47	CA30P	I110	2
SR-55	I405	S91	11.82
SR-57	I5	S60	16.42
SR-57	S60	I210	7.79
New SR-58	S99	I5	17.79
SR-58	S99	I15	125.83
SR-60	I10	I215	52.84
SR-60	I215	8.90 Miles East of I215	8.9
SR-7	MX/CA Line	I8	7.23
SR-71	S60	3.63 Miles South of S71	3.88
SR-710	I210	2.17 Miles South of I210	2.17
SR-78	S111	S86	25.12
SR-86	S78	I10	46.92
SR-905	MX/CA Line	I805	6.55
SR-91	I110	I215	58.83
SR-99	I5	I305	298.94
US-101	CA36P	I5	64.17
US-101	I80	26.12 Miles South of I680	75.75
US-101	I580	6.38 Miles North of S116	36.43
US-50	S99	12.61 Miles East of S99	12.61
W Willow St	CA61R	I710	0.81

La Media Rd	S905	USA-Mex Border (Otay Mesa POE)	2.35
CA1A - Burbank - Glendale Airport	I-5	Burbank - Glendale Airport	0.87
CA29P - Port of Long Beach	Alameda	Port of Long Beach	2.03
CA30P - Port of Los Angeles	Anaheim St	Port of Los Angeles	4.54
CA31P - Port of San Francisco	Rt 101	Port of San Francisco	1.86
CA32P - Port of Oakland	I-880	Port of Oakland	2.26
CA33P - Port of Richmond	I-580	Port of Richmond	0.9
CA34P - Port of Sacramento	US50	Port of Sacramento	0.39
CA35P - Port of Redwood City	Rt. 101	Port of Redwood City	1.1
CA36P - Port of Hueneme	US 101	Port of Hueneme	20.21
CA39P - Channel Islands Harbor	Rt 101	Channel Islands Harbor	0
CA3A - Los Angeles International Airport	I-105	Los Angeles International Airport	0.98
CA40P - Port of Benicia	I-680	Port of Benicia	2.44
CA41P - Port of Stockton	I-5	Port of Stockton	1.81
CA4A - Oakland International Airport	I-880	Oakland International Airport	1.03
CA5A - Ontario International Airport	Rt. 10	Ontario International Airport	0.93
CA60R - Fresno TOPC Rail Yard	Rt.99	Fresno TOPC Rail Yard	0.58
CA61R - Long Beach (Carson) Rail Yard	Rt. 47	Long Beach (Carson) Rail Yard	0.75
CA62R - Oakland Rail Yard	I-880	Oakland Rail Yard	1.27
CA63R - Lathrop Rail Yard	Rte. 99	Lathrop Rail Yard	4.84
CA64R - LA (Nr. Union Station)	I-5	LA (Nr. Union Station)	1.09
CA65R - Richmond Rail Yard	Rt. 580	Richmond Rail Yard	1.45
CA66R - LA ATSF Rail Yard	I-710	LA ATSF Rail Yard	1.36
CA67R - Stockton Rail Yard	Rte 99	Stockton Rail Yard	1.57

CA68R - San Bernadino Rail Yard	I-215	San Bernadino Rail Yard	1.79
CA69R - City of Industry Rail Yard	SR 60	City of Industry Rail Yard	1.05
CA78R - UPS - Richmond Terminal	I-80	UPS - Richmond Terminal	2.17
CA7A - Lindbergh Field - San Diego	I-5	Lindbergh Field - San Diego	2.11
CA8A - San Francisco Intl Airport	US 101	San Francisco Intl Airport	0.29
		TOTAL	**3126.28**
Source: U.S. DOT Federal Highway Administration, 2022			

Table D.2: California Intermodal Connectors

Route	Length (Miles)
Anaheim - Amtrak	0.2
Bakersfield - Amtrak	2.2
Bakersfield Bus Terminal	0.6
Barstow Bus Terminal	1.9
Burbank - Glendale Airport	1.1
Channel Islands Harbor	0
City of Industry Rail Yard	2.13
Del Mar - Amtrak	0.9
Emeryville - Amtrak	0.2
Eureka Pipeline Ter.	0
Fresno - Amtrak	0.4
Fresno Air Terminal Airport	4
Fresno Bus Terminal	0.6
Fresno TOPC Rail Yard	0.5
Fullerton - Amtrak	1.1
Indio Bus Terminal	1.8
John Wayne Airport - Orange Co.	0.5
LA (Nr. Union Station)	1.3
LA (Nr. Union Station)	0.6

LA ATSF Rail Yard	1.8
LA ATSF Rail Yard	3.1
LA/Vernon Facility	0
Lathrop Rail Yard	3.1
Lindburgh Field - San Diego	1
Long Beach (Carson)Rail Yard	0.7
Long Beach Airport	1
Los Angeles 1 Pipeline Ter.	0
Los Angeles 2 Pileline Ter.	0
Los Angeles Bus Terminal	1
Los Angeles International Airport	8.2
Martinez - Amtrak	2.3
Oakland - Amtrak	0.6
Oakland Bus Terminal	0.2
Oakland International Airport	1.9
Oakland Rail Yard	1.9
Oceanside - Amtrak	0.9
Ontario International Airport	0.7
Ontario International Airport	0.8
Palm Springs Regional Airport	8
Port of Hueneme	11.8
Port of Hueneme	8.7
Port of Benicia	1.9
Port of Humbolt	0.4
Port of Long Beach	3
Port of Los Angeles	3.6
Port of Los Angeles	1
Port of Oakland	1.8
Port of Redwood City	1.6
Port of Richmond	0.8
Port of Richmond	1.1
Port of Sacramento	2.3
Port of San Diego	3.4
Port of San Francisco	1.6

Port of Stockton	4.3
Richmond Rail Yard	0.2
Sacramento Metro Airport	0
Salinas Bus Terminal	0.7
San Bernadino - Amtrak	0.7
San Bernadino Rail Yard	2.9
San Diego - Amtrak	0
San Diego Bus Terminal	0
San Francisco Intl Airport	0.3
San Francisco -Trans Bay	0.7
San Jose - Amtrak	1
San Jose Bus Terminal	0.5
San Jose Intl Airport	0
San Juan Capistrano - Amtrak	0.3
San Luis Obispo Bus Terminal	0.4
Santa Ana - Amtrak	0.2
Santa Barbara - Amtrak	0.3
Santa Barbara Airport	2.4
Santa Barbara Bus Terminal	0.7
Stockton Amtrak Station	1
Stockton Bus Terminal	0.1
Stockton Bus Terminal	0.1
Stockton Rail Yard	2.8
Union Station (LA) - Amtrak	0.3
UPS - Richmond Terminal	1.9
TOTAL	**122**
Source: U.S. DOT Federal Highway Administration, 2018	

Table D.3: California Non-PHFS Interstate Highway

Route	Start Point	End Point	Length (Miles)
I-10	Lincoln Blvd	I-405	3.3
I-10	I-5	I-710	2.95
I-215	Highland Ave	I-15 (North)	8.85
I-280	6th St	I-101 (South)	57.17
I-305	I-5	Harbor Blvd	2.31
I-380	I-280	US-101	1.67
I-5	MX/CA Line	Grape St	16.52
I-5	I-8	I-805 (North)	10.64
I-505	I-5	I-80	32.98
I-580	I-880	Grand Ave	3.13
I-580	0.31 Miles North of Fairmont Dr	I-238	2.34
I-580	I-205	I-5	16.03
I-680	I-80	CA40P	11.09
I-680	I-780	I-580	28.33
I-8	0.17 Miles East of SR-67	SR-111	100.01
I-8	S-78	CA/AZ Line	47.12
I-805	I-5 (South)	SR-905	1.6
I-880	I-280	0.13 Miles South of US-101	4.08
I-980	I-880	I-580	2
		TOTAL	**352.12**
Source: U.S. DOT Federal Highway Administration, 2022			

Table D.4: California's Critical Urban Freight Corridors

Road	County	Type	Start Point	End Point	Miles
SR 37	MRN	PM	R11.2	14.501	3.3
SR 152	SCL	PM	0.078	0.23	0.2
SR 152	SCL	PM	4.404	5.03	0.6
SR 152	SCL	PM	6.117	M10.277	4.2
SR 152	SCL	PM	R9.914	11.351	1.4
SR 156	MON	PM	R1.6	R1.4	0.92
US 101	SB	PM	9.200	12.300	3.09
SR 58	KER	PM	51.04	R52.35	1.74
Churn Creek Rd/Rancho Rd	SHA		.15 miles east of Interstate 5 on Churn Creek Road	.10 miles east of Shasta View Drive on Rancho Road	1.8
Pier B St	LA	Lat/Long	33.776921, -118.208396	34.053992, -118.001449	1.6
Harbor Street	SJ	Lat/Long	37.949263, -121.317923	37.948228, -121.333781	0.880
Port Road 5	SJ	Lat/Long	37.948831, -121.324887	37.950909, -121.327930	0.21
Port Road 13	SJ	Lat/Long	37.948844, -121.324182	37.944927, -121.323390	0.28
Port of Stockton Expressway	SJ	Lat/Long	37.948216, -121.355010	37.926890, -121.357975	1.53
McCloy Avenue	SJ	Lat/Long	37.948292l, -121.343438	37.963586, -121.366497	1.27
Embarcadero	SJ	Lat/Long	37.953317, -121.347736	37.963586, -121.367840	1.3
Humphreys Drive	SJ	Lat/Long	37.948913, -121.367710	37.963585, -121.367839	1.01
Hooper Street	SJ	Lat/Long	37.94903, -121.346731	37.953603, -121.348709	0.29
West Fyffe Street	SJ	Lat/Long	37.948937, -121.367722	37.949043, -121.343437	1.33
Navy Drive	SJ	Lat/Long	37.938077, -121.330015	37.948288, -121.321641	0.97
Washington Street	SJ	Lat/Long	37.944301, -121.336359	37.945208, -121.321641	0.81
Garner Rd.	STA	Lat/Long	37.63825141490, -120.92333435500	37.62504811490, -120.92293195700	0.91

SR 132	STA	Lat/Long	37.6382717092, -120.998177	37.6386852436, -121.03041377	1.97
SR-11	SD	Lat/Long	32.5639139998718, -116.927760999627	33.7491650007087, -118.190937000874	0.51
Britannia Blvd.	SD	Lat/Long	32.5635229998607, -116.97980000044	34.1067440004991, -117.331082999625	2.14
La Media Rd.	SD	Lat/Long	32.562918999903, -116.962388000726	34.2704450001563, -118.632805999964	2.27
SR-11	SD	Lat/Long	32.5641949997071, -116.947439999233	33.7912799997597, -118.240692999675	0.64
SR-11	SD	Lat/Long	32.5639139998718, -116.927760999627	32.708744999666, -115.499399000737	1.58
Temple Avenue	LA	Lat/Long	34.053714, -118.001719	34.053992, -118.001450	0.07
Montebello Blvd	LA	Lat/Long	34.005741, -118.109491	34.005164, -118.109787	0.11
Turnbull Canyon Road	LA	Lat/Long	34.020249, -117.971562	34.018491, -117.973529	0.17
Durfee Avenue	LA	Lat/Long	34.059963, -118.013133	34.061934, -118.012139	0.19
California Street	SBR	Lat/Long	34.067048, -117.226176	34.084850, -117.226192	0.2
BNSF (McKinley Street)	RIV	Lat/Long	33.885711, -117.517141	33.883014, -117.515173	0.25
BNSF & UP (3rd Street)	RIV	Lat/Long	33.984094, -117.365335	33.982930, -117.361711	0.25
San Bernardino Avenue	SBR	Lat/Long	34.077393, -117.201002	34.077575, -117.226066	0.4
SR-98	IMP	PM	31.8721	32.46	0.6
UP (Bellgrave Avenue)	RIV	Lat/Long	34.005021, -117.506396	34.007253, -117.499197	0.6
Archibald Avenue	SBR	Lat/Long	34.030943, -117.593095	34.043989, -117.593385	0.9

Aviation Blvd	LA	Lat/Long	33.945400, - 118.378495	33.931014, - 118.378472	1
Pier D Street	LA	Lat/Long	33.762574, - 118.218733	33.769822, - 118.208312	1
SR-74	OR	PM	1.062	2.134	1.1
SR-86	RIV	PM	23.229	22.176	1.1
South Mountain View Avenue	SBR	Lat/Long	34.067054, - 117.243662	34.085852, - 117.243728	1.3
West Century Blvd	LA	Lat/Long	33.945616, - 118.396175	33.945416, - 118.369020	1.5
Alabama Street	SBR	Lat/Long	34.067088, - 117.208757	34.106066, - 117.208778	1.6
Grove Avenue	SBR	Lat/Long	34.031256, - 117.628356	34.055001, - 117.628543	1.6
Harbor Scenic Drive	LA	Lat/Long	33.766958, - 118.207607	33.749165, - 118.190937	1.6
5th Street	SBR	Lat/Long	34.108394, - 117.303124	34.106744, - 117.331083	1.7
SR-118	LA	PM	1.789	.051	1.7
SR-1	LA	PM	1.337	9.247	1.9
SR-111	IMP	PM	3.227	1.181	2.42
SR-103	LA	PM	.055	1.752	2.5
Tippecanoe Avenue	SBR	Lat/Long	34.064873, - 117.261113	34.104569, - 117.259615	2.8
Miliken Avenue	SBR	Lat/Long	34.024436, - 117.558273	34.067221, - 117.558022	3
SR-118	VEN	PM	18.208	19.981	3.09
Etiwanda Avenue	SBR	Lat/Long	34.067096, - 117.524007	34.018458, - 117.524421	3.3
Riverside Avenue	SBR	Lat/Long	34.068455, - 117.370326	34.021223, - 117.362479	3.3
Rice Avenue	VEN	Lat/Long	34.222267, - 119.142429	34.147208, - 119.136904	4.3

SR-71	LA	PM	4.498	.676	1.4
US-395	SBR	PM	4.011	15.706	4.5
Euclid Avenue	SBR	Lat/Long	34.029790, -117.651018	33.961260, -117.650681	4.7
I-215	SBR	PM	9.334	17.753	8.4
SR-118	VEN	PM	22.558	.053	10.08
I-210	SBR	PM	11.531	44.502	19.1
I-210	SBR	PM	33.18	11.531	21.8
SR-57/Lambert IC Improvements	OR	PM	2.874	20.884	0.34
210/5th Street	SBR	PM	30.264	30.236	0.25
Jurupa Ave/Archibald	SBR		34.044473, -117.593200	34.046818, -117.524297	5.12
SR-47 Alameda Corridor Term	LA	PM	3.529	4.565	8.2
Oakdale Road	STA	Lat/Long	37.7109204101752, -120.958371438346	37.7035304591772, -120.958252598471	0.5
North County Corridor	STA	Lat/Long	37.7105766158817, -120.931767899891	37.7109393803991, -120.916870249462	0.63
SR 60	RIV	Lat/Long	33.982542, -117.708866	33.932763, -116.990416	2.6
SR 71	SBD	Lat/Long	33.982542, -117.708866	33.883688, -117.641222	8.1
Euclid Ave (Part 2)	SBD	Lat/Long	33.961260, -117.650681	33.930807, -117.659350	2.2
Terminal Way-Ferry St	LA	Lat/Long	33.751443, -118.258504	33.751207, -118.250805	1.6
Seaside Fwy (SR-47/I-710)	LA	Lat/Long	33.753913, -118.251693	33.777691, -118.206823	3.4
SR37	SOL	PM	R6.877	R12.001L	5.1
				TOTAL	**192.3**
Source: Caltrans, 2022					

Table D.5: California's Critical Rural Freight Corridors

Road	County	Type	Begin Postmile/Lat-Long	End Postmile/Lat-Long	Miles
SR 37	SOL	PM	R0.0	R6.877	6.9
SR 37	SON	PM	0	R6.245	6.2
SR 37	MRN	PM	14.501	14.617	0.1
SR 152	SCL	PM	0.01	0.078	0.1
SR 152	SCL	PM	0.23	4.404	4.2
SR 152	SCL	PM	5.03	6.117	1.1
SR 152	SCL	PM	11.351	R35.161	23.8
SR 89	SHA	PM	29.000	30.000	0.99
SR 44	SHA	PM	44.000	47.000	4.07
SR 89	SHA	PM	42.700	42.900	0.2
SR 89	SIS	PM	28.500	29.500	1
SR 97	SIS	PM	29.400	29.900	0.48
SR 299	SHA	PM	17.200	18.293	1.04
SR 299	TRI	PM	66.5	67.425	0.95
US 395	LAS	PM	14.000	R16	2.03
SR 89	PLU	PM	27.300	27.400	0.11
SR 49	NEV	PM	10.8	R13.3	2.5
US 395	INY	PM	29.940	42.080	12.14
Skyline Extension	LAS	Intersection	Skyline Road/Johnstonville Rd.	SR 36 R29.931	0.49
Faith Home Rd.	STA	Lat/Long	37.6093232937, -120.92042064	37.5511595323, -120.920390836	4
Fink Road	STA	Lat/Long	37.397462, -121.137693	37.391316011, -121.070037919	4.01
SR-132	STA	Lat/Long	37.6382717092, -121.067334424	37.6386852436, -121.03041377	2
SR-108	STA	PM	30.55	33.05	2.69
South Fifth Ave.	STA	Lat/Long	37.76776585280, -120.844361868	37.7665983375,	0.09
SR-118	VEN	PM	20	22.54	2.54
SR-111	IMP	PM	7.7	3.2	5.35
North County Corridor	STA	Lat/Long	37.70745193, -120.9583157	37.71057662, -120.9317679	1.63

SR-60	RIV	PM	21.379	27.971	6.6
SR-46	Kern	PM	0	0.4	.40
SR-46	SLO	PM	57.3	60.8	3.50
				TOTAL	**101.2**
Source: Caltrans, 2022					

Appendix E. Designation Process for Critical Urban Freight Corridor (CUFC) and Critical Rural Freight Corridor (CRFC)

In response to FAST Act requirements, Caltrans and MPOs need to collaborate and submit nominations to FHWA for the designation of Critical Urban Freight Corridors and Critical Rural Freight Corridors (CUFC/CRFC), which are part of the National Highway Freight Network (NHFN).[395] The NHFN is the focus of funding for the National Highway Freight Program (NHFP) and for federal grant programs such as FASTLANE and INFRA (for projects that support national goals identified in 23 U.S.C. 167(b) and 23 U.S.C. 117(a)(2)). The portion of the NHFN already designated by Congress is called the Primary Highway Freight Systems (PHFS) and the CRFCs and CUFCs are important freight corridors that provide critical connectivity to the PHFS. The purpose and intent of these CUFC/CRFC is provided in detail on the federal websites. The provisions of the CUFC/CRFC program remain unchanged under the IIJA passed in 2021.

As noted in the federal guidance, there is no deadline for designating the CUFC/CRFC, and designations and de-designations will be on a rolling needs-based assessment. At any given time, California can have up to a maximum of 311 miles designated as CUFC and 623 miles as CRFC. FHWA recommends that Caltrans and MPOs work with the FHWA to develop an approach and timeline for identifying, tracking changes to, updating information on, and verifying the status of CUFC and CRFC roadways as part of the certification process.

This document describes the initial corridor designation process, assumptions applied for calculating miles, the rolling designation (or "on/off") process, and mileage methodology assumptions. Per the FAST Act, States are responsible for designating public roads in their state as CRFCs. In accordance with 23 U.S.C. 167(e), a State may designate a public road within the borders of the State as a CRFC if the public road is not in an urbanized area.

- In an urbanized area (UZA) with a population of 500,000 or more, the MPO in consultation with the State, is responsible for designating the CUFCs.
- In an urbanized area with a population of less than 500,000, the State, in consultation with the MPO, is responsible for designating the CUFCs.

Note that if a project is on the PHFS, no CUFC/CRFC designation is required. For others the following CUFC/CRFC nominating process will apply.

Process for CUFC/CRFC Designation in California

To initiate the coordination process, Caltrans reached out to all regional partners in October 2016. First, Caltrans and its partners formed a Technical Working Group (TWG) which met over several months to agree upon a process for the ongoing/rolling designations. The TWG reached a statewide consensus that each MPO be provided a certain "initial target allocation" out of the 311 CUFC miles, with the flexibility of temporarily increasing their target allocation by "trading miles" with donor agencies based on needs. Caltrans facilitated the process. There is no regional “target allocation” for CRFCs and Caltrans will oversee statewide distribution of CRFCs working with all regional agencies. After reviewing several potential options for the target allocations for CUFC, the MPO subcommittee developed a formula based on a 75 percent weight for the urbanized area populations and 25 percent weight on the proportion of PHFS (see **Table E.1**).

Table E.1: CUFC Target Miles and Caltrans Role in Managing the CUFC Target Miles396

MPO	Target Miles
AMBAG	3.75
BCAG	0.69
FCOG	5.35
KCAG	0.62
KCOG	5.67
MCAG	1.96
MCTC	0.87
MTC	65.07
SACOG	18.18
SANDAG	28.67
SBCAG	2.64
SCAG	160.58
SJCOG	7.76
SLOCOG	1.23
SRTA	1.8
StanCOG	4.24
TCAG	2.69
California Total	**311.77**
Source: California Department of Transportation, 2017	

Caltrans Office of Freight Planning will develop a Statewide critical freight corridor inventory (Scoreboard) which include a publicly available GIS database and a historical record of designated and de-designated miles. These resources can be found at https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/sustainable-freight-planning under the technical resources, tools, and training tab.

After the initial CUFC designation cycle, the TWG will reconvene every quarter to review the status of the freight network and may also update this guide as needed. The initial CUFC allocation in **Table E.1** is more of a target for the purposes of soliciting CUFC mileage nominations. There will likely need to be a trading process between regions that Caltrans should oversee.

CUFC "ON" PROCESS

The MPOs identify needed CUFC miles based upon available target miles for each region and the need to apply those miles to a project for funding allocation or INFRA grant eligibility. The MPOs assign miles to a project when the CTC approves a project and obligates funds; the MPOs advise Caltrans of this and request concurrence.

Upon receipt of a concurrence letter (within 15 days of request), MPOs submit nominations directly to FHWA for urbanized areas (UZAs) with a population of 500,000 or more within MPO boundaries. For UZAs with population under 500,000, MPOs submit nominations to Caltrans for official submittal to FHWA. Caltrans adjusts CUFC target miles on the scoreboard.

NOTE: Although large MPOs are technically only responsible for designating miles within the UZAs with population of 500,000 or more, they will nominate ALL urban miles within MPO boundaries, and seek concurrence from Caltrans. Caltrans will provide concurrence based on statewide and interregional plans and policies, for both CUFC and CRFC nominations.

CUFC "OFF" PROCESS

When project funding has been obligated (funds transferred), the MPOs can then de- designate those miles from its respective CUFC target allocation for the region. Caltrans adjusts the CUFC scoreboard accordingly.

CUFC "SWAP" PROCESS

When a loan of CUFC miles is negotiated from one region to another, Caltrans shall approve of the swap and indicate this swap on the publicly posted CUFC scoreboard. An official letter requesting the swap will be submitted to Caltrans, followed by an official response from Caltrans.

CRFC PROCESS

Statewide, the 623 CRFC miles will be managed by Caltrans as part of the assignment process. The "need" for CRFC designations, based on an initial call for shovel-ready projects, is estimated to be much less than the miles allocated to California. Therefore, Caltrans has proposed a list of criteria to prioritize corridors (if CRFC mileage needs are more than the federally allocated 623 miles).

CRFC ASSIGNMENT

The large MPOs and the smaller MPOs similarly submit their CRFC requests to Caltrans. Caltrans then submits requests to FHWA California Division Office. Caltrans maintains a CRFC scoreboard similar to the CUFC Scoreboard

MILEAGE METHODOLOGY AND ASSUMPTIONS

Interchanges

If one of the interchange roads is on the PHFS, no additional miles are required for this interchange project. This includes reconfiguring ramps, widening an overcrossing, signalizing ramps, and/or adding connections to reduce weaving which will improve operations for the mainline, particularly if congestion on the ramps/non-PHFS crossing causes queues to extend onto the PHFS. This is consistent with clarification that FHWA provided at the April 3, 2017 meeting of the TWG.

If neither of the roads is on the PHFS, the project sponsor should measure the distance on the mainline segment that corresponds to the largest project "footprint." For example, if the interchange project includes adding a new lane on one of the highways in addition to ramp modifications, the CUFC/CRFC would correspond to the distance of the widening component of the project. Per the logic for an interchange on the PHFS, only one of the intersecting roads needs to be designated as a CUFC/CRFC.

- If an interchange project includes significant mainline widening, the portion of the widening beyond the extent of the interchange would need to be designated as a CRFC/CUFC.
- If the interchange is on the PHFS, then the interchange would be exempt, and mileage would only be assigned to the widening portion of the project beyond the interchange extents on a non-PHFS route.

New Roadway Alignment Projects

Projects that would construct new alignments should use the mileage of the new alignment for designating a CUFC/CRFC. If the new alignment is planned to replace a route currently designated as part of the PHFS, no mileage is needed to be assigned to this project.

Roadway Projects Crossing Urban/Rural Boundaries

The urban portion of the project would be assigned CUFC and the rural portion of the project would be assigned CRFC mileage.

Port Projects

Statewide, port projects (seaport, airport, land port) cannot amount to more than 10% of the State's entire FAST Act Formula funds. No CUFC miles should be assigned.

ITS Projects/Non-Traditional Projects/Emission Reduction Projects

Intangible operational improvements such as ITS projects, incentives for near-zero emission technology or upgrading truck scales do not require CUFC/CRFC miles.

Grade Crossing Improvements

Grade crossing improvements like safety measures associated with implementing rail quiet zones and multimodal infrastructure at rail crossings are not roadway projects. No CUFC/CRFC miles should be assigned.

Grade Separation Projects

If the project would separate rail from a roadway that is already the PHFS, no CUFC/CRFC miles should be assigned. This is consistent with clarification that FHWA provided at the April 3, 2017 meeting of the TWG. If the project would separate rail from a roadway off the PHFS, the non-PHFS roadway would need to be designated as CUFC/CRFC and mileage should be measured along the length of the project footprint. In both cases, rail grade separation needs no CUFC/CRFC.

Appendix F. Bi-National and Multistate Corridor Efforts

California is an active member of many bi-national, multistate, and multimodal corridor initiatives that include the identification, planning, and implementation of corridor management and operational strategies that improve the effectiveness and efficiency of freight and passenger movement. The goal of these efforts is to bring states together to plan, manage, rehabilitate, and fund the capital and operational improvements needed to operate and maintain select nationally significant freight corridors cooperatively and collaboratively. These efforts consist of the United States-Mexico Joint Working Committee (JWC), United States-Mexico Binational Bridges and Border Crossings Group (BBBXG), Interstate 10 Corridor Coalition (I-10), 15 Mobility Alliance (I-15 MA), Interstate 15 Freight Mobility Enhancement Plan (I-15 MEP), Western States Freight Coalition (WSFC), West Coast Collaborative - Alternative Fuel Infrastructure Corridor Coalition (WCC-AFICC), and Marine 5 Highway (M-5) Corridor. The CFMP 2023 is informed by these efforts through engagement and review of the Bi-National and Multistate Corridor effort products.

Bi-National Efforts

The JWC and BBBXG are the primary bi-national efforts between the United States and Mexico to improve efficiency and effectiveness, align priorities of the Ports of Entry (POEs), and facilitate transportation across the international border.

UNITED STATES-MEXICO JOINT WORKING COMMITTEE

The JWC facilitates efficient, safe, and economical cross-border transportation movements and cooperates on land transportation planning. The JWC promotes effective communication and coordination, analyzes current and future transportation infrastructure needs, and evaluates transportation demand and infrastructure impacts. The JWC is working with partner agencies to create border-wide regional master plans that encompass comprehensive and prioritized assessment of transportation needs along the border that include POEs. The group is mostly comprised of transportation professionals from the FHWA, Mexico's Secretariat of Communications and Transportation and representatives from the U.S. Department of State, Mexican Ministry of Foreign Affairs of Mexico (Secretaría de Relaciones Exteriores), four U.S. border states DOTs, and six Mexico border States.

UNITED STATES-MEXICO BINATIONAL BRIDGES AND BORDER CROSSINGS GROUP

The BBXG is a forum for a bi-national effort to manage the planning, construction, and maintenance of planned, ongoing, or new border crossing projects and POEs along the 1,952-mile U.S.-Mexico border. The purpose of BBBXG's semi-annual meetings is to discuss operational matters involving existing and proposed bridges, border crossings, related infrastructure, and to exchange views on policy and technical information. Related issues involving facilitation of travel between the two countries, such as border region highways and other infrastructure projects are also discussed. The BBXG is co-chaired by the Department of State and the Mexican Ministry of Foreign Affairs of Mexico and is attended by federal agencies with an interest in border crossings. The ten U.S. and Mexican border states are active participants in these meetings.

Multistate Efforts

INTERSTATE 10 CORRIDOR COALITION

The Interstate 10 Corridor Coalition connects people, businesses, and services across multiple states. Arizona, California, New Mexico, and Texas formed the I-10 Corridor Coalition in 2016. The Coalition's goal is to work together using Intelligent Transportation Systems (ITS) and communications to create safer and more efficient travel for goods and people along a corridor stretching from California through Texas and eventually coast to coast. This includes determining the best ways to create seamless commercial vehicle inspection and permitting operations across the four states and to find the most economical way to complete corridor-level ITS projects.

The I-10 Corridor Coalition is committed to multi-jurisdictional coordination organized around a common vision and is facilitated through a cooperative support structure. The I-10 Corridor Coalition's vision is to create one connected corridor throughout the four states. This corridor utilizes the transportation expertise of the states collectively to enable resource sharing, joint testing, and economies of scale, while applying best practice protocols to improve safety and efficiency, improve freight and passenger movement, expand and coordinate the use of technology along the corridor, and promote cooperative planning.

INTERSTATE 15 MOBILITY ALLIANCE

The I-15 Mobility Alliance is a multistate cooperative alliance between California, Nevada, Arizona, and Utah Departments of Transportation. The Alliance was initially formed in 2007 with the federal designation of the I-15 Corridor of the Future. In 2011, the Alliance was officially established to develop a comprehensive multimodal plan, prioritize projects and policies of interregional significance, and to guide appropriate governance mechanisms for the on-going efficient and effective construction, operation, and maintenance of the Corridor. The effort resulted in the development of the I-15 Corridor System Master Plan in 2012 (and its 2017 update); Multistate I-15 Dynamic Mobility Project (MCOM Grant awarded to the Alliance); I-15 Corridor Alternative Route Study in 2017, and the I-15 Freight Mobility Enhancement Plan (National Economic Partnership Grand awarded to Caltrans and NDOT) in 2020. The Alliance now includes more than 95 public and private transportation and resource agency stakeholders. Throughout 2022, the Alliance hosted a series of issue-based workshops to identity needs and priorities for the multistate corridor, including High-Speed Rail & High-Capacity Transit; Major Infrastructure Projects; Freight Mobility; and Alternative Fuels & Emerging Technologies. In addition, the Alliance will be prioritizing projects and policies of interregional significance; seeking financial and other resources necessary for the implementation of the infrastructure improvements along and/or systemically connected to I-15; and devising appropriate governance mechanisms for the ongoing efficient and effective construction, operations, and maintenance of the corridor on a more sustainable basis.

INTERSTATE 80 WINTER OPERATION COALITION

The Interstate 80 Winter Operation Coalition is a partnership of the western states of California, Nevada, Utah, Wyoming, and Nebraska who are collaborating on strategies to improve safety, mobility, consistency of travel, and freight movement along the I-80 corridor. The Coalition successfully secured a federal grant through the Multistate Corridor Operations and Management (MCOM) program, which is funding the current program initiatives. The effort aims to improve the quality of information provided to travelers and the quality of real-time information shared among agencies for decision-making. These five sates initiated a single strategic planning effort to reach a consensus on how best to link operational processes and data to maximize winter mobility along the I-80 corridor.

The Coalition's objectives include:

- Establishing an institutional structure for coordinating operations on I-80 in the western states.
- Actively engage freight industry stakeholders to help inform priorities and needs that the Coalition can advance.
- Share best practices and winter operations innovations with I-80 Coalition partners.
- Researching innovative practices from other areas of the country facing similar challenges.

WESTERN STATES FREIGHT COALITION

The Western States Freight Coalition (WSFC) is a voluntary partnership of state DOTs from California, Arizona, Colorado, Idaho, Oregon, Nevada, New Mexico, Washington, and Utah, which are committed to multi-jurisdictional coordination, organized around a common agenda, and facilitated through a cooperative support structure. The WSFC mission is to facilitate, through multistate coordination, efficient, safe, sustainable, and forward-looking multimodal freight transport across the Western U.S. that fosters economic opportunities.
The WSFC heavily focused on addressing truck parking issues and sharing information on how each state was addressing needs in its state. Recently, the Western Association of State Highway and Transportation Officials (WASHTO) voted to form a freight committee. Given this recent development, it is likely that the WSFC will disband and join the new committee with the other member states and Canadian provinces of WASHTO.

WEST COAST COLLABORATIVE - ALTERNATIVE FUEL INFRASTRUCTURE CORRIDOR COALITION

Caltrans is an active partner in the West Coast Collaborative - Alternative Fuel Infrastructure Corridor Coalition (WCC-AFICC), a partnership between California, Oregon, and Washington that seeks to accelerate the modernization of west coast transportation corridors by deploying alternative fuel infrastructure for medium and heavy-duty vehicles. The Coalition is in the process of finalizing and implementing its Strategic Plan.

Marine Corridors

MARINE 5 HIGHWAY CORRIDOR

MARAD is working with the western states of California, Oregon, and Washington to explore its development for the purpose of alleviating freight movements and congestion along I-5 from the California–Mexico border region in San Diego to the U.S.–Canada border north of Seattle, Washington.In 2014, the West Coast Corridor Coalition sponsored the M-5 Corridor Study to determine the market and operational viability of marine highway services on the west coast. The study investigated if M-5 services were economically and operationally attractive to shippers and able to obtain sufficient cargo volumes in the marketplace. Operational, utilization, and cost parameters for six potential marine highway services were developed for the study. Caltrans worked with the with the Port of San Diego and the Port of Bellingham (Washington) to have the West Coast Marine Highway 5 (M-5) Coastal Connector Project officially designated by the United States Maritime Administration (MARAD) under their America's Marine Highway (AMH) program. The M-5 Coastal Connector utilizes the movement of goods by waterborne routes that are served by highway or railway, therefore reducing and augmenting land-based transportation, vehicle-miles-traveled, and associated greenhouse gas emissions. One sailing from the Port of Bellingham to the Port of San Diego carrying 6,000 tons of lumber removes an estimated 250 truck trips and 272,500 truck miles traveled; 197,000 of those miles are in California. In addition to air quality benefits, the shift from roadway to waterway goods movement will dramatically decrease roadway maintenance costs. The project designation was officially awarded in August of 2021, allowing Caltrans and our partners to request federal funding for implementation.

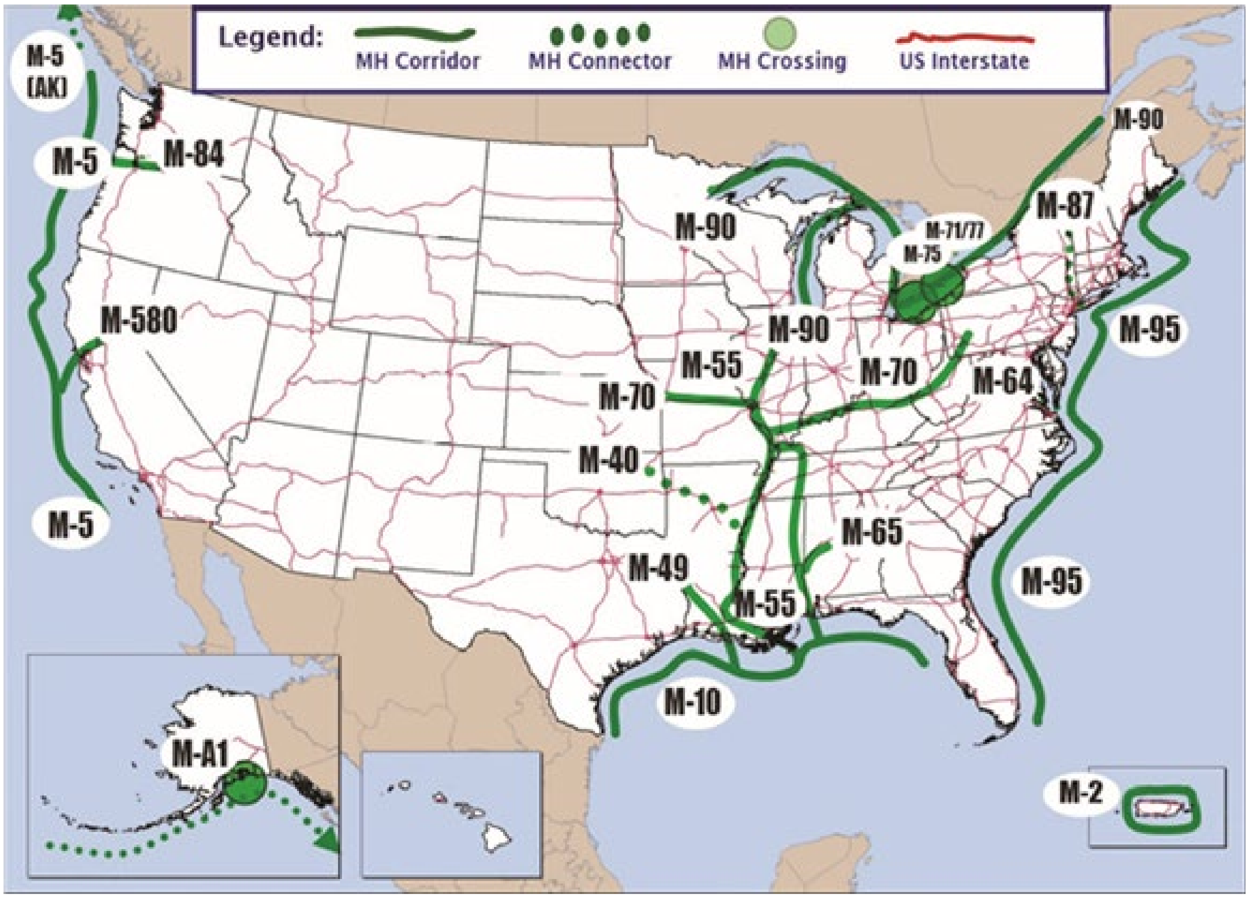

Figure F.1: America's Marin Highway Routes (Source: U.S.DOT Maritime Administration, 2019)

Appendix G. Truck Technology Types

Dual-Mode Hybrid & Plug-In Hybrid Electric Vehicle

This vehicle is an advanced parallel hybrid with the internal combustion engine as the main source of power. The technology is moderately mature with little to no changes in operations compared to a diesel-operated truck. The actual ZE range is limited, as it only functions in ZE mode at low speeds and/or is subject to certain load limits. Unlike the Hybrid Electric Vehicles (HEVs), the Plug-In Hybrid Electric Vehicles (PHEVs) have batteries that are recharged through the electrical grid. Recharging is becoming faster and charging locations are becoming more prevalent. PHEVs can operate in ZE mode for longer distances than HEVs. These trucks achieve approximately 15 percent emissions savings compared to conventional diesel trucks.

Range-Extended Electric Vehicles with Integrated Engine

These vehicles can use either electric power or diesel fuel, but the primary source of energy is the electric motor. The engine can run either on diesel or compressed natural gas (CNG) when the batteries are depleted. The determining factor for ZE range is battery size. Therefore, this truck type can be designed for specific ZE ranges as needed, subject to corresponding changes in cost. These trucks achieve approximately 25 percent emissions savings compared to conventional diesel trucks.

Range-Extended Electric Vehicles with Integrated Fuel Cells

This technology is analogous to the Range-Extended Electric Vehicles (REEV) with integrated engines, except that it relies on a fuel cell in place of an integrated engine when the vehicle battery is depleted. The fuel cells require hydrogen refueling stations for recharging, making these trucks a practical solution only in areas where such refueling stations exist. The technology can be designed to fit within tight spaces and can be accommodated by a standard diesel truck, but it comes at a higher price point compared to other technologies. These vehicles also offer relatively long useful lifespans and small maintenance costs. This technology is already available on the market. These vehicles can operate in true zero-emissions mode making it is relatively easy to obtain regulatory certification for them.

Battery Electric Vehicles

The Battery Electric Vehicle (BEV) is an electric-only vehicle powered by its battery alone, meaning that longer ranges require larger, heavier, more costly batteries. The vehicle batteries can be recharged using dedicated recharging stations or overhead/in-pavement catenary power systems (if the vehicle is properly equipped to draw power from such a source). Recharging of the internal battery requires more time than refueling a REEV fuel cell or internal combustion engine. Alternatives to on-road charging include battery exchange. Battery exchange is currently being used in port environments, such as the Port of Long Beach's Middle Harbor Terminal, which uses battery exchange to continuously power Automated Guided Vehicles (AGV) that move cargo throughout the terminal. Full-electric trucks require larger batteries than HEVs and typically weigh more. HEVs have a longer range, but as battery technology continues to improve some EV trucks have demonstrated travel ranges of 200 miles. One of the major disadvantages posed by EVs is cost. The batteries for full-electric trucks currently add approximately $100,000 to the vehicle price. These vehicles can operate in true zero-emissions mode making it is relatively easy to obtain regulatory certification for them.

On-site Solar Generation at Truck Parking Facilities

On-site solar generation provides an opportunity for additional energy production at parking areas, with the ability to lessen demands on the grid. There are a handful of projects testing the deployment of solar panels to support Electric Vehicle Supply Equipment (EVSE) to support zero-emission trucks. The first solar-powered truck stop in the United States for heavy-duty electric trucks is expected to open late October 2022 in Bakersfield, California. The 25-megawatt, solar-powered electric-only 110-acre truck stop will feature a solar micro-grid with battery storage and grid energy from Pacific Gas & Electric, and over time will grow to support more than 40 charging bays.

Range Extenders Utilizing Roadway Power

New truck technologies require roadway infrastructure to charge the electric trucks while on route using technologies that are already widely used for transit vehicles. This technology allows for smaller, cheaper on-board batteries and therefore lower vehicle costs as well. This cost savings per vehicle is offset by significantly greater costs for infrastructure supporting systems relative to other ZE/NZE technologies. These vehicles can operate in true zero-emissions mode making it may relatively easier to obtain regulatory certification for them.

For more information and status for each truck technology type, please refer to ARB's Heavy-Duty Investment Strategy located at https://ww2.arb.ca.gov/sites/default/files/2019-09/fy1920fundingplan-appd.pdf.

Appendix H. Outreach and Engagement Efforts

During the development of the CFMP 2023, various outreach efforts, such as public workshops, public outreach, and a digital outreach strategy via Facebook were conducted to better identify and understand the freight-related concerns of California residents. With the development of the CFMP 2023 various outreach efforts were conducted to gather feedback from a diverse set of demographic populations and geographic regions to make sure we captured all the freight related concerns. Primary communities of focus were:

- **Rural Communities** - Rural communities tend to be isolated, which often leads to fewer supply chain transportation routes in their community. Lack of modern freight infrastructure makes it challenging to move goods into, thorough, and out of these communities.
- **Urban Communities** - Urban communities experience congestion from the many supply chain transportation routes traversing their communities. On the other hand, they also experience a great benefit from the proximity of the supply chain.
- **Native American Tribes** – There are roughly 109 Indian tribes in California. Some are near highly populated metropolitan areas, while others are located in the mountains of Northern and Eastern California. Native American concerns are a priority for the State. Quality feedback regarding Tribal needs provided during targeted outreach informed the development of the CFMP 2023.
- **Environmental Justice Communities** – Outreach to these communities was essential, given the disproportionate impacts on air quality, public health, and social inequity freight movements created in these areas. Outreach was focused on communities that were classified under AB 617 and identified by CARB to participate in the Community Air Protection Program (CAPP). AB 617 was created to reduce health impacts from nonvehicular air pollution and is supported by an extensive emissions database and air monitoring networks. CAPP will develop and implement focused actions to improve overall air quality for these selected communities. Including feedback from these communities was extremely vital to the overall creation and future implementation of the CFMP.

Outreach Activities

PUBLIC WORKSHOPS AND OUTREACH ACTIVITIES

Caltrans hosted multiple public workshops during the CFMP development. The Southern California Introductory Public Workshop was held in Diamond Bar on May 17, 2018, and the Northern California Introductory Public Workshop was held in West Sacramento on June 6, 2018. In both workshops, participants were given an overview of the CFMP and were asked to discuss how they interacted with freight, how they benefitted from freight, how they were impacted by freight, and what types of investments they would like to see regarding freight in their respective communities. To promote participation in the workshops, more than 1,200 email invitations were sent, over 100 personal phone invitations were made, and numerous organizations invited their entire memberships (estimated in the hundreds).

Public Outreach was conducted at multiple different events throughout California. These events were staggered to conduct outreach both before and after the draft plan was released. These events included the following:

- California Transportation Planning Conference in San Diego from February 23-25, 2019
- Kool April Nights in Redding on April 27, 2019 from 7am-4pm
- CicLAvia in Wilmington on April 28, 2019 from 9am-4pm
- Downtown Farmers Market in San Luis Obispo on May 23, 2019 from 6pm-9pm
- One on one interview with Don Norton Executive Director, CA Short Line Railroad Association on August 9th from 11am- 12pm
- One on one interview Douglas Briggs, P.E. Chief, Highways for National Defense on September 1st from 10am-11am
- One on one interview Dr. Tom O'Brien Executive Director Center for International Trade & Transportation University of Long Beach on August 23rd from 10am- 11am
- One on one interview with Rob Ball Deputy Director Planning Kern Council of Governments on August 9th from 11am-11:30am
- One on one interview with El Sereno Community Land Trust on August 22nd from 1:30pm-2:30pm
- One on one interview with Mike Jacob General Counsel and Vice President of the Pacific Merchant Shipping Association on August 16th from 2pm-3pm
- Presentation and outreach to AB 617 Portside Environmental Justice Steering Committee Meeting in San Diego on September 24, 2019, from 6pm-8pm
- Presentation and outreach to San Bernardino/Muscoy AB 617 Community Steering Committee, October 20th, 2022
- Presentation and outreach to South Los Angeles AB 617 Community Steering Committee, September 8th, 2022
- Presentation and outreach to East LA, Boyle Heights, and West Commerce AB 617 Community Steering Committee, August 18th, 2022
- Presentation and outreach to Southeast Los Angeles AB 617 Community Steering Committee, August 4th, 2022
- Presentation and outreach to Wilmington, Carson, West Long Beach AB 617 Community Steering Committee, August 25, 2022
- Presentation and outreach to Eastern Coachella Valley AB 617 Community Steering Committee, October 27, 2022
- Presentation and outreach to Shafter AB 617 Community Steering Committee, September 22, 2022.

Caltrans staff created innovative ways to engage people at these events to spark their interest in freight. Once the public was engaged, staff proceeded to converse with them about freight issues in California and encouraged participants to share how freight affected them and their communities. Some of the prominent questions we asked, and themes we noticed from these conversations included the following:

- What impacts from freight do you observe in your community?
- How do you interact with freight in your community?
- What benefits from freight do you observe in your community?

- What freight investments should be made in your community?

Caltrans staff invited participants to take a 10-question survey on provided iPads. If they declined, staff offered a CFMP business card which included a QR code. Once scanned, this code would direct them to the freight survey, which they could complete on their own. Additionally, Caltrans created mailers with the questions listed above for people to fill out and mail back. Conducting public outreach proved to be much more effective than the two public workshops, as these events allowed Caltrans staff to speak with a larger number of people from a diverse range of backgrounds.

PUBLIC SURVEY

1. How many shipments do you receive each month from online retailers like Amazon, Walmart, Wayfair?
    - 1-2
    - 3-5
    - 6-10
    - More than 10
2. Where are these shipments delivered?
    - Home
    - Work
    - Amazon Box
    - Other
3. How do you experience the merchandise movement activity in your community?
    - Cargo trains at rail crossings
    - Semi-trucks on major highways
    - UPS/FedEx trucks in your neighborhood
    - Industries such as manufacturing/distribution in your city
4. Rank which good move below benefits your community the most. (1st Most Beneficial)
    - Higher tax revenues
    - High number of jobs
    - Faster economic development
    - Higher house prices
    - Access to a larger market through online shopping
5. Classify the following items in order for the biggest truck traffic impact in your community. (1st Biggest Impact)
    - Truck traffic congestion
    - Health impacts and air pollution
    - Acoustic pollution
    - Truck/driver safety (sharing the public road)
    - Truck-damaged Road/pavement
6. Have you ever had to move due to negative freight impacts?
    - Yes, my house
    - Yes, my work
    - Yes, my children's school
    - No
7. What projects do you think should be a priority in your community?
    - Safety projects at the rail crossing
    - Alleviating truck congestion

    - Improving air quality
    - Created goods movement work/job training programs
    - Increasing the use of alternative energies
    - Increased flexibility in out-of-hours and nighttime delivery
8. Did you participate in the development of the 2014 California Cargo Mobility Plan (CFMP)?
    - Yes
    - No
    - I do not know
9. What motivated you to participate today?
    - I want to learn more
    - I want concerns about the impact of freight on my community
    - I think freight can benefit my community
10. Provide additional feedback.

INDUSTRY FOCUS GROUPS

The six focus groups in *Bakersfield, Oakland, San Bernardino, Stockton, Redding, and Los Angeles* each began with the same general agenda topics: Competitiveness, Technologies, Workforce, Sustainability, Projects. For each topic, the team asked participants specific questions to solicit views of major groups with similar interests. The questions are listed below under their corresponding topics:

Competitiveness:

- How does the cost of freight transportation in California affect your ability to grow and to compete with non-California firms or locations?
- What can Caltrans and other state agencies do to lower those barriers?
- How should we measure freight transportation's impact on California's Competitiveness for new jobs or market share?
- Do you have data or other information that would be helpful?

Technologies:

- What technologies do you see as most promising for your business?
- What should the State do to encourage or enable new freight transportation technology?

Workforce:

- Do you expect to have the workforce you need to operate and grow in the future?
- What workforce shortfalls have you experienced, or do you expect?
- What can the public and private sectors do to develop the workforce we need?

Sustainability:

- If we define sustainability as including operations, economics, environmental impacts, and social impacts, what do you see as the challenges to achieving sustainability for your business in California?
- What should Caltrans and the State of California do to help you achieve sustainability?

Projects:

- What California infrastructure projects or programs are most important to your business?
- What is the most important criteria Caltrans should use in evaluating freight projects or programs?

- How should Caltrans measure progress against those criteria?

INDUSTRY INTERVIEWS

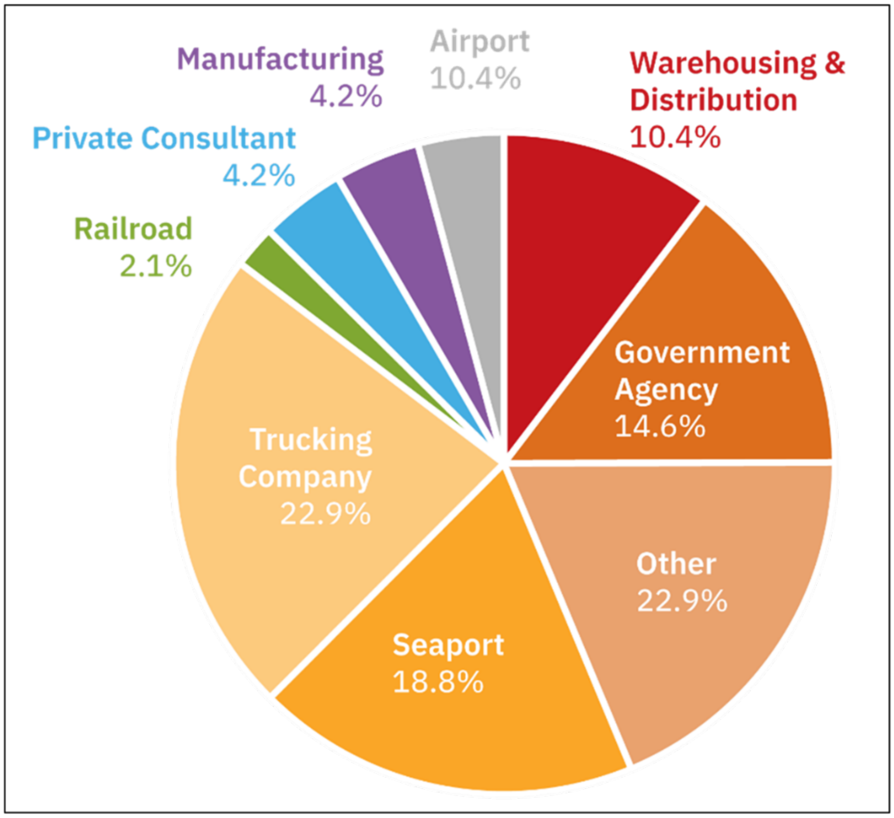

Figure H.1: Breakdown of the Stakeholders who provided feedback

Major industry stakeholders such as trucking, ports, railroads, and industry associations were interviewed with the same questions as the industry focus groups. Like the Industry Focus Groups, questions fell under the following themes: Competitiveness, Technologies, Workforce, Sustainability, and Projects.

INDUSTRY SURVEY

An online survey was created and distributed via email to freight stakeholders from the Public and Private sectors throughout the state. There were 106 respondents categorized as shown below:

Fifteen substantive questions and 3 identification questions were asked. Questions are listed below:

1. How does the cost of freight transportation in California affect your ability to grow and to compete with non-California firms or locations?
2. What can Caltrans and other State agencies do to increase your competitiveness?

3. What elements do you think we should consider when measuring freight transportation's impact on California's competitiveness?
4. What new technologies or innovative programs do you currently have or will deploy within the next few years?
5. If you are not currently, or do not plan to deploy any new technologies or innovative programs from Question 4, what are the biggest barriers?
6. What technologies do you see as most promising for your business?
7. What should the State do to encourage or enable new freight transportation technology?
8. What type of workforce shortfalls have you experienced, or do you expect to encounter in the near future?
9. What can the public sector do to develop the workforce we need?
10. What can the private sector do to develop the workforce we need?
11. If we define sustainability as including operations, economics, environmental impacts, and social impacts, what do you see as the challenges to achieving sustainability for your business in California?
12. What are the best opportunities to reduce energy consumption in your business?
13. What California infrastructure projects or programs are most important to your business?
14. What are the most important criteria in evaluating freight projects or programs?
15. What other issues should the California Freight Mobility Plan address?

DIGITAL OUTREACH AND SOCIAL MEDIA SURVEY

An online survey tailored specifically for the public was created and distributed via mailers, business cards, and Facebook (described below).

The Digital Outreach effort was designed to gather information through Facebook from specific, targeted groups throughout California. Caltrans began this effort by running a test Facebook post through the Caltrans Headquarters main Facebook page which allowed Facebook users two ways to take the survey:

- via the Caltrans Facebook Page,
- via a “boosted” post on targeted users’ newsfeeds

The boosted post reached from 1,200 to 4,400 persons for 7 days within the Moreno Valley and Oakland areas who associated with certain lifestyles and interests (parenting, online shopping, travel, education, retail shopping, etc.). The post allowed targeted users to voluntarily access a link directing them to the CFMP survey on Constant Contact’s digital platform. Caltrans staff found that they were able to engage thousands of people in a short amount of time for a very low cost through Facebook.

After the test proved to be effective, Caltrans created six additional Facebook posts unique to different geographic areas that included compelling information about goods movement, freight industry facts, and other posts seeking the general public’s needs when it comes to freight. These six targeted communities were: Long Beach, Ontario, Moreno Valley, Bakersfield, San Pedro, Oakland, and Redding. All posts included a call-to-action which motivated the audience to complete the CFMP survey to help improve freight mobility in their respective communities.

SURVEY RESULTS

As mentioned above, a main component of the outreach efforts included the CFMP survey. In this survey, respondents were asked nine questions regarding the impact of freight in their lives and communities. Approximately 40 members of the public took the survey via the Facebook posts. The survey was not scientific but did provide a qualitative assessment of how the public who uses Facebook feel about freight in California.

This survey served as a useful tool to gather information regarding freight related issues in various communities. When respondents were asked about their participation in the development of the 2014 CFMP, 62 percent said they did not participate at all and 32 percent of respondents said they were motivated to participate now so they could learn more and understand the concerns about freight impacts in their respective communities. Not only did this survey allow Caltrans to gather important information regarding public perceptions of freight, but the digital outreach effort was also able to increase public participation in the development of this plan and create awareness surrounding freight related issues statewide.

Appendix I. TCEP Cycle 3 Projects with ZEV Infrastructure

Table I.1: TCEP Cycle 3 Projects with ZEV Infrastructure

Project	Programmed Amount	Scope w/ZEV components?	Description
1. Port of Oakland Microgrid	$41,635,000	100%	Supports up to 145 heavy duty/Class 8 truck electrical chargers distributed throughout the Port. Will provide reliability and resiliency at the Port during grid overload events or when requested by the State to reduce power demand. It also includes solar generation and accompanying battery energy storage systems.
2. I-5, SR 15, and Harbor Drive 2.0	$18,500,000	Partial	Project includes zero-emission commercial vehicle charging for up to 3 trucks.
3. Otay Mesa East Port of Entry	$140,000,000	Partial	Project will deploy two heavy truck electric charge points at the CVEF with infrastructure allowances to expand this to 10 charge points over time. Additional 30 Electric Vehicle (EV) charge points will be provided along with solar power parking covers.
4. Electric Vehicle Oasis South	$28,095,000	100%	Will install charging equipment at 6 struck stops in Southern California, battery storage and onsite solar power generation, direct charging will be available and will charge 85 trucks per day.
5. Sacramento County Watt EV Innovative Freight Terminal	$33,688,000	100%	Will install public zero-emission truck direct current fast charging,

			onsite solar power generation and provide charging for transit and passenger vehicles.
6. TOWN Rail Safety Improvements	$30,200,000	Partial	Will include ZEV infrastructure for electric charging and hydrogen fueling stations for medium and heavy-duty trucks, an investment of $1.7 million to construct 10 electric charging stations and has procured battery electric trucks.
7. US 395 Freight Mobility and Safety Project	$35,000,000	Partial	Will set aside up to $5 million for zero-emission fueling infrastructure
8. I-10 Corridor Freight and Managed Lane Project	$85,000,000	Partial	Will include a $10 million investment in zero-emission truck fueling and charging infrastructure and authorization by SBCTA to invest a share of excess toll revenue for zero-emission truck funding incentives.
9. Southern California Hydrogen Fueling Facilities	$41,900,000	100%	The Project will construct six hydrogen fueling stations along California freight corridors in the Cities of Ontario, Colton, Hesperia, Rialto, San Diego (Otay Mesa), and Carson near the Port of Long Beach. The hydrogen fueling stations will include two to four fueling aisles.
10. Fix 5 Cascade Gateway	$70,849,000	Partial	The project will install a new medium and heavy-duty electric vehicle charging facility with (2) charging ports at the California Highway Patrol Cottonwood Commercial Vehicle Enforcement Facility.

Appendix J. Smart Growth and Urban Freight Considerations

Recent and impending technological advancements stand to revolutionize urban transportation. From autonomous vehicles and intelligent transportation systems to shared- and micro-mobility (i.e., electric scooters, bikeshare), many facets of urban transportation are evolving, and urban goods movement is no exception. The rapid increase of e-commerce as a share of global retail sales has reduced the number of trips that households must make to buy goods, but this reduction in trips has been offset in many metropolitan areas by increases in package delivery trips.[397] The wide availability of many commonly demanded products through online retailers like Amazon resulted in large increases in rapid direct-to-consumer package deliveries. Online retailers like Amazon can deliver many products the same day they are ordered by consumers.[398] The resulting increase in delivery trips has increased competition for limited curb space in many metropolitan areas, as goods movers must share the curb with Transportation Network Companies (TNCs), transit vehicles, parked automobiles, bicyclists, and pedestrians.[399]

As the global transportation and goods movement industries evolved over time, cities rapidly grew and are expected to continue this trend in the future. According to the World Bank, 55 percent of the global population lives in urban areas today; by 2050, 68 percent of the global population will be urban.[400] In California, 95 percent of the population lived in urban areas in 2010, compared to 94 percent in 2000.[401] As the world becomes more urbanized, the demand for commercial activity will continue to increase as people consume more goods and services than ever before, driving up competition for both space and resources.[402]

From an urban planning perspective, the growth of cities has resulted in many negative consequences, including increases in GHGs from automobile use and industrial activity, and sprawling development patterns that consume large quantities of land. This has led to the adoption of 'smart growth' as a planning philosophy, which aims to promote "compact development (moderate to modestly high density), a mixture of land uses in that development, and a range of feasible transportation options that promote and facilitate the use of modes of travel other than the automobile (e.g., transit, bicycles, and walking)".[403]

While the achievement of smart growth goals may ultimately serve to make cities more livable for people, it also presents challenges to the urban goods movement industry, which has historically been overlooked in metropolitan planning processes. While the achievement of smart growth goals will undoubtedly supply many benefits to urban populations, urban planners and local governments must be mindful of the needs of the goods movement industry and urban consumers and businesses, which are all central to the urban economy.

Smart Growth

Urban areas in the United States have historically been automobile-centric environments, and the urban planning profession has contributed to this through the development of such policies as minimum parking requirements, minimum lot sizes, and restrictions on development density.[404]

Automobile dominance in the United States has been intensified since the 1950s by the interstate highway network, which served to improve connectivity within and between urban areas, making extensive automobile travel both possible and attractive. However, population density has been increasing in most California cities over the past thirty years as an increasing share of the state's population is choosing to live in urban areas, which is increasing competition for road infrastructure, as the urban goods movement industry must share the road with an increasing number of personal automobile users.

Figure J.1 shows a map of the percent change in urban population density from 1990-2019 (in people per square mile) for California cities with a population of 100,000 or more; 35% of those cities experienced an increase in population density of 1-25%, and 31% experienced an increase of 25-50%. Three cities experienced an increase in population density of 200-500%, and two cities experienced an increase greater than 500%, suggesting that little or no development existed in those areas prior to 1990. The areas with the largest increases in population density are in the Sacramento area and in Southern California between Riverside and Carlsbad.

Expansion of the roadway infrastructure in urban areas has facilitated economic growth, including within the freight industry; however, the widespread adoption of automobile- oriented urban development results in many negative consequences, including increased GHGs and associated reductions in air quality due to automobile dependence, increased quantities of impervious surfaces and associated degradation of water quality due to polluted runoff, and loss of open space due to increased land consumption, to name a few.[405]

As awareness of the impacts of automobile dependency has grown, urban planners and policy makers have increasingly looked to policies under the umbrella of 'smart growth' to enhance the livability of cities and curtail the negative impacts of automobile dependency.[406] In California, several pieces of legislation (AB 32, SB 375, SB 743, SB 50) have been passed or proposed to advance smart growth priorities. SB 375 requires CARB to set regional targets for GHG reductions and requires metropolitan planning organizations to include a 'Sustainable Communities Strategy' detailing how those reductions will be achieved.[407] Once fully implemented, SB 743 will change the way transportation impact analysis is conducted in California, shifting the focus from measuring traffic congestion to measuring the impacts of driving using key metrics such as VMT per capita, VMT per employee, and net VMT, which will incentivize denser land use development thus reducing lengths of overall trips[408] SB 50 seeks to incentivize residential development projects that provide high job accessibility or transit accessibility, both of which would reduce the need for vehicle trips.[409]

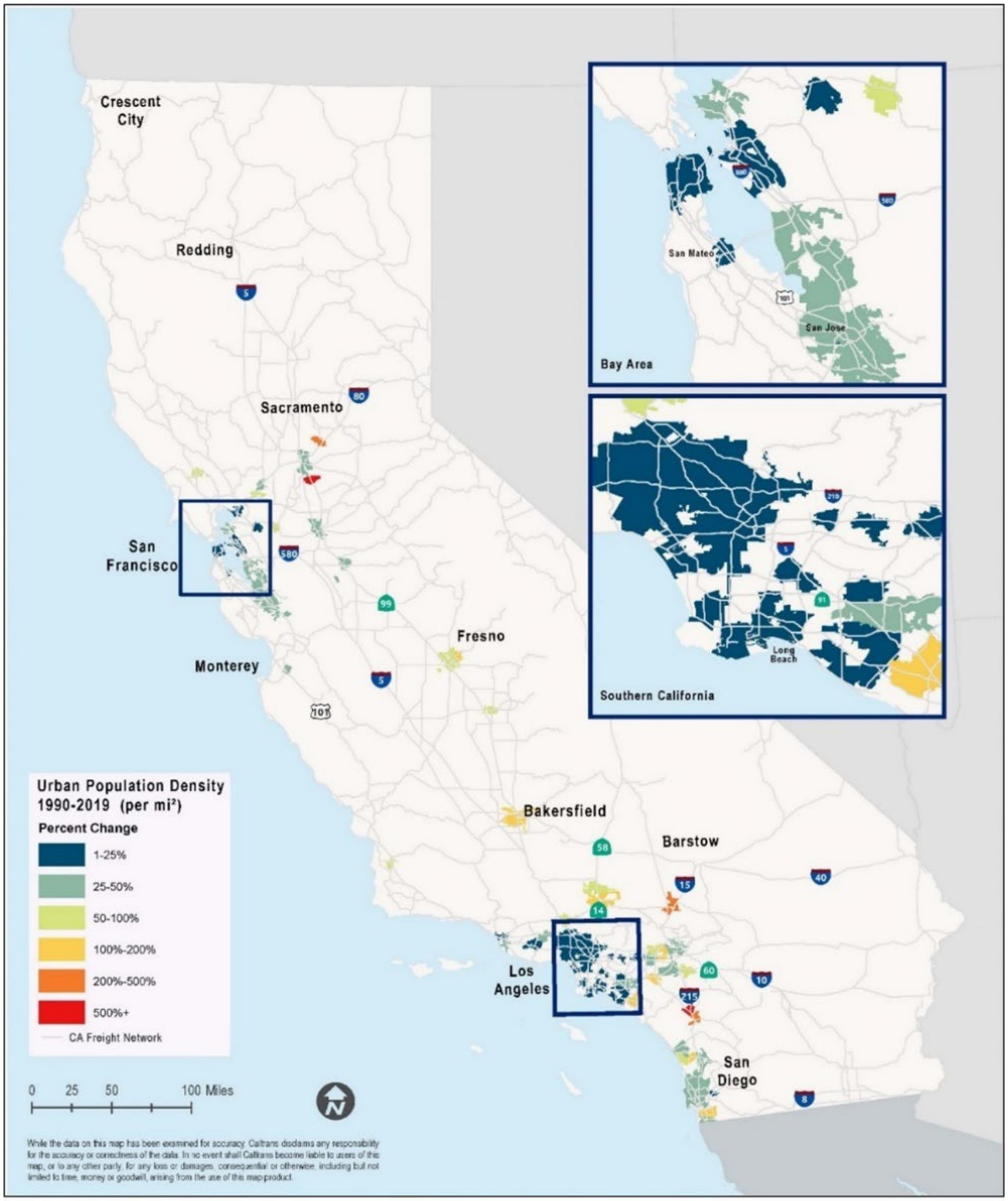

Figure J.1: California Urban Population Density Change in Major Cities, 1990-2019 (Source: Map created by Fehr & Peers, Data from U.S. Census Bureau, 1990-2019)

Historical urban development patterns in the United States have often been characterized as 'sprawling,' which is indicative of an increase in per capita land consumption and an increase in the distance between trip origins and destinations, both of which drive up the cost of providing urban services.[410] In contrast to sprawling development patterns, smart growth policies "result in more compact, multimodal development, reduce per capita land consumption and the distances between common destinations, which reduces the costs of providing public infrastructure and services, and improves accessibility and reduces per capita motor vehicle travel, which in turn provides economic, social and environmental benefits".[411] In its 2006 report, This Is Smart Growth, the U.S. EPA identified ten fundamental principles of smart growth to guide metropolitan planning and development decisions.

Table J.1: **U.S. EPA Smart Growth Principles**

U.S. EPA Smart Growth Principles
1. Mix land uses
2. Take advantage of compact building design
3. Create a range of housing opportunities and choices
4. Create walkable neighborhoods
5. Foster distinctive, attractive comm unities with a strong sense of place
6. Preserve open space, farmland, natural beauty, and critical environmental areas
7. Strengthen and direct development towards existing communities
8. Provide a variety of transportation choices
9. Make development decisions predictable, fair, and cost effective
10. Encourage community and stakeholder collaboration in development decisions

Source: This Is Smart Growth (US EPA 2006)[412]

Implementation of the Smart Growth principles impacts planning and development decisions by increasing urban building density and reducing car dependency by mixing residential, retail, office, and light manufacturing land uses, reducing street widths, and supplying a wide range of destination types within walking or bicycling distance of residential locations across the socioeconomic spectrum. Although this has far-reaching benefits for livability and quality of life in urban areas, several of the Smart Growth principles present challenges for the urban goods movement industry.

Several studies have attempted to quantify the benefits of smart growth compared to the costs of sprawl. Ewing and Hamidi created an index to measure urban compactness.[413] The index was constructed using data from the Census and the U.S. Geological Survey's National Land Cover Database and involved principal component analysis of six weighted factors: gross population density in persons per square mile; the percentage of the county population living at low suburban densities of 100 to 150 persons per square mile, corresponding to less than one housing unit per acre; the percentage of the county population living at medium to high urban densities of more than 12,500 persons per square mile, corresponding to roughly eight housing units per acre; the net population density of urban places within a county; the average block size; and the percentage of blocks with areas less than 1/100 square miles, corresponding to the average size of an urban block. The authors found that nationally, a 10 percent increase in an urban area's compactness score was associated with a 0.6 percent decline in average household vehicle ownership and a 7.8 – 9.5 percent decline in VMT, while walking commute mode share increased by 3.9 percent and public transit commute mode share increased by 11.5 percent.[414,415] The San Francisco-Oakland, Oxnard, and Los Angeles-Long Beach-Anaheim urbanized areas ranked among the top ten most compact urbanized areas in the nation according to the study.

In a meta review of 300 academic papers studying the impacts of compact urban forms, Ahlfeldt and Pietrostefani (2017) found that 69 percent of the studies reviewed uncovered positive effects associated with increases in compactness, including higher wages, increases in local public spending, pollution and energy use reduction, and increases in non-car mode choice, among others.[416] More than 70 percent of the studies reviewed attributed positive impacts to increased economic density, while 56 percent attributed positive impacts to increased built environment density, and 58 percent attributed positive impacts to an increase in the proportion of mixed land uses.

While a large body of literature has examined the benefits of smart growth for personal travel and livability, relatively little work has been done to examine the impacts of smart growth on urban goods movement. The existing body of knowledge concerning the impacts of smart growth on urban goods movement is presented in detail in later in this chapter.

URBAN GOODS MOVEMENT

Urban goods movement refers broadly to the movement of products, including package delivery and waste management, throughout urban areas.[417] More specifically it is "the complex network of vehicular modes, technological systems and physical structures controlled by people that are responsible for sending and receiving goods."[418] Given that urban areas are major sources of demand for goods and many freight trips originate or end in an urban area (first mile/last mile), urban goods movement is a major part of the broader freight industry and the economy at large.

Figure J.2 provides a map of urban population density in 2019 for California cities that have a population of 100,000 or more, highlighting the geographic locations throughout the state that support the urban goods movement industry. In California, ninety-five percent of the population lives in urban areas (including outlying suburban areas), and the state's annual gross domestic product (GDP) of more than 2.4 trillion dollars accounts for approximately 14 percent of the nation's GDP; goods production and movement within and between urban areas throughout the state undoubtedly plays a major role in the economic growth of California and the country.[419] Ultimately, goods movement forms the backbone of California's economy, as every California resident and business depends on the prompt delivery of various goods from their place of manufacture to where they are consumed.

Urban goods movement as an industry has undergone rapid change in recent years and is expected to continue at a similar pace as new technologies reach widespread adoption. Within the past decade, e-commerce has exerted a strong influence on urban goods movement, affecting both the quantity and the timing of deliveries. The majority of e-commerce establishments and employees are located in California.[420] Additionally, the top five buying markets in the country in terms of price for industrial commercial real estate are located in California (Los Angeles, San Francisco, Oakland, Sacramento, and San Jose), and this is connected to the increase in demand from big box retailers for fulfillment centers used to ship online orders.[421]

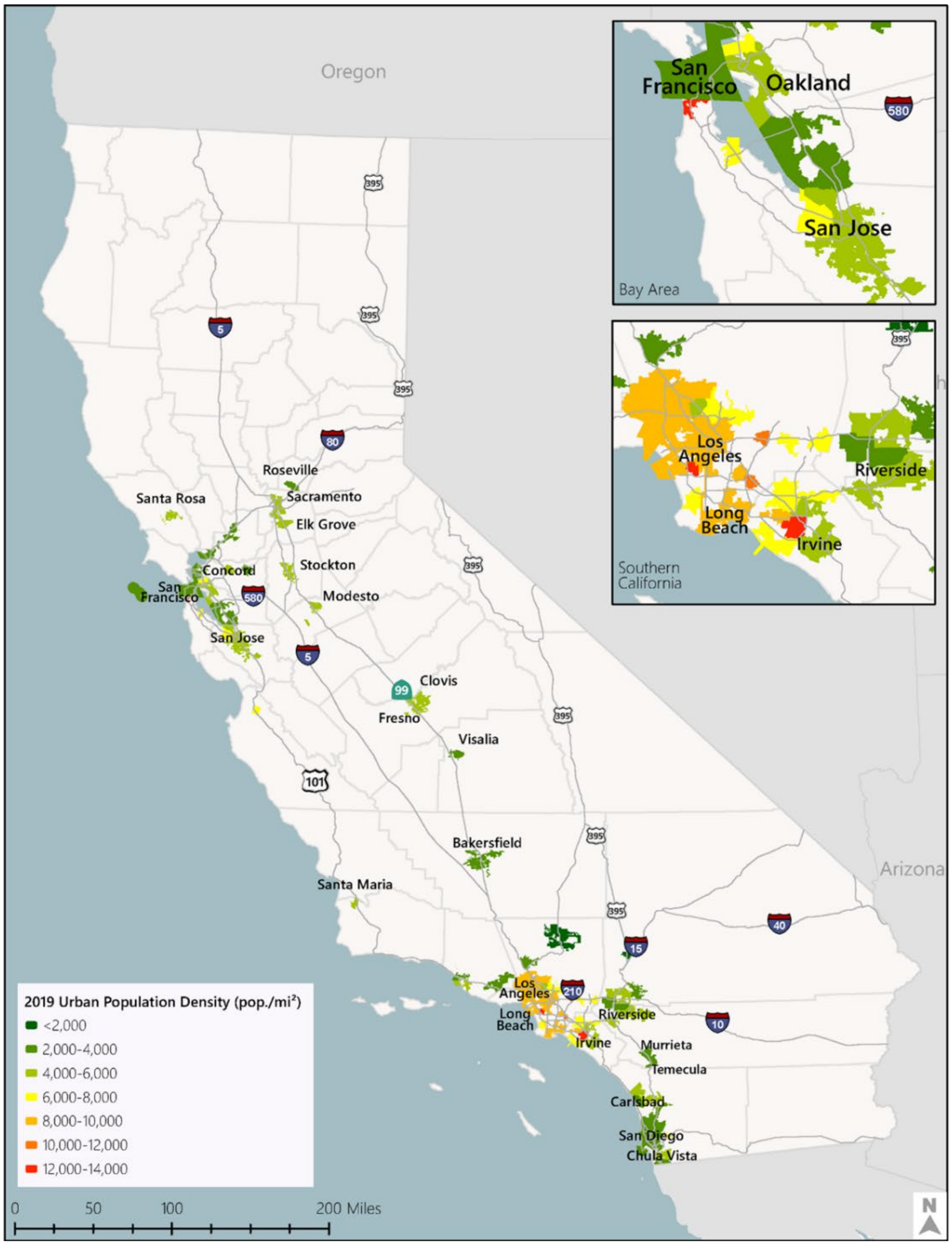

Figure J.2: 2019 California Urban Population Density in Major Cities (Source: Map created by Fehr & Peers, Data from U.S. Census Bureau, 2019)

While the shift toward e-commerce has had a large impact on deliveries to private residences, requiring more frequent deliveries and a greater number of delivery vehicles to meet the demand, commercial businesses have also been affected. According to the Volvo Research and Educational Foundations, "Online sales are growing three times faster than traditional retail sales and companies have shifted to just-in-time deliveries – receiving goods only as they are needed to reduce inventory cost – requiring more frequent and customized deliveries."[422] This has become standard practice for many businesses as they look to maximize revenue in the face of increasing urban rents. Shifting to just-in-time deliveries has also increased the frequency of deliveries and the number of delivery vehicles needed.

A burgeoning technology that stands to radically transform the entire transportation industry – including goods movement – is vehicle automation. While substantial investments have been made in vehicle automation for personal transportation, the goods movement industry will be impacted as well.

Autonomous vehicles (AVs) are projected to supply several benefits: safety improvements, congestion reduction, and greater fuel efficiency. According to Bucsky (2018), "the associated benefits of AV technologies in goods transport can be categorized into three groups: (1) traffic related gains (lower travel time, shrinking costs, less traffic), (2) economic (financial benefits for transport companies, e.g. lower costs, restructuring of market), (3) safety and environment."[423] Bucsky notes the many potential implications of shifting to AV technology to the goods movement industry, one of which is the displacement of a human driver.

Alternatively, other automation scenarios may be adopted including truck platooning, in which a convoy of several trucks would be operated by a single human driver in the lead truck; highway automation with drone operation, in which a human operator would remotely control trucks on local streets, but allow the truck to operate autonomously on highways; and highway exit-to-exit automation, in which a human driver would navigate a load through local streets and complex driving situations such as congested urban freeways with many on and off ramps and then attach the load to a self-driving truck for long-haul travel on the freeway. [424, 425]

While much research has focused on the potential benefits of AV technology to the transportation industry and the goods movement industry specifically, widespread adoption of the technology may also create significant challenges for goods movement. According to a report by Viscelli (2018), adoption of autonomous trucks for long-haul deliveries will potentially have major implications for employment in the freight industry, threatening nearly 300,000 trucking jobs. Without policy intervention to protect jobs, "the most likely scenario for widespread adoption involves local human drivers bringing trailers from factories or warehouses to 'autonomous truck ports' (ATPs) located on the outskirts of cities next to major interstate exits. Here, they will swap the trailers over to autonomous tractors for long stretches of highway driving. At the other end, the process will happen in reverse: a human driver will pick up the trailer at an ATP and take it to the destination."[426]

SMART GROWTH & URBAN GOODS MOVEMENT

Smart growth goals and urban goods movement priorities often appear to be at odds with one another. From a smart growth perspective, the increase in delivery vehicle trips that has resulted from the growth of e-commerce and just-in-time deliveries stands in stark contrast to the goals of reducing vehicle miles travelled, greenhouse gas emissions, and automobile congestion on urban streets. The mechanics of goods movement is often taken for granted by urban planners, local governments, and consumers alike because goods are expected to be delivered on time and in enough quantities to keep the economy running. However, the process of moving goods where they need to go is often seen as a nuisance.

According to the Guidebook for Understanding Urban Goods Movement (Rhodes et al. 2012), "Cities are quickly becoming the most concentrated, dense consumer market in history. Meanwhile, the capacity of urban transportation infrastructure has increased only modestly. Urban design and regulations affecting how freight moves in modern cities have failed to keep pace with the growing demand for goods and services, and the transportation systems that support modern logistics and supply chain management."[427] Concrete steps must be taken to align smart growth and urban goods movement priorities to ensure that the economic engine of the goods movement industry is able to perform at its peak ability while simultaneously improving the livability of cities and reducing their environmental impacts. Seven key stakeholders will be needed to make this happen[428]:

- government (including transportation planning agencies),
- communities and residents,
- shippers,
- truckers,
- distribution and warehouse facilities,
- property owners and managers, real estate developers,
- commercial establishments

FREIGHT EFFICIENT LAND USES

Freight Efficient Land Uses (FELU) refers broadly to land-use that minimizes the private and external costs associated with the production, transportation, and consumption of goods, including reverse and waste logistics. As alluded to previously in this chapter, goods movement and land-use connections have been overlooked in the past in terms of supporting the industry while also reducing the negative impacts to communities. The private sector is often only concerned with the private costs associated with selecting a location for facilities without consideration of the external impacts like emissions, noise, aesthetics and congestion. Therefore, it is important for local, regional and state agencies to approach freight land-uses through an efficiency lens that considers everyone as part of the costs of moving goods.

In its 2022 Research Report, Planning Freight-Efficient Land Uses, NCHRP identifies 5 FELU principles to guide local land-use practitioners and transportation professionals on how to take action and create an FELU program.

Table J.1: **FELU 5 Principles**

FELU 5 Principles	
1.	**Minimize the Private and External Costs of Supply Chains and Their Stages.**
2.	**Reduce the Distance Traveled at Supply Chain Stages, Upstream and Downstream.**
3.	**Mitigate, or Eliminate, The Externalities at Supply Chain Nodes and Large Traffic Generators.**
4.	**Recognize and account for local conditions.**
5.	**Engage all Stakeholders**
Source: Planning Freight-Efficient Land Uses (NCHRP Research Report 998 2022)	

POLICY AND INFRASTRUCTURE IMPACTS

Delivery trucks contribute to and are affected by congestion in metropolitan areas. This creates significant economic inefficiencies for the urban goods movement industry while also hindering the achievement of smart growth goals by worsening congestion and causing increases in greenhouse gas emissions. According to the report, Urban Freight for Livable Cities, urban goods movement – which constitutes the 'last mile' of the logistics chain – accounts for more than a quarter of the total cost of freight transport.[429] The Texas A&M Transportation Institute states that trucks generate 17 percent of the cost of congestion in the United States but represent only 7 percent of all traffic.[430]

Because urban roads are narrower than freeways and serve more user types, deliveries within cities typically cannot be made using full-size trucks. Instead, deliveries are made by trucks that are approximately one-third of the size of a full-size truck, which necessitates the use of more delivery vehicles and increases inefficiency in the logistics chain--including additional miles travelled and land use compatibility issues associated with freight transfers from line haul to local trucks. Compounding the problem, many trucks on urban roadway networks are only partially loaded or may be empty. According to the Volvo Research and Educational Foundations, "in the U.S. trucks generate 20 billion miles each year while driving empty".[431] Implementation of Principles 2 and 4 of the US EPA Smart Growth principles could present direct challenges for truck movement in urban areas since it may result in the narrowing of urban streets. Considering this, planners and policy makers should consider the turning radius requirements at intersections of urban freight delivery vehicles when evaluating projects that narrow streets by adding pedestrian and bicycle safety infrastructure and amenities. In some cases, alternative goods movement routes can be chosen to ensure that delivery vehicles can access the destinations they need to access, while still improving walkability and compactness in strategically chosen locations.

Many urban road narrowing projects are undertaken to provide 'complete streets' that serve all users instead of focusing on maximizing efficiency for motor vehicles at the expense of other travel modes. A growing body of research is now exploring how urban goods movement can be integrated into the complete streets conceptual framework. Alison Conway of the City College of New York recommends conducting corridor studies to identify where urban bicycle and freight networks overlap, as these can be key points of conflict for infrastructure design.[432] In addressing specific goods movement needs when designing or changing infrastructure, Conway recommends adhering to seven overarching themes:

- selecting a design and control vehicle;
- supplying adequate space for safe large vehicle turns;
- reducing the frequency of severity of conflicts between large vehicles and vulnerable roadway users;
- reducing speeds without unintended detrimental impacts on operations and safety;
- supplying network connectivity and redundancy;
- supplying adequate space for vehicle parking, loading, and delivery operations; and
- supplying safe access to sidewalks and buildings.

Teran (2015) notes several areas of overlap where urban goods movement and complete streets design can coexist.[433] Implementing road diets, for example, can increase traffic flow while reducing vehicle speeds and providing space for walking, bicycling, transit, and parking. When addressing complete streets design, planners and designers should identify the intersections that are most often used for goods movement and design the curb radius to suit the needs of trucks. Even intersections in locations with less goods movement traffic can be designed with multimodal considerations in mind, ensuring that adequate infrastructure is provided for all users, including trucks. In dense downtown areas, parallel streets can be designed as one-way couplets, with one street serving slower-moving traffic such as bicycles and pedestrians and the other serving trucks and other less vulnerable roadway users. Truck-serving streets would supply better curb access to allow for efficient loading and unloading.[434]

Four of the US EPA Smart Growth principles pose notable safety challenges when urban goods movement is considered. Implementation of Principles 1 through 4 (Mix land uses; Take advantage of compact design; Create a range of housing opportunities and choices; Create walkable neighborhoods) could result in the closer proximity of pedestrians and bicyclists to delivery trucks. Most bicycle-truck collisions occur in urban areas, suggesting that the higher collision rate is a function of greater exposure of bicyclists to truck activity in urban areas.[435] By increasing the density of urban environments, mixing land uses, increasing housing supply, and enhancing walkability and bicycle access through smart growth initiatives, planners and policy makers may ultimately increase the exposure of bicyclists and pedestrians to trucks. Careful consideration must be taken to manage interactions between trucks and the most vulnerable roadway users to maximize safety for everyone. As previously mentioned, designated truck routes may be helpful in achieving this end. **Figure J.3** shows the proximity between bicycles and trucks that can occur in urban areas, even when dedicated bicycle infrastructure is provided.

Figure J.3: Bicycle Truck Proximity on Urban Streets (Source: Transportation Research Procedia)

A major barrier for the urban goods movement industry that contributes to traffic congestion and safety concerns is access to the curb for freight loading and unloading. The demand for curb space has increased in recent years considering the advent of TNCs such as Uber and Lyft and the growing volume of package deliveries spurred by the e-commerce boom. When delivery trucks are unable to access the curb or loading zone at their destination, they often double park and occupy a travel lane, which increases congestion and potentially reduces safety by limiting visibility in the roadway and forcing cars to travel around double-parked trucks. On streets with bicycle lanes, delivery trucks may effectively block these lanes when double-parked or may be required to pass through them to access the curb, posing safety concerns for bicyclists in both cases by increasing collision risk and forcing bicyclists to mix with vehicular traffic **Figure J.4**[436]

These problems are compounded in the case of destinations with high curbside delivery demand and vehicle turnover, such as multi-tenanted buildings, which typically generate more deliveries than single-tenant buildings. If multi-tenanted buildings do not have internal logistics staff to manage deliveries, drivers must deliver goods to wherever recipients are located within the building. This may add to the expected delivery time while also increasing emissions associated with vehicle idleness, and further blocks lane access.[437] Additionally, in situations

Figure J.4: Curbside Bicycle Lane Complicates Truck Access to the Curb (Source: Santa Monica Next)

where double-parking is not possible and the curb or loading zone is occupied, delivery trucks may take unnecessary trips around the block while waiting for delivery access, resulting in an increase in greenhouse gas emissions. According to the Institute of Transportation Engineers (ITE), "it is becoming increasingly important to designate loading zones not only in commercial or industrial areas, but also in residential areas where the frequency of package deliveries may result in blockages for other curbside uses".[438]

Given the increasing competition for curb space and the negative impacts it has had on urban goods movement, urban planners and policy makers are increasingly looking towards tools under the umbrella of 'curbside management' to reduce these impacts while simultaneously working toward achieving smart growth goals. In the Curbside Management Practitioners Guide, the Institute of Transportation Engineers (ITE) recommends several strategies for ensuring the availability of curb space for urban goods deliveries:

Freight Zone Pricing

Requiring payment for access to freight loading and unloading zones has the dual effect of reducing the duration of loading zone occupancy and increasing the likelihood that loading space will be available when needed.

Off-peak Delivery and Congestion Pricing

By charging delivery vehicles a fee to deliver goods during peak periods, cities may effectively incentivize delivery during off-peak periods, thus reducing peak-period congestion. Potential benefits to delivery carriers of switching to off-peak delivery include increased parking/loading zone availability, reduced traffic congestion, and faster travel times with attendant reductions in the time needed to complete delivery routes.

Delivery Vehicle Staging Zones

Providing time-limited on-street queueing areas for delivery trucks at high-demand locations can prevent trucks from blocking travel lanes or driving unnecessarily while waiting for access to the loading/unloading zone.

Urban Consolidation Centers for Last Mile Delivery

The rapid increase in e-commerce deliveries in recent years has worsened problems related to last-mile deliveries, which increase competition for road space between urban passenger and freight traffic. To address this, Urban Consolidation Centers (UCCs) bring together packages from a multitude of delivery companies and provide last-mile delivery service using relatively smaller, low-emission vehicles that reduce competition for road space. UCCs are often formed through public-private partnerships between local governments and delivery companies.

Moving Loading and Access Around the Corner

Many delivery drivers are willing to park farther away from their delivery destination if it means they will not have to waste time waiting for loading space to become available. By moving loading and unloading zones at a reasonable distance away from delivery destinations, cities can preserve curb space for high-turnover parking and transit use while reducing goods movement inefficiencies.

Much of the guidance from the Transportation Research Board (TRB) about curbside management overlaps with that of the ITE. However, TRB also recommends allowing delivery vehicles to use off-street parking, setting up appointment- or reservation-based systems for deliveries, and using zoning to increase loading bay sizes to accommodate larger trucks and greater truck volumes.[439] Leonardi et al. (2014) recommends using joint procurement and internal logistics operations for large multi-tenanted buildings to reduce delivery vehicle dwell times.[440]

New York City has had remarkable success in using curbside management and other policies to manage urban goods movement and achieve smart growth goals. After forming the New York City Department of Transportation (NYCDOT) Office of Freight Mobility in 2007, the City created a Commercial Vehicle Parking Plan which recommended allocating more curb space for commercial vehicles and using a pricing strategy with an escalating rate structure to maximize turnover of commercial vehicle parking. Combined, these measures have reduced commercial vehicle double-parking and dwell times and have increased parking availability, effectively reducing the need for delivery vehicles to circulate around the block while waiting for loading/unloading space to become available.[441] In addition to curbside management policies, NYCDOT established the 'THRU Streets' program in 2002, which designates certain streets in midtown Manhattan for cross-town travel while other streets are reserved for truck loading and unloading. This is similar to the idea of 'layered networks,' which is based on the recognition that streets cannot always prioritize all users. Instead, the layered networks concept "envisions streets as systems, each street type designed to create a high-quality experience for its intended users".[442] Implementation of the 'THRU Streets' program resulted in major improvements to traffic flow in congested Manhattan and has improved safety by reducing conflicts between turning vehicles and pedestrians.[443]

The City of Portland has implemented truck signal priority along major urban freight corridors to improve safety by reducing the likelihood of trucks running red lights and enhancing the efficiency of freight movement by reducing delay experienced at traffic signals. Additionally, the City collects city-wide freight logistics data that it plans to use to develop a coordinated freight management system to manage deliveries and prevent double-parking of trucks at the curbside.[444]

National Cooperative Highway Research Program (NCHRP) Report 844 presents case studies of the integration of goods and services movement by commercial vehicles in smart growth environments for six metropolitan areas in the United States across six key smart growth classifications: industrial areas transitioning to housing and entertainment districts; working waterfronts transitioning to mixed-use and/or recreation; older commercial and neighborhood areas being revitalized; retrofitting aging commercial corridors; greenfield new communities; and large scale construction.[445] In the Brady Arts District in Tulsa, Oklahoma, a former rail-served industrial and commercial area transitioned into an arts and entertainment district over a period of 20 years and faced challenges in the form of increased truck traffic during construction, reluctance from residents to retain freight-serving uses in the area, and conflicts between residential and commercial uses. In addressing these challenges, the City found that developing delivery and loading regulations could be useful for managing conflicts at the curbside in the future and innovative funding strategies such as tax increment financing could be used to improve walkability and safety with limited other financial resources. The City also determined that certain industrial uses could be used as buffers between municipal land uses and more intense industrial uses.[446]

In the Ballard neighborhood of Seattle, Washington, what was once a major hub for the maritime industry has recently been a site of major population growth with attendant increases in land and housing prices, which has created challenges for the maritime industry and the working-class neighborhoods that have historically existed in the area. Additionally, the street network is ill-equipped to accommodate freight delivery to new businesses in the neighborhood, creating challenges for shippers. To address these challenges, the City has chosen to prioritize which streets in the neighborhood should be 'Complete Streets,' enhancing some streets for industrial and commercial needs and others for multimodal transportation. Additionally, the City is using zoning to ensure that the neighborhood can keep important industries like the maritime industry while barring incompatible uses.[447]

TECHNOLOGICAL IMPACTS

In addition to policy-based tools like curbside management, technological and logistical innovations may also play a role in aligning smart growth goals with urban goods movement priorities. From a logistical perspective, two innovations that promise to reduce delivery vehicle volumes, dwell times, and demand for curb space are: 1) the use of neighborhood pickup points, and 2) automated parcel systems as alternatives to home deliveries. Neighborhood pickup points are typically local shops or other convenient destinations where customers can receive and/or return deliveries.

Automated parcel systems are locker banks that are typically found in shopping centers or large easily accessible public destinations. Carriers leave packages in secured lockers which customers can unlock to receive their delivery using a digital code provided by the carrier. Advantages of neighborhood pickup points and automated parcel systems include eliminating instances of missed deliveries and consolidation of shipments from a carrier to a single location, which maximizes time and financial efficiency.[448] While the implementation of these logistical innovations could supply multiple benefits to the goods movement industry while advancing smart growth goals, their widespread adoption is not guaranteed.

In addition to neighborhood pickup points and automated parcel systems, several new startup companies have emerged with the goal of optimizing package delivery in large urban developments, especially in multifamily developments where tenants are increasingly demanding secure package delivery. Many of these companies are using the model of partnering with multifamily property owners and managers to install secure lockers within buildings and providing tenants with personal access codes to retrieve their deliveries.[449, 450] Independently of these companies, many multifamily buildings are installing their own ground floor package rooms or lockers where tenants can pick up their deliveries. Figure J.5 shows an example of an Amazon Hub package locker in a multifamily development. [451]

Figure J.5: Amazon Hub Package Locker (Source: The Wall Street Journal)

From a technological perspective, several new innovations hold promise for aligning smart growth and urban goods movement goals:

1. The use of local, alternatively-fueled autonomous vehicles for making deliveries has been promising. A startup called Udelv began testing grocery delivery using autonomous vehicles in San Mateo, California in partnership with Draeger's, a local grocery store chain, in 2018 and will soon deploy autonomous delivery vehicles in Oklahoma City as well.[452, 453] National grocery store chain Kroger has also been testing unmanned AVs to deliver groceries to customers in Arizona.[454] By serving multiple customers with a single autonomous delivery vehicle, both traffic congestion and greenhouse gas emissions can be reduced.
2. 3D printing allows certain goods to be effectively manufactured at or near the place where they will be consumed, thus reducing delivery trip length or eliminating the need for delivery altogether. German logistics carrier DHL states that the "future commercial viability of 3D printing and its mainstream adoption will be dependent on critical success factors such as affordability, material versatility, and the speed and quality of the print," but maintains that many companies are showing growing interest in this burgeoning technology as part of their future business models.[455]
3. The use of bicycling to carry cargo in inner cities is being tested. In its European operations, DHL is piloting a model that relies on a DHL van to deliver trailers full of goods to the city-center, where containers with packages can be attached to cargo bicycles for delivery, reducing VMT and associated noise and emissions.
4. Amazon and other companies are testing the use of unmanned aerial vehicles, or drones, for deliveries. The company's first fully autonomous home delivery without the use of a human pilot was conducted in 2017, but the timing of widespread implementation of the service is not yet publicly known.[456] Amazon's tests have used battery powered drones, which will need frequent battery recharging if the service is deployed on a large scale. If the company switches to using fossil fuels to power its drones, the emissions consequences of the service could outweigh the benefits. Despite the potential negative consequences of drone deliveries, modifications to the building stock to accommodate drone delivery has already begun in some metropolitan areas. In Miami, Florida, for example, a developer is designing a 60-story residential tower to include a rooftop takeoff and landing strip for drones.[457]

RESEARCH GAPS

Several important research gaps exist that merit future exploration. The first pertains to the lack of California-specific information concerning the intersections of smart growth and urban goods movement. Currently, few case studies have been conducted that examine California cities. Future studies that focus on California could inform policy and planning decisions in ways that maximize smart growth and urban goods movement outcomes within the state's unique context.

Another important research gap pertains to the safety implications of new technologies like autonomous vehicles. Existing research and technological development have focused on ensuring that autonomous vehicles can detect other vehicles and key infrastructural features such as traffic signals, signs, and roadway striping. However, comparatively little investment has been made in ensuring that autonomous vehicles can operate safely in truly multimodal environments where pedestrians and bicyclists share the road with motor vehicles. As autonomous vehicle technology is adopted by the urban goods movement industry, safety in urban environments will become an important consideration, and future research should specifically examine the intersections between technology, urban goods movement, and safety.

Lastly, future research would do well to examine intersections between smart growth, urban goods movement, and disaster resilience and emergency response. The existing literature on the subject offers competing claims about the vulnerability of dense urban areas to natural disasters and emergency response situations. Some studies have concluded that higher density in urban areas leads to greater vulnerability to natural disasters, while others have concluded that increases in infrastructure density reduce vulnerability.[458, 459] At least one study has concluded that the agglomeration economies found in dense urban areas lead to improved risk management and preparedness for emergency situations.[460]

Importantly, many of California's densest cities are in coastal areas, which increases their vulnerability to sea level rise, and suggests that the location, as well as the form, of cities affects their vulnerability. Additionally, if the frequency and intensity of wildfires in California continue to increase, there may be impacts on urban goods movement including delivery delays and implications for the siting of fulfillment centers and route choices. Research into these impacts could help the urban goods movement industry take a proactive approach in planning for emergency preparedness and reducing negative impacts.

As previously mentioned, NCHRP Report 844 presents case studies of the integration of goods and services movement by commercial vehicles in smart growth environments for six metropolitan areas in the United States.[461]

Importantly, none of the case study metropolitan areas are in California. Pilot studies in California cities covering some or all the smart growth classifications presented in NCHRP Report 844 would allow for the preparation of recommendations and guidance that are specific to the California context and would help the urban goods movement industry navigate smart growth challenges in California.

CONCLUSIONS AND RECOMMENDATIONS

As the global trend toward urbanization continues, urban transportation is evolving at a rapid rate, and this has important implications for urban goods movement and the achievement of smart growth goals. The demand for goods in urban areas is greater than ever and shows signs of further growth as e-commerce continues to increase its share of the retail industry. Most e-commerce institutions and employees are in California, underscoring the importance of efficient urban goods movement to the health of the state's economy. However, despite the economic importance of urban goods movement, the aims of the goods movement industry have often been seen by urban planners and policy makers as being at odds with smart growth goals. Recently, with growth of TNCs and their approach to maximize the utilization of vehicles, there are new opportunities to integrate small urban deliveries with passenger transportation services. However, this is a still a new concept and require further investigation to evaluate its benefits and impacts.

To this end, the needs of the urban goods movement industry have often been overlooked in planning decisions, and this has the potential to be detrimental to the industry and to the economy. With new technological advancements like autonomous vehicles and other innovations on the horizon, urban transportation and the goods movement industry will both be transformed in foreseeable and unforeseeable ways, making the alignment of smart growth and urban goods movement goals fundamental to ensuring that California's cities maximize livability and economic health in the future. A summary of issues and associated recommendations for making smart growth and goods movement more compatible, as discussed in this paper is presented in **Table J.2**.

Table J.2: **Key Issues and Solutions Associated with Aligning Smart Growth and Urban Good Movement Priorities and Outcomes**

Recommendations	Issues Addressed			
	Traffic Congestion	Traffic Safety	Competition for Curb Space	Greenhouse Gas Emissions
Planners and policy makers can take the needs of goods movers into account more explicitly when making infrastructure decisions (i.e., choose alternate freight routes where appropriate, supply adequate space for large vehicle turns and loading/unloading, provide network connectivity and redundancy)	Ü		Ü	
Implement road diets	Ü	Ü		
Prioritize certain intersections for freight movement	Ü	Ü		
Utilize off-peak delivery and congestion pricing	Ü		Ü	Ü
Utilize urban consolidation centers for last mile delivery	Ü		Ü	
Move loading and curbside access around the corner	Ü		Ü	
Allow delivery vehicles to use off-street parking	Ü		Ü	
Develop neighborhood package pickup points, multifamily residential package rooms, and automated parcel systems	Ü		Ü	
Develop neighborhood 3D printing centers	Ü		Ü	Ü
Utilize drone deliveries	Ü	Ü	Ü	Ü
Conduct corridor studies to find places where the urban freight and bicycle networks overlap		Ü		
Implement truck signal priority and/or bicycle signal priority		Ü		

Use low-intensity industrial land uses as buffers between high-intensity industrial land uses and municipal land uses		Ü		
Implement freight zone pricing			Ü	
Develop delivery vehicle staging zones	Ü		Ü	
Implement appointment- or reservation-based systems for deliveries	Ü		Ü	
Utilize joint procurement and internal logistics operations in large multi-tenanted buildings			Ü	
Allocate added curb space for commercial vehicles				Ü
Utilize alternatively-fueled delivery vehicles and/or autonomous delivery vehicles				Ü
Source: Summary Analysis by Fehr and Peers				

Appendix K. Future Freight System Scenarios

During the outreach and engagement process, stakeholders voiced concerns about the volume, impact, and conflicts of disruptive trends facing the freight industry. These trends (described in **Chapter 4**) create challenges for making long-term public and private investments in California's freight industry. Robotics and automation will result in changing skillsets necessary for the freight industry. The uncertainty of future conditions in our era requires creative thinking for effective long-range planning. Shifts in societal and/or technological standards may drastically alter freight dynamics and volume. Accurate planning requires an understanding of the impacts to prepare for the "what if" scenario.

The CFAC members recommended developing a Freight Scenario Modeling Technical Advisory Subcommittee to discuss the most relevant trends and identify scenarios for further analysis. Four meetings were held with the Subcommittee to discuss the necessity and importance of evaluating several possible scenarios as the context for the CFMP. The Subcommittee discussed how different trends could impact freight flows from various aspects, such as cargo sourcing, a destination of the cargo, mode and routing, total volume and shipment size (see **Table K.2**).[462] Based on this guidance, the following scenarios were developed based on the following recommended characteristics:

- Decision making: capture the right decision
- Plausibility: within realistic limits
- Alternatives: no favorites or preferences (unofficial/official)
- Consistency: internal logic is aligned
- Differentiation: structurally different
- Memorability: easy to recall (name helps)
- Challenge: push against established

Scenario Evaluation Methodology and Available Tools

The Subcommittee's selection of the CFMP 2020 scenarios focused on the ability to quantitatively analyze, compare, and contrast differences using available data and tools. The California Statewide Freight Forecasting Model and the California Statewide Travel Demand Model (CS2FDM, 2019) were integrated in 2020. The integrated model is validated for base year 2015 and future base year 2040, and it provides a consistent platform for statewide analysis. The CS2FDM will be the main tool to evaluate these scenarios. This is a transportation model; therefore, the economic elasticity of the supply chain to various factors– such as impacts of immigration or housing policies on population and job market or impacts of trade policies on import and export flows– needs to be evaluated in advance. Economic conditions of each scenario must be studied carefully and translated into basic model indicators such as population, employment, the capacity of facilities, the tonnage of goods to/from ports, a payload of trucks for different commodities, etc.

It is also important to consider available data, technical tools and resources, and the schedule for developing the most relevant alternative future scenarios and their respective analyses. Each scenario includes several elements. These elements are highly correlated and assumed to generate similar impacts on freight flows. The dynamic nature of the multifaceted freight industry complicates a scenario analysis, as some trends will create contradicting impacts on freight flows. To conduct meaningful analysis, it is important to clearly define the assumptions in each scenario and only change the specified elements with all else remaining constant.

Table K.1: **Freight Flow Patterns**

How can an event impact Freight Flows?	• **Impact on sourcing patterns**: Where are raw products and WIP sourced from? Are materials sourced in or out of the region?
	• **Impact on flow destination**: Where is the demand located? How are destination locations distributed?
	• **Impact on routing:** How is freight moved within the region? Are there intermediate shipment points or mode switches?
	• **Impact on flow volume**: How will the total volume of freight shipped in and through the region change?
	• **Impact on value density:** How will the product characteristics change? How does the value density change?

Final CFMP 2020 Scenarios

The Subcommittee identified the following three scenarios to analyze:

- Land Use and Workforce Shift
- Trucking Operation on Freight Highway Network
- Emerging Modes in the Multimodal Freight System

The next steps involve clarifying and defining the assumptions and boundaries for each scenario, preparing input data, and identifying the methodology to evaluate each scenario in detail. The baseline assumptions for evaluating all scenarios are Existing Conditions (2015) and Future Baseline Conditions (2040).

The "Future 2040 Baseline Conditions" scenario includes:

- All RTP infrastructure projects
- MPOs' projections for employment and population
- Historic patterns of household characteristics and industry mix in each region
- Historic growth of the state, national economy, jobs and GDP
- Historic trends of imports and exports from each gateway

The results of the Subcommittee survey were used for the selection process and was shared with all CFAC members at the January 8, 2019, CFAC meeting. The three scenarios recommended by CFAC for analysis are described below.

SCENARIO 1: LAND USE AND WORKFORCE SCENARIO

In this scenario, demand for the freight highway network deviates significantly from historic trends. The evaluation factors include changes in population and job balance for various industry sectors. These changes are anticipated to result in a severe transportation and warehousing workforce shortage in dense, urban areas. Under this scenario, workforces are predicted to migrate to lower density regions where housing is cheaper and more available. Conversely, urban areas may continue to reduce and restrict industrial development and shift wholesale and transport jobs to lower density rural areas. The focus areas may be (**Figure K.1**)[463]:

- In the Bay Area, the workforce and jobs are shifted from zones with high-median home value in Alameda, Contra Costa, San Mateo, Santa Cruz, and Santa Clara to the northern part of San Joaquin Valley.
- In Southern California, the workforces and jobs are shifted from the densest areas within Los Angeles County to the eastern edge of Los Angeles County, and to the surrounding, more affordable areas in San Bernardino, Riverside, and Northern San Diego Counties.

Input:

- Household candidates for migration were selected using the criteria detailed in **Table K.2**, wherein 25 to 100 percent of the new households (with at least one member working in blue-collar jobs) added between 2015 and 2040 are relocated based on household incomes.[464]
- The new home locations in Traffic Analysis Zones (TAZ) is probabilistically chosen by random drawings from a probability distribution with weights based on the proportion of low-income households (<$35k). The higher the proportion of low-income households, more likely it is to receive the migrating households.

Table K.2: **Classification of Migration Candidates**

Home County	Household Income (In 2010 $$)	Worker Condition	% of (2015-2040) Moved
Alameda, Contra Costa, San Mateo, Santa Cruz, Santa Clara	HH Income <$35k	At least one member working within this group	100%
Alameda, Contra Costa, San Mateo, Santa Cruz, Santa Clara	HH Income in ($35k, $75k)	At least one member working within this group 2,444	50%
Alameda, Contra Costa, San Mateo, Santa Cruz, Santa Clara	HH income >=$75k	At least one member working within this group	25%
Los Angeles, Orange	HH income <$35k	At least one member working within this group	100%
Los Angeles, Orange	HH Income in ($35k, $75k)	At least one member working within this group	50%
Los Angeles, Orange	HH income >=$75k	At least one member working within this group	25%
Medium	Workforce Issues	Changes in housing in California	3
Medium	Workforce Issues	Workforce retraining and education	3
Low	Workforce Issues	Retention of workforce/businesses in California	7
Low	Workforce	Land use changes	14

Figure K.1: The Shift of Workforce and Jobs from Dense, Urban Areas (Orange) to Rural Areas (Blue) (Source: Analysis and map created by Fehr & Peers, 2019; U.S. Census Bureau TIGER Traffic Analysis Zones, 2017; Esri base map, 2019)

Table K.3: **Original Home Locations and Changed Home Location of Relocated Households (County Level Stats)**

New County Home									
Old Home County	**Merced**	**Sacramento**	**San Joaquin**	**Solano**	**Stanislaus**	**Yolo**	**San Bernardino**	**Riverside**	**Grand total**
Alameda	155	1,050	415	148	185	150			2,103
Contra Costa	76	545	224	70	135	81			1,131
San Mateo	65	421	156	41	78	56			817
Santa Clara	189	1,199	520	186	260	209			2,563
Santa Cruz	22	115	44	18	21	12			232
Los Angeles							18,132	18,755	36,887
Orange							4,183	4,259	8,442
Grand Total	507	3,330	1,359	463	679	508	22,315	23,014	52,175

Table K.3 shows the original and new home locations (county-level changes) of the 52,175 households that would be relocated. [465]

- The growth in wholesale and transport jobs between 2015 and 2040 in Northern California Counties (Alameda, Contra Costa, San Mateo, Santa Cruz, Santa Clara) and Southern California Counties (Los Angeles, Orange) is reduced by 50 percent.
- These jobs are then apportioned to the beneficiary counties (Merced, Stanislaus, San Joaquin, Sacramento, Solano, Yolo in the north and San Bernardino, Riverside in the south) using a proportion of 2040 jobs before the migration.
- These changes are also reflected in the occupation listing - blue-collar by adjusting the counts by delta (wholesale jobs + transport jobs), assuming all the wholesale and transport jobs fall under the blue-collar category.
- The total number of population and jobs remain as the 2040 Baseline conditions proposed by MPOs. This scenario only shifts the lower income households and transportation jobs
- The import and export distribution from major gateways are also shifted proportionally to these new TAZs since the warehousing capacity at new TAZs has increased and while it is relatively decreased in other TAZs. The total volume of imports and exports via each gateway remains like the 2040 Baseline conditions.

Output

The following metrics would be evaluated for the percentage change at the regional, corridor or statewide level before and after:

- Population by income group

- Employments by industry
- Total VMT/truck VMT
- Volume on selected corridors (I-80, I-580, I-710 and I-605, I-10, I-5)
- Travel time/delay › Emissions/GHG

SCENARIO 2: TRUCKING OPERATIONS ON THE FREIGHT HIGHWAY NETWORK

This scenario assumes a freight highway network that deviates significantly from historic trends. This scenario also anticipates a large-scale impact on the planning and implementation of regional or statewide infrastructure projects or policies that affect trucking operations on the Freight Highway Network. When focusing on delivery, the majority of the costs consist of fuel and wages – both of which are heavily influenced by prevailing market forces.
One solution to reduce the cost and to increase the efficiency is dedicated truck facilities which allow truck platooning and autonomous trucks. Based on previous studies, the use of cooperative adaptive cruise control (CACC) by platooning and autonomous trucks could increase highway capacity and decrease traffic congestion. With 50 percent market penetration, highway capacity could increase by 22 percent, and with 80 percent penetration, it could increase by 50 percent.

This scenario assumes two major truck corridors have dedicated truck lanes between major freight hubs, and these dedicated lanes primarily serve platooning and autonomous trucks. These corridors are shown in **Figure K.2**. [466]

- Truck routes in Northern California, connecting the Ports of Oakland and Stockton with I-580, I-205, I-5 and SR 4.
- Truck routes in Southern California, connecting San Pedro Bay Ports of Long Beach and Los Angeles and the World Logistic Center in Moreno Valley with I-710 and SR 60.

Input

Network change to allow 100 percent platooning and autonomous trucks:

- On the above truck routes, change one of the existing general-purpose lanes to permanently dedicated truck lanes
- Increase the capacity for the new truck only lanes by 50 percent to represent the change of vehicle mix in these lanes
- Decrease the cost of trucking by reducing the travel time by 30 percent

Output

Changes at the regional, corridor or statewide level before and after are anticipated to be measurable in these four categories:

- Travel time/Delay
- Total and Truck VMT/VHT
- Regional traffic volume
- Mode split

SCENARIO 3: EMERGING MODES IN MULTIMODAL FREIGHT SYSTEM

This scenario assumes alternative cargo movers are introduced into the multimodal freight system. The purpose is to evaluate the impact of policies that encourage modal shifts between trucking, maritime, rail, air and other urbanized modes, on the performance and operation of the highway system. This scenario analyzes the anticipated migration to electric trucks, the implementation of drone and robot deliveries, and the introduction of autonomous trucks.

Input

Update Origin-Destination Matrix and shift hours of service:

- The Bay area and Southern California are selected as the dense urban areas.
- 50 percent of light duty trucks that travel less than 10 miles are replaced by another mode of transport; this part of the trip is eliminated from the O/D matrix
- 50 percent of light- and medium- duty trucks that travel 10-50 miles will be replaced with autonomous cargo handling trucks that operate during off-peak periods. To implement this change in the model, 50 percent of trucks that fit this description are shifted to the off-peak period, which represents fewer congestion conditions. See **Figure K.3**. for a map showing the 50-mile buffer area from the Bay area and Southern California.

Output

Following metrics would be evaluated for the percentage change at regional, corridor or statewide level before and after:

- Regional Wide Volume
- Travel Time/ Delay
- VHT/ VMT
- Mode Split

Figure K.2: Truck Routes for Platooning and Autonomous Trucks (Source: The California Department of Transportation

Figure K.3: Defense Urban Areas with Alternative Cargo Movers that Travel Less than 50 Miles (Source: The California Department of Transportation

Appendix L. Freight Investment Plan

			TCEP Dollars by FY ($1,000's)					
PPNO	Project Title	Total Project Cost ($1,000's)	FY 23/24 Cycle 3	FY 24/25 Cycle 3	FY 25/26 *Cycle 4	FY 26/27 *Cycle 4	State SB 1 funds (Subject to Change)	Estimated Federal NHFP funds (Subject to Change)
3445A	Rt 5, Redding to Anderson Widening, Phase 2	$ 158,236						$ 71,882
2103D	7th Street Grade Separation (East)	$ 317,000						
T0003	Freight Intelligent Transportation System (FITS)-Contract 1	$ 30,600						
T0004	FITS: System Integration/GoPort Application/Smart Parking System-Contract 2	$ -						
T0005	FITS: Joint Traffic Management Center/Emergency Operations Center-Contract 3	$ -						
T0004	Quiet Zone Safety Engineering Measures	$ 8,875						
0462G	US 101 / 25 Interchange Improvements Phase 1	$ 101,200						$ 20,000
5301X	Rt 80/680/12 Interchange, Package 2A	$ 93,700						
7101P	South Coast 101 HOV-Carpinteria-Segment 4A	$ 138,675						
7101R	South Coast 101 HOV-Padaro-Segment 4B	$ -						
7101S	South Coast 101 HOV-Summerland - Segment 4C	$ -						
7101X	South Coast 101 HOV	$ 40						
7101Y	South Coast 101 HOV	$ 3,550						
2985	South Coast 101 Segment - Santa Monica Road and Via Real Intersection Improvement	$ -						
6955	Rt 58 / 99 Bakersfield Freeway Connector	$ 50,000						$ 25,000
T0005	1. Southern Terminus Gap Closure	$ 9,529						$ 5,000
T0006	2. Terminal Island Railyard Enhancements	$ 34,015						$ 21,645
T0007	4. Pier G & J Double Track (POLB)	$ 25,000						$ 14,000
T0008	6. Montebello Boulevard Grade Separation	$ 179,954						
T0009	7. Turnbull Canyon Road Grade Separation	$ 86,246						
2002A	8. Rosecrans/Marquardt Grade Crossing	$ 158,438						
3189B	Rt 5 Golden State Chokepoint Relief	$ 539,200						$ 179,000
2741S	Rt 71 Freeway Conversion	$ 174,544						
5394	Rt 57 / 60 Confluence: Chokepoint Relief Program	$ 420,200						$ 99,000

FREIGHT PLAN
California Freight Mobility Plan

			TCEP Dollars by FY ($1,000's)					
PPNO	Project Title	Total Project Cost ($1,000's)	FY 23/24 Cycle 3	FY 24/25 Cycle 3	FY 25/26 *Cycle 4	FY 26/27 *Cycle 4	State SB 1 funds (Subject to Change)	Estimated Federal NHFP funds (Subject to Change)
4961	Rt 34 (Fifth St) / Rice Avenue Grade Separation	$117,532						
3010T	Rt 60 Truck Safety and Efficiency, Phase 1A	$ 24,000						
0260J	Rt 395 Widening from SR 18 to Chamberlaine Way	$ 55,521						
3009P	Rt 10 Corridor, Contract 1 (Express Lanes)	$ 929,191						$ 104,316
T0011	Etiwanda Avenue Grade Separation	$ 76,000						
0161A	Rt 99 Livingston Widening, North Bound	45950						$ 24,505
T0002	Fyffe Avenue Grade Separation	$ 13,000						
0944M	Rt 132 West Freeway / Expressway Phase 1	$ 158,393						
1036	1. Rt 125/905 Connector	$ 37,965						
0999E	2. Rt 11/Siempre Viva Interchange and Commercial Vehicle Enforcement Facility, Segment 2B	$ 37,095						
0999F	3. Otay Mesa East Port of Entry Segment 3A	$ 66,570						
1241	Intelligent Transportation System Technology (Advanced Technology Corridors at Border Ports of Entry)	$ 39,176						
1258	5. Rt 98 Improvements	$ 13,096						
1335	6. Calexico East POE Truck Crossing Improvement	$ 32,538						
0999C	Otay Mesa East Port of Entry Segment 3	$ 374,554						
T0014	Sorrento to Miramar, Ph2 Intermodal Improvements	$ 129,037						
1334	Otay Mesa Truck Route, Phase 4A	$ 12,524						
T0013	Tenth Avenue Marine Terminal Beyond Compliance Environmental Enhancements	$ 7,000						
3834	Rt 57 / Lambert Road Interchange Improvement	$ 107,433						$ 56,540
5876	Capital Region Freight I-5 - Arena Blvd.	$ 37,700						$ 30,670
5101A	Capital Region Freight I-80 - Douglad to Riverside	$ 26,898						$ 16,300
1812	Capital Region Freight Elkhorn (Dept. of Airports)	$ 26,000						
8273C	I80 Cordelia CVEF	$ 250,770						
3597	I5 Improvements Shasta - Fix 5 Cascade	$ 80,235						

			TCEP Dollars by FY ($1,000's)					
PPNO	Project Title	Total Project Cost ($1,000's)	FY 23/24 Cycle 3	FY 24/25 Cycle 3	FY 25/26 *Cycle 4	FY 26/27 *Cycle 4	State SB 1 funds (Subject to Change)	Estimated Federal NHFP funds (Subject to Change)
3009Q	I-10 Truck Climbing	$ 36,487						$ 21,313
0167M	I-15 San Bernardiono Aux and Express Lanes	$ 297,555						$ 24,436
3017N	I-15 San Bernardiono - Toll system Provider	$ 7,600						
3017P	I-15 San Bernardino - Establish Existing Planting	$ 2,012						
3416	I-580 Interchange Improvements - City of Tracy	$ 49,183						$ 20,000
2190	San Onofre to Pulgas Double Track, Phase 2	$ 35,537						
LP003	San Dieguito Double Track Phase 1	$ 61,813						
T0015	Del Mar Bluffs, Phase 5	$ 65,196						
T0016	Broadway to Gaslamp Signalization and Platform	$ 38,861						
T0019	East Basin Rail Gateway Expansion: Fourth Track at Ocean (POLB)	$ 24,800						
5830	Fenix Terminal Rail Expansion POLA	$ 51,470						$ 16,992
6297	SR 99 Madera - South Madera 6 Lane	$ 110,873						
0226L	SR 46 Expressway Conversion SLO-Antelope	$ 101,300						
3386E	SR 46 Gap Closure Segment 4C - Kern	$ 37,000						
0077G	SR 71 91 Interchange	$ 148,208						$ 20,000
5388	Rt 605 / 91 Interchange Improvement: Gateway Cities Freight Crossroads Project	$ 154,300						$ 10,000
5496	SR 91 Aux lane - Atlantic to Cherry Ave.	$ 86,636						$ 48,332
9883	Stockton Diamond Grade Sep.	$ 237,133						
0658L	Solano I-80 Managed Lanes	$ 274,900						
0658N	Solano I-80 Managed Lanes - Toll Work	$ -						
1272	McKinley Grade Sep.	$ 108,300						
3474	SR 55 Improvements	$ 349,212						$ 101,809
T0018	Port of Stockton Rail Improvements	$ 46,007						
3507	North County Corridor Phase 1 Expressway	$ 163,000						
0298F	I 680 SR 4 Interchange	$ 236,000						
0057D	SR 156 Castroville Blvd. Interchange	$ 55,200						$ 17,706
5088	SR 47 Interchange Improvements	$ 60,355						$ 6,000
1435	La Media Road Additional Lanes	$ 42,700						

			TCEP Dollars by FY ($1,000's)					
PPNO	Project Title	Total Project Cost ($1,000's)	FY 23/24 Cycle 3	FY 24/25 Cycle 3	FY 25/26 *Cycle 4	FY 26/27 *Cycle 4	State SB 1 funds (Subject to Change)	Estimated Federal NHFP funds (Subject to Change)
Cycle 3 Projects								
6197	America's Green Port Gateway: Pier B Early Rail** (East Expansion)	$ 69,363	$37,336				$37,336	$ -
6198	America's Green Port Gateway: Pier B Early Rail** (Locomotive Facility)	$ 57,654	$ 33,106				$33,106	$ -
0999C	Otay Mesa East Port of Entry	$ 532,154	$ 85,800				$85,800	$ -
0999G	CVEF Design and Construction-Segment 2C	$ 61,700	$ 54,200				$54,200	$ -
8273C	Westbound I80 Cordelia Commercial vehicle Enforcement Facility	$ 243,270		$ 129,000			$ 129,000	$ -
1447	I-5/SR-15/Harbor Drive	$ 68,400	$ 6,500				$ 6,500	$ -
1417	SR-15 Operational Improvements	$ 62,800	$ 12,000				$ 12,000	$ -
1317	I-10 Corridor Freight and Managed Lane Project**	$ 806,000	$ 85,000				$ 15,000	$ 70,000
6369	Tulare Six Lane and Paige Ave (dependent on approved SCS)	$ 238,143	$ 36,969				$ 11,969	$ 25,000
2090L	Port of Oakland Microgrid (Substations/BESS)	$ 44,221	$ 1,948	$ 29,007			$ 30,955	$ -
2090M	Port of Oakland Microgrid (Solar)	$5,092	$ 294	$ 3,271			$ 3,565	$ -
2090J	Port of Oakland Microgrid (EV Chargers)	$ 10,163	$ 7,115				$ 7,115	$ -
T0020	Fresno UPRR Double Track (dependent on approved SCS)	$ 133,400		$ 40,000			$ 40,000	$ -
4382	I-605 Valley Boulevard Interchange Improvements	$ 53,280	$ 33,570				$ 6,570	$ 27,000
4600A	SR 91 Operational and Multimodal Improvements	$ 107,670	$ 42,566				$ 42,566	$ -
4117	Rt 49 Corridor Improvement	$ 33,100		$ 14,615			$ 2,615	$ 12,000
6199	EV Oasis South*	$ 40,136	$ 8,027	$ 20,068			$ 28,095	$ -
1318	Southern California Hydrogen Fueling Facilities* (Phase 1)	$ 33,347	$ 13,150				$ 13,150	$ -
1319	Southern California Hydrogen Fueling Facilities* (Phase 2)	$ 26,889	$ 10,300				$ 10,300	$ -
1320	Southern California Hydrogen Fueling Facilities* (Phase 3)	$ 44,314	$ 18,450				$ 18,450	$ -
6200	I-710 Integrated Corridor Management (ICM)	$ 40,150		$ 27,840			$ 27,840	$ -
5860	I-5 Managed Lanes	$ 383,360	$ 10,000				$ 10,000	$ -
8030	Centennial Corridor Southbound 99 to Westbound 58 Connector	$ 13,400		$ 9,380			$ 3,380	$ 6,000
3597	Fix 5 Cascade Gateway	$ 82,611	$ 450	$ 70,399			$ 12,849	$ 58,000

			TCEP Dollars by FY ($1,000's)					
PPNO	Project Title	Total Project Cost ($1,000's)	FY 23/24 Cycle 3	FY 24/25 Cycle 3	FY 25/26 *Cycle 4	FY 26/27 *Cycle 4	State SB 1 funds (Subject to Change)	Estimated Federal NHFP funds (Subject to Change)
0242K	I-80 San Pablo Dam Road Interchange Improvements	$ 112,000	$ 19,700				$ 19,700	$ -
3546	SR 4 Wagon Trail Realignment	$ 56,000		$ 5,250			$ 5,250	$ -
1821	Sacramento County WattEV Innovative Freight Terminal*	$ 61,850	$ 1,018	$ 32,670			$ 33,688	$ -
1321	SR 60 Potrero Boulevard Interchange	$ 50,000		$ 33,500			$ 7,500	$ 26,000
2090K	TOWN Rail Safety Improvements	$ 59,005	$ 2,833	$ 27,367			$ 5,367	$ 22,000
6201	Maritime Support Facility Access – Terminal Island	$ 39,670		$ 14,936			$ 14,936	$ -
1322	U.S. 395 Freight Mobility and Safety Project** (CON Mainline)	$ 74,583	$ 30,000				$ 30,000	$ -
1323	U.S. 395 Freight Mobility and Safety Project** (Zero Emission)	$ 5,000	$ 5,000				$ 5,000	$ -
2653	Five Cities Multimodal Transportation Network Enhancement Project	$ 81,094		$ 61,294			$ 61,294	$ -
3196	Shell Beach Road Shared Use Path Extension	$ 4,355	$ 508	$ 3,629			$ 4,137	$ -
5490	Grant Line Road Safety Freight Mobility***	$ 47,859	$ 3,000				$ 3,000	$ -
	TOTALS:	$ 11,727,369	$ 558,840	$ 522,226			$ 832,233	$ 1,200,446

Endnotes

[1] U.S. Bureau of Economic Analysis. https://www.bea.gov/news/2021/gross-domestic-product-state-1st-quarter-2021
[2] U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Accounts, http://www.bea.gov/regional/index.htm
[3] America's Top Trading Partners (https://money.cnn.com/interactive/news/economy/how-us-trade-stacks-up/index.html?iid=EL)
[4] State Exports from California (https://www.census.gov/foreign-trade/statistics/state/data/ca.html)
[5] https://www.metrans.org/assets/research/psr-18-sp90_part-1_giuliano_final-report.pdf
[6] Note: Surface Transportation Assistance Act (STAA), 1982. Allows large trucks to operate on the Interstate and certain primary routes called collectively the National Network. These trucks, referred to as STAA trucks, are longer than California legal trucks. As a result, STAA trucks have a larger turning radius than most local roads can accommodate. Other states allow STAA vehicles on all roads where they are not expressly prohibited. California allows STAA vehicles only on roads where they are expressly permitted.
[7] Discretionary cargo is maritime cargo for which the United States port of unlading is different than the United States port of entry. This means that shippers have the discretion to bring the cargo through almost any port in the United States because the cargo is not bound to any particular location. Cargo can be moved to final destinations across the country using the intermodal transportation system.
[8] "U.S. Waterborne Foreign Container Trade by U.S. Customs Ports 2000 – 2017." United States Department of Transportation, MARAD (Maritime Administration). https://maritime.dot.gov/data-reports/data-statistics/us-waterborne-foreign-container-trade-us-customs-ports-2000-%E2%80%93-2017.
[9] Note: Using three import ports, such as Los Angeles, Savannah, and New York-New Jersey.
[10] Note: Using four import ports, such as Los Angeles, Seattle, Savannah, and New Yok-New Jersey.
[11] John McCown Container Report - Capital Link Marine Transportation (capitallinkshipping.com)
[12] California Ports – Environmental Stewards – California Association of Port Authorities
[13] California, LA and Japan Sign Agreements for Green Shipping Initiative (maritime-executive.com)
[14] "An Analysis of the Operational Costs of Trucking: 2018 Update". *American Transportation Research Institute*. October 2018. Print.
[15] "Welcome to California's 2022-23 State Budget". *California Department of Finance*. June 2022.
[16] "SB1 By The Numbers". Rebuilding California. http://www.rebuildingca.ca.gov/sb-1-by-the-numbers.
10b Transportation (ca.gov)
[17] Larson, William, "New Estimates of Value of Land of the United States," U.S. Bureau of Economic Analysis, 2015. The estimated values were aggregated from valuation of different property types, including agricultural areas, federal land, and developed suburban and urban areas.
[18] "Electric Power Monthly Average Price of Electricity to Ultimate Customers by End-User Sector Report". *U.S. Energy Information Administration Independent Statistics and Analysis*. https://eia.gov.
[19] "Gasoline and Diesel Fuel Update". *EIA- U.S. Energy Information Administration*. https://www.eia.gov/petroleum/gasdiesel/
[20] "A Blueprint for Action Report". The Boyd Company, Inc. Pg. 10, http://growadamscounty.com/wp-content/uploads/2015/05/Blueprint-for-Action-Report_.pdf.
[21] McCann, Adam. "Best and Worst States to Start a Business." WalletHub. July 8, 2019. https://wallethub.com/edu/best-states-to-start-a-business/36934/.
[22] "Best and Worst States to Do Business." USA Today. March 5, 2018. https://www.usatoday.com/story/money/business/2018/03/05/economic-climate-best-and-worst-states-business/376783002/.
[23] "America's Top States for Business 2018." *CNBC*. July 10, 2018. https://www.cnbc.com/2018/07/10/americas-top-states-for-business-2018.html. Web.
[24] Gambale, Geraldine. "2018 Top States for Doing Business: Georgia Ranks #1 Fifth Year in a Row." Area Development. https://www.areadevelopment.com/Top-States-for-Doing-Business/Q3-2018/overall-results-georgia-ranked-top-state-by-site-selection-consultants.shtml.
[25] Kolko, Jed, David Neumark, and Marisol Cuellar Mejia. "Business Climate Rankings and the California Economy". *PPIC*. 2009. Print.
[26] "Occupational Employment and Wages, May 2017." United States Department of Labor, Bureau of Labor Statistics. March 30, 2018. https://www.bls.gov/oes/2017/may/oes533032.htm#nat.
[27] Brajkovic, Vesna. "HDT Fact Book 2022: Driver Turnover Slows". *Drivers - Trucking Info*. https://www.truckinginfo.com/10179472/hdt-fact-book-2022-driver-turnover-slows-except-for-private-fleets#Truck%20Driver%20Turnover%20Trends
[28] "Railroad Jobs: A Highly Skilled & Compensated Workforce." Association of American Railroads. https://www.aar.org/wp-content/uploads/2019/10/AAR-Railroad-Jobs-Issue.pdf.

29 "Overview of America's Freight Railroads." Association of American Railroads. October 2018. https://www.aar.org/wp-content/uploads/2018/05/AAR-Overview-Americas-Freight-Railroads.pdf.
30 "U.S. Freight & International Trade Stats." Association of American Railroads. February 2019. https://img1.wsimg.com/blobby/go/29e544b6-eb7c-4706-9d4f-78d8700070f6/downloads/Notes%20on%20Freight_Intl%20Trade%206-19.pdf?ver=1561742750285.
31 PMA Pacific Maritime Association (pmanet.org) https://www.google.com/search?q=PMA+Pacific+Maritime+Association+(pmanet.org)&oq=PMA+Pacific+Maritime+Association+(pmanet.org)&aqs=edge..69i57j0i546l3j0i30i546j69i64.1256j0j4&sourceid=chrome&ie=UTF-8
32 U.S. Bureau of Labor Statistic https://www.bls.gov/ooh/transportation-and-material-moving/airline-and-commercial-pilots.htm#tab-1
33 "Final 2016 RTP/SCS." Southern California Area of Governments (SCAG). http://scagrtpscs.net/Pages/FINAL2016RTPSCS.aspx.
34 California Economic Trends, Stats & Rankings | IBISWorld https://www.ibisworld.com/united-states/economic-profiles/california/#:~:text=What%20can%20construction%20trends%20tell,out%20of%20all%20US%20states.
35 Data – CA – employmenthttps://data.edd.ca.gov/resource/r4zm-kdcg.csv
36 Gross domestic product (GDP) by state (millions of current dollars) (CFM) (Press release). Bureau of Productivity Analytics. October 13, 2017. p. 7. Retrieved March 24, 2018. And "Report for Selected Country Groups and Subjects". World Economic Outlook. International Monetary Fund. October 2018.
37 California Chamber of Commerce, Trade Statistics, 2022. https://advocacy.calchamber.com/international/trade/trade-statistics/
38 U.S Department of Commerce, International Trade Administration, Office of Trade and Economic Analysis, California Trade & Economy Factsheet. 2022. https://www.trade.gov/data-visualization/state-economy-and-trade-factsheets
39 FHWA National Highway System, 2017. https://www.fhwa.dot.gov/planning/national_highway_system/
40 FHWA National Highway System Intermodal Connectors, 2018. https://www.fhwa.dot.gov/planning/national_highway_system/intermodal_connectors/california.cfm
41 FHWA National Highway Freight Network - Individual State Maps and Tables, 2017. https://ops.fhwa.dot.gov/freight/infrastructure/ismt/nhfn_states_list.htm
42 FHWA Office of Highway Policy Information, Highway Statistics 2016. https://www.fhwa.dot.gov/policyinformation/statistics/2016/ps1.cfm#foot3
43Association of American Railroads, State Rankings, 2017. https://www.aar.org/wp-content/uploads/2019/05/AAR-State-Rankings-2017.pdf
44 Surface Transportation Act. January 1, 1982. https://www.transportation.gov/content/surface-transportation-assistance-act
45 Caltrans, Interregional Transportation Strategic Plan 2021. https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/system-planning/systemplanning/2021-itsp-oct21-a11y.pdf
46 Caltrans, Interregional Transportation Strategic Plan 2021. https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/system-planning/systemplanning/2021-itsp-oct21-a11y.pdf
47 Source: The CaliBaja Regional Economy: Production, Employment, Trade & Investment. The University of San Diego, Ahlers Center for International Business: Oct, 2022: pg 4. (LINK)
48 Source: 2021 California-Baja California Master Plan. California Department of Transportation District 11, San Diego Association of Governments Service Bureau, and Secretaria de Infraestructura y Desarrollo Urbano y Reordenacion Territorial del Estado de Baja California. Feb, 2021: pg 1. (LINK)
49 Source: CaliBaja Regional Economy: Pg. 2.
50 Source: 2021 California-Baja California Master Plan. California Department of Transportation District 11, San Diego Association of Governments Service Bureau, and Secretaria de Infraestructura y Desarrollo Urbano y Reordenacion Territorial del Estado de Baja California. Feb, 2021: pg ES-2. (LINK)
51 Caltrans State Highway System Management Plan, 2021. https://dot.ca.gov/-/media/dot-media/programs/asset-management/documents/2021-shsmp-final-10-06-21-a11y.pdf
52 USDOT Federal Highway Administration, "Jason's Law Truck Parking Survey Results and Comparative Analysis," 2015. https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking/jasons_law/truckparkingsurvey/jasons_law.pdf
53 "Jason's Law Truck Parking Survey Results and Comparative Analysis." *Jason's Law Truck Parking Survey Results and Comparative Analysis - FHWA Freight Management and Operations*, https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking/jasons_law/truckparkingsurvey/index.htm.
54 USDOT Federal Highway Administration, 2019. https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/
55 Data from Caltrans Division of Traffic Operations 2018)
56 Surface Transportation Board (stb.gov)

[57] Bureau of Transportation Statistics. Freight Facts and Figures. 2022. https://data.bts.gov/stories/s/45xw-qksz
[58] Association of American Railroads. 2022. https://www.aar.org/wp-content/uploads/2021/02/AAR-California-State-Fact-Sheet.pdf
[59] Caltrans California State Rail Plan, 2018. http://www.dot.ca.gov/californiarail/docs/CSRP_Final_rev121818.pdf
[60] Caltrans California State Rail Plan, 2018. http://www.dot.ca.gov/californiarail/docs/CSRP_Final_rev121818.pdf
[61] Short Line Rail Improvement Plan (Jacobs DB for the California Department of Transportation, 2021)
[62] National Port Readiness Network, 2019. https://www.maritime.dot.gov/ports/strong-ports/national-port-readiness-network-nprn
[63] Airport Ranks from Federal Aviation Administration, 2018. (https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passeneger/previous_years/#2013) and the cargo operation provided by Caltrans Division of Aeronautics.
[64] https://dot.ca.gov/-/media/dot-media/programs/aeronautics/documents/2020_casp_adopted_divofaero_01052022-a11y.pdf
[65] Genevieve Giuliano, et. al, Managing the Impacts of Freight in California, A Research Report from the National Center for Sustainable Transportation January 2018
[66] U.S. Energy Information Administration, 2019. https://www.eia.gov/dnav/pet/pet_pnp_cap1_dcu_nus_a.htm
[67] U.S. Energy Information Administration, 2018. https://www.eia.gov/tools/faqs/faq.php?id=46&t=8
[68] U.S. Energy Information Administration, 2019 (https://www.eia.gov/state/maps.php)
[69] Southern California Association of Governments - Industrial Warehousing in the SCAG Region, 2018. http://www.scag.ca.gov/Documents/Task2_ FacilityInventory.pdf
[70] Southern California Association of Governments - Industrial Warehousing in the SCAG Region, 2018. http://www.scag.ca.gov/Documents/Task2_ FacilityInventory.pdf
[71] Southern California Association of Governments - Industrial Warehousing in the SCAG Region, 2018. http://www.scag.ca.gov/Documents/Task2_ FacilityInventory.pdf
[72] USDOT Federal Highway Administration, 2017. https://www.federalregister.gov/documents/2017/01/18/2017-00681/national-performance-management-measures-assessing-performance-of-the-national-highway-system
[73] American Transportation Research Institute, Top 100 Truck Bottleneck List, 2022. https://dot.ca.gov/-/media/dot-media/programs/asset-management/documents/2022-tamp-a11y.pdf
[74] Caltrans. California Transportation Asset Management Plan . May 2022, https://dot.ca.gov/-/media/dot-media/programs/asset-management/documents/2022-tamp-a11y.pdf
[75] Caltrans. California Transportation Asset Management Plan . Jan. 2018, https://dot.ca.gov/-/media/dot-media/programs/asset-management/documents/20190726-am-finalcaliforniatamp-a11y.pdf
[76] Caltrans. California Transportation Asset Management Plan . Jan. 2018, https://dot.ca.gov/-/media/dot-media/programs/asset-management/documents/20190726-am-finalcaliforniatamp-a11y.pdf
[77] Caltrans. California Transportation Asset Management Plan . Jan. 2018, https://dot.ca.gov/-/media/dot-media/programs/asset-management/documents/20190726-am-finalcaliforniatamp-a11y.pdf
[78] Caltrans. California Transportation Asset Management Plan . Jan. 2018, https://dot.ca.gov/-/media/dot-media/programs/asset-management/documents/20190726-am-finalcaliforniatamp-a11y.pdf
[79] Caltrans. California Transportation Asset Management Plan . Jan. 2018, https://dot.ca.gov/-/media/dot-media/programs/asset-management/documents/20190726-am-finalcaliforniatamp-a11y.pdf
[80] Caltrans. California Transportation Asset Management Plan . Jan. 2018, https://dot.ca.gov/-/media/dot-media/programs/asset-management/documents/20190726-am-finalcaliforniatamp-a11y.pdf
[81] Caltrans. California Transportation Asset Management Plan . Jan. 2018, https://dot.ca.gov/-/media/dot-media/programs/asset-management/documents/20190726-am-finalcaliforniatamp-a11y.pdf
[82] Caltrans, "Height & Low Clearances." http://www.dot.ca.gov/trafficops/trucks/height.html
[83] California Strategic Highway Safety Plan Steering Committee. California Safe Roads: 2020-2024 Strategic Highway Safety Plan. May 2022, https://dot.ca.gov/-/media/dot-media/programs/safety-programs/documents/shsp/2022-shsp-full-report-2020-2024-a11y.pdf
[84] California State Highway Reliability Report, 2018. https://www.fhwa.dot.gov/tpm/reporting/state/reliability.cfm?state=California
[85] Caltrans, 2018 California State Rail Plan. http://www.dot.ca.gov/californiarail/docs/CSRP_Final_rev121818.pdf
[86] Caltrans, 2013 California State Rail Plan. http://www.dot.ca.gov/californiarail/docs/Final_Copy_2013_CSRP.pdf
[87] Federal Railroad Administration, Office of Safety Analysis, TOTAL AT-GRADE HIGHWAY-RAIL CROSSINGS FOR State of California Report https://safetydata.fra.dot.gov/OfficeofSafety/publicsite/query/invtab.aspx
[88] Federal Railroad Administration, office of Safety Analysis, TOTAL CASUALTIES BY STATE Report https://safetydata.fra.dot.gov/officeofsafety/publicsite/summary.aspx
[89] American Association of Port Authorities' (AAPA) Seaport Directory, 2018. http://www.nxtbook.com/naylor/AAPD/AAPD0018/index.php?startid=35#/0
[90] NOAA Raster Chart Products, nauticalcharts.noaa.gov/charts/noaa-raster-charts.html#rnc-charts

[91] Caltrans, California Aviation System Plan 2020. https://dot.ca.gov/-/media/dot-media/programs/aeronautics/documents/2020_casp_adopted_divofaero_01052022-a11y.pdf
[92] Caltrans, Caltrans Transportation Performance Management Engagement. https://dot.ca.gov/programs/federal-liaison/tpm-engagement#perfmngmt-1
[93] Federal Highway Administration, Transportation Performance Management. https://www.fhwa.dot.gov/tpm/reporting/state/state.cfm?state=California
[94] https://plantingseedsblog.cdfa.ca.gov/wordpress/?p=17255#comment-242171
[95]California Agricultural Statistic Review 2020-2021, California Department of Food and Agriculture.
[96] California Agricultural Statistic Review 2020-2021, California Department of Food and Agriculture.
[97] California Agricultural Statistic Review 2020-2021, California Department of Food and Agriculture.
[98] https://www.ncba.org/policy
[99] https://www.trains.com/trn/california-feed-and-poultry-producer-seeks-emergency-order-due-to-union-pacific-service-failures/v
[100] "Gross Domestic Product (GDP) by State (Millions of Current Dollars)" (CFM) (Press release). Bureau of Productivity Analytics. October 13, 2017. p. 7. Retrieved March 24, 2018.
[101] "ICYMI: California Poised to Become World's 4th Biggest Economy" Office of Governor Gavin Newsom. October 24, 2022. https://www.gov.ca.gov/2022/10/24/icymi-california-poised-to-become-worlds-4th-biggest-economy/
[102] US Census Bureau News, May 18, 2023. "Quarterly Retail E-Commerce Sales". https://www.census.gov/retail/mrts/www/data/pdf/ec_current.pdf
[103] Hooper, Alan and Daniel Murray. "E-Commerce Impacts on the Trucking Industry, American Trucking Research Institute." TruckingResearch.org February 2019. https://truckingresearch.org/wp-content/uploads/2019/02/ATRI-Impacts-of-E-Commerce-on-Trucking-02-2019.pdf
[104] Demmitt, Jacob. "Amazon has Big Plans for Uber-like 'Flex' Package Delivery Service, Job Postings Reveal." GeekWire. December 16, 2015. http://www.geekwire.com/2015/amazon-plans-to-expand-uber-style-crowdsourced-delivery-network-to-millions-of-drivers/
[105] Page 22 on Defines DNC - https://vig.cdn.sos.ca.gov/2020/general/pdf/topl-prop22.pdf
[106] Masunaga, Samantha. "Uber and Lyft Team Up to Deliver for Wal-Mart." Los Angeles Times. June 3, 2016. https://www.latimes.com/business/la-fi-tn-walmart-uber-lyft-20160603-snap-story.html
[107] Kelleher, Kevin. "How Postmates Survived and Thrived Despite the Naysayers." Time. July 11, 2016. http://time.com/4401591/postmates-on-demand-delivery/
[108]https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Transportation/TNC_Data/2019_TNC_Data_Report.pdf
[109]https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Transportation/TNC_Data/2019_TNC_Data_Report.pdf
[110] Banjo, Shelly and Drew Fitzgerald. "Stores Confront New World of Reduced Shopper Traffic E-Commerce Not Only Siphons Off Sales, but Changes Shopping Habits." Wall Street Journal. January 16, 2014, https://www.wsj.com/articles/stores-confront-new-world-of-reduced-shopper-traffic-1389919360
[111] Egan, Matt. "Macy's is Closing Another 100 Stores." CNN Money U.S. August 11, 2016
[112] Cao, Xinyu (Jason), Frank Douma, Fay Cleveland, and Zhiyi Xu. "The Interactions between E-Shopping and Store Shopping: A Case Study of the Twin Cities Final Report." Humphrey Institute of Public Affairs, University of Minnesota. The Intelligent Transportation Systems Institute Center for Transportation Studies. August 2010. http://conservancy.umn.edu/bitstream/11299/101340/1/CTS%2010-12.pdf
[113] Stern, Julie D. "The View from E.CON: The Future of Industrial Real Estate is E-Commerce." NAIOP Commercial Real Estate Development Association. Summer 2014. https://www.naiop.org/en/Magazine/2014/Summer-2014/Business-Trends/The-View-From-ECON
[114] "E-Commerce and a New Demand Model for Logistics Real Estate." Prologis. July 2014. https://www.prologis.com/logistics-industry-research/e-commerce-and-new-demand-model-logistics-real-estate
[115] "Innovation, Disruption and the Value of Time: The Next 10 Years in Logistics Real Estate." Prologis. September 2018. https://www.prologis.com/logistics-industry-research/innovation-disruption-and-value-time-next-10-years-logistics-real
[116] "List of Amazon Locations." Wikipedia. Accessed on November 15, 2022. https://en.wikipedia.org/wiki/List_of_Amazon_locations#United_States
[117] "Amazon Plans a Second Fulfillment Center in Stockton, California." Area Development News Desk. September 18, 2018. http://www.areadevelopment.com/newsItems/9-18-2018/amazon-fulfillment-facility-stockton-california.shtml
[118] "Amazon will order 100,000 electric delivery vans from EV startup Rivian, Jeff Bezos says." The Verge, September 19, 2019. https://www.theverge.com/2019/9/19/20873947/amazon-electric-delivery-van-rivian-jeff-bezos-order
[119] "FedEx to Add 1,000 Electric Vehicles to Parcel Fleet." The Wall Street Journal, November 20, 2018. https://www.wsj.com/articles/fedex-to-add-1-000-electric-vehicles-to-parcel-fleet-1542736194

[120] "Anheuser-Busch Completes First Zero-Emission Beer Delivery." Nikola Motor, November 21, 2019. https://nikolamotor.com/press_releases/anheuser-busch-completes-first-zero-emission-beer-delivery-69
[121] "Reducing Rail Emissions in California." California Air Resources Board, February 13, 2020. https://ww2.arb.ca.gov/our-work/programs/reducing-rail-emissions-california
[122] California Energy Comission, New ZEV Sales in California. Retrieved on 5/18/2023 from https://tableau.cnra.ca.gov/t/CNRA_CEC_PUBLIC/views/DMVDataPortal/SALES_Dashboard?%3Adisplay_count=n&%3Aembed=y&%3AisGuestRedirectFromVizportal=y&%3Aorigin=viz_share_link&%3AshowAppBanner=false&%3AshowVizHome=n

[123] California Air Resources Board, 2023. "In Use Locomotive Regulation". https://ww2.arb.ca.gov/news/carb-passes-new-use-locomotive-regulation-estimated-yield-over-32-billion-health-benefits-0

[124] California Air Resources Board, 2023. "Advanced Clean Fleet Rule". https://ww2.arb.ca.gov/news/california-approves-groundbreaking-regulation-accelerates-deployment-heavy-duty-zevs-protect
[125] Rifkin, Jeremy. "The Third Industrial Revolution." Palgrave MacMillan. September 27, 2011.
[126] Rasmus, Russ, Sunny Webb, and Matthew Short. "3D Printing's Disruptive Potential." Accenture Technologies, Copyright 2014.
[127] Lapowsky, Issie. "Amazon Can Now Test Its Delivery Drones in the U.S." Wired. April 10, 2015. https://www.wired.com/2015/04/amazon-drone-faa-green-light/
[128] Jay, Mary Lou. "Technology Payoffs, The ROI for AI, IoT and Advanced Analytics." MHI Solutions, Volume 7, Issue 1, December 19, 2018.
[129] The future of mobility is at our doorstep (mckinsey.com)
[130] "Autonomous Vehicles in California." Department of Motor Vehicles, accessed on February 9, 2020. https://www.dmv.ca.gov/portal/dmv/detail/vr/autonomous/bkgd

[131] United States Department of Transportation, National Highway Traffic Safety Administration (NHTSA). (2023). https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety

[132] California Legislative Information. (n.d.). California Vehicle Code: Division 16.6. Retrieved on 05/16/2023 from https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=VEH&division=16.6.&title=&part=&chapter=&article=
[133] Goble, Keith. "Seven More States Adopt Rule Changes for Truck Platoons." Land Line. May 1, 2018. http://www.landlinemag.com/story.aspx?storyid=72230#.XCflef7sQy8
[134] McAuliffe, Brian R., Mark Croken, Mjtaba Ahmadi-Baloutaki, and Aresh Raeesi. "Fuel-Economy of a Three-Vehicle Truck Platooning System (Deliverable 2.6)." Report No. LTR-AL-2017-0008. April 22, 2017. https://path.berkeley.edu/sites/default/files/merged_truckfuelconsumptionfinalreport.pdf
[135] Borison, Adam. "Prepared Direct Testimony of Adam Borison on Behalf of San Diego Unified Port District." Berkeley Research Group. September 26, 2017. http://docs.cpuc.ca.gov/PublishedDocs/SupDoc/A1709005/1544/216775950.PDF
[136] "Are Blackouts The Future For California?" National Public Radio, October 21, 2019. https://www.npr.org/2019/10/21/771280208/are-blackouts-the-future-for-california
[137] "Critical Issues in the Trucking Industry – 2018." American Trucking Research Institute,. October 2018. https://atri-online.org/wp-content/uploads/2018/10/ATRI-Top-Industry-Issues-2018.pdf
[138] "Highway Statistics Series Publications – Table VM-1." U.S. Department of Transportation Federal Highway Administration. Retrieved July 10, 2017. https://www.fhwa.dot.gov/policyinformation/statistics.cfm.
[139] Cassidy, William B. "U.S. Shippers Hitting Capacity Barriers on Rail, Road." Journal of Commerce. May 24, 2018. https://www.joc.com/rail-intermodal/us-shippers-hitting-capacity-barriers-rail-road_20180524.html
[140] Shea, Daniel, Kristy Hartman and Sijia Qiu. "Transporting Crude Oil by Rail: State and Federal Action." National Conference of State Legislatures. October 30, 2015. http://www.ncsl.org/research/energy/transporting-crude-oil-by-rail-state-and-federal-action.aspx
[141] Middleton, Dan. "Strategies for Separating Trucks from Passenger Vehicles: Final Report." Texas A7M University, Texas Transportation Institute, Report No. 0-4663-2. September 2006. https://static.tti.tamu.edu/tti.tamu.edu/documents/0-4663-2.pdf
[142] Forkenbrock, David J. and March, Jim. "Issues in The Financing of Truck-Only Lanes." Public Roads, Publication Number: FHWA-HRT-05-007, Vol. 69 No. 2, 2005. https://www.fhwa.dot.gov/publications/publicroads/05sep/02.cfm
[143] Kahaner, Larry. "Platooning is Closer Than You Think – Just Like the Trucks.". Fleetowner.com. 2015. http://fleetowner.com/driver-management-resource-center/platooning-closer-you-think-just-trucks

[144] Wang, Jian, Yameng Shao, Yuming Ge, and Rundong Yu. 2019. "A Survey of Vehicle to Everything (V2X) Testing" Sensors 19, no. 2: 334. https://doi.org/10.3390/s19020334
[145] "Mobility Investment Priorities, Texas Legislature 2030 Transportation Committee's Action Program, Variable Pricing." Texas A&M University. http://mobility.tamu.edu/mip/strategies-pdfs/travel-options/technical-summary/variable-pricing-4-pg.pdf

[146] "Toll Facilities in the United States." FHWA Office of Highway Policy Information, Publication No: FHWA-PL-18-018. https://www.fhwa.dot.gov/policyinformation/tollpage/
[147] Stakeholder interviews for the MTC Freight Emissions Study
[148] "Truck Tolling: Understanding Industry Tradeoffs When Using or Avoiding Toll Facilities." National Academies of Sciences, Engineering, and Medicine. 2012 Washington, DC: The National Academies Press. http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_w003.pdf
[149] Carpenter, Tom. "Raise Interstate Highway Gross Vehicle Weight Limits." 2012. https://opendot.ideascale.com/a/dtd/Raise-interstate-highway-gross-vehicle-weight-limits/31750-7039
[150] Senate Bill 671 (Gonzalez, Chapter 769, Statutes of 2021).
[151] California Energy Commission. (2023). https://www.energy.ca.gov/event/workshop/2023-03/staff-workshop-potential-solicitation-medium-and-heavy-duty-charging-and
[152] San Diego Gas & Electric. (2023). CA's First Public, DC Fast Chargers for Electric Medium and Heavy-Duty Vehicles at a Truck Stop Open for Public Use. Retrieved from https://www.sdgenews.com/article/cas-first-public-dc-fast-chargers-electric-medium-and-heavy-duty-vehicles-truck-stop-open
[153] "Request for Proposals, Business Plan and Consultant Services." State of Utah Division of Purchasing Solicitation #CF19042
[154] "Trucking Activity Report (TRAC)." American Trucking Association. September 2018
[155] "West Coast Marine Highway Market Analysis Project." Cardno TEC, Inc. Prepared for West Coast Corridor Coalition, April 2014. http://californiaports.org/wp-content/uploads/2014/04/West-Coast-Marine-Highway-Market-Analyis-Final.pdf
[156] Margaronis, Stas. "Lessons from the M-580." AJOT. September 22, 2014. https://www.ajot.com/premium/ajot-lessons-from-the-m-580
[157] "M-580 Corridor Multimodal Freight Network Optimization Study." https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/freight-planning/cfmp-2020-accordion/caltrans-m-580-final-report.pdf
[158] "Facts and Frequently Asked Questions," Virgin Hyperloop One, Retrieved February 3, 2020. https://hyperloop-one.com/facts-frequently-asked-questions
[159] "ITF Transport Outlook 2015." ITF (2015). OECD Publishing, Paris. https://doi.org/10.1787/9789282107782-en
[160] Lloyd, Rob. "Demand World". Hyperloop One Blog, April 29, 2018. https://hyperloop-one.com/blog/new-cargo-brand-built-demand-world
[161] California Energy Commission. (2023). Hydrogen Refueling Stations in California. Data last updated April 21, 2023. Retrieved May10, 2023 from https://www.energy.ca.gov/zevstats
[162] https://urldefense.com/v3/__https:/business.ca.gov/wp-content/uploads/2023/02/CACriticalMaterialsOverview_Jan2023.pdf__;!!LWi6xHDyrA!_JUavLrIxF5xg6tQzxHgCGSSy_2CFnJuiKbvyEvKyYRytsSpuQQjdlk3dTqfTqapeMefqx0akGuqlm9VqDEe2NkTExv_ObjJ1xxCjg$
[163] "What is a Safe Systems Approach?" State of California, California Office of Traffic Safety. Accessed on November 16, 2022. https://www.ots.ca.gov/the-safe-system/
[164] https://dot.ca.gov/-/media/dot-media/programs/asset-management/documents/2023_shsmp_draft_02-09-2023_1000.pdf
[165] State of California. "State of California Emergency Plan" CalOES, October 1, 2017.
[166] State of California. "California Emergency Support Function 1 Transportation Annex." CalOES, October 2013. https://www.caloes.ca.gov/PlanningPreparednessSite/Documents/01%20Executive%20Summary%20Transportation.pdf
[167] "Hazardous Materials: Enhancing Rail Transportation Security for Toxic Inhalation Hazard Materials." Federal Register, 16 Aug. 2004, https://www.federalregister.gov/documents/2004/08/16/04-18705/hazardous-materials-enhancing-rail-transportation-security-for-toxic-inhalation-hazard-materials.
[168] "Code Section Group." Codes Display Text, https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=VEH&division=15.&title=&part=&chapter=5.&article=1.
[169] Caltrans. "Near-Zero-Emission and Zero-Emission Vehicles." Caltrans. https://dot.ca.gov/programs/traffic-operations/legal-truck-access/ex-zero-emission-vehicle
[170] Government Publishing Office. "Title 49- Transportation." *Code of Federal Regulations*, 1 Oct. 2017, https://www.govinfo.gov/content/pkg/CFR-2017-title49-vol9/xml/CFR-2017-title49-vol9-part1549.xml.
[171] https://www.congress.gov/bill/117th-congress/house-bill/3684/text
[172] Stoffel, M (2022, October 20). Personal Communication. Word Review)
[173] Stoffel, M, (2022, October 20th), Microsoft Word Review
[174] BNSF Railway. *Corporate Responsibility and Sustainability Report*. BNSF Railway, 2017, https://www.bnsf.com/in-the-community/environment/pdf/sustainability-report-2017.pdf.
[175] https://www.congress.gov/bill/117th-congress/house-bill/3684/text
[176] https://dot.ca.gov/programs/local-assistance/fed-and-state-programs/protect

177 https://www.npr.org/sections/thesalt/2020/04/03/826006362/food-shortages-nope-too-much-food-in-the-wrong-places
178 https://cnr.ncsu.edu/news/2020/05/coronavirus-toilet-paper-shortage
179 https://lbbusinessjournal.com/news/long-beach-la-ports-set-june-cargo-records
180 https://www.sfgate.com/local/article/cargo-ships-San-Francisco-bay-Oakland-supply-chain-16770819.php
181 https://www.latimes.com/business/story/2021-10-13/the-global-supply-chain-is-a-mess-what-does-that-mean-for-you
182 https://ncsolutions.com/press-and-media/fueled-by-the-pandemic-consumer-packaged-goods-purchases-grew-19-in-2020-compared-to-2019-according-to-ncsolutions/
183 https://ww2.arb.ca.gov/sites/default/files/2021-11/SPBP_Congestion_Anchorage_Emissions_Final.pdf
184 https://mxsocal.org/assets/pdf/announcements/container-vessel-queuing-process-faqs-for-la-lb-oak-v-2.pdf
185 https://ajot.com/insights/full/ai-las-seroka-urges-calm-on-ilwu-pma-talks
186 https://www.reuters.com/business/retail-consumer/americas-biggest-warehouse-is-running-out-room-its-about-get-worse-2022-08-02/
187 https://www.freightwaves.com/news/58900-long-dwelling-containers-now-on-penalty-clock-in-la-long-beach
188 https://www.businessinsider.com/shipping-containers-line-streets-in-california-neighborhood-2021-10
189 https://www.transportation.gov/sites/dot.gov/files/2022-03/EO%2014017%20-%20DOT%20Sectoral%20Supply%20Chain%20Assessment%20-%20Freight%20and%20Logistics_FINAL_508.pdf
190 https://www.ktvu.com/news/container-shortage-port-of-oakland-congestion-to-impact-availability-of-holiday-merchandise
191 https://time.com/6213399/railroad-strike-impact-trains/
192 https://www.miq.com/resources/news/article/rail-capacity-and-congestion/
193 https://www.pmsaship.com/wp-content/uploads/2022/09/August-2022-Container-Dwell-Time-Press-Release.pdf
194 https://www.courthousenews.com/la-long-beach-ports-see-progress-moving-backlogged-containers-but-bigger-issues-persist/
195 https://www.businessinsider.com/why-supply-shortages-economy-inventory-chips-lumber-cars-toilet-paper-2021-5#labor-16
196 https://propellerclubnortherncalifornia.org/pmas-mckenna-reports-thirteen-la-lb-ilwu-workers-have-died-from-covid-19/
197 https://dot.ca.gov/news-releases/news-release-2020-008
198 https://dot.ca.gov/news-releases/news-release-2021-034
199 https://business.ca.gov/new-leases-will-make-state-owned-properties-available-for-storing-up-to-20000-shipping-containers-to-help-alleviate-national-supply-chain-issues/
200 https://calsta.ca.gov/subject-areas/usdot-empa
201 https://business.ca.gov/wp-content/uploads/2022/11/Suppy-Chain-Initiative-Report-2022_GOBiz.pdf
202 https://www.latimes.com/business/story/2021-11-10/cargo-jam-in-la-ports-begins-to-ease-as-hefty-fines-loom
203 https://www.transportation.gov/sites/dot.gov/files/2022-03/EO%2014017%20-%20DOT%20Sectoral%20Supply%20Chain%20Assessment%20-%20Freight%20and%20Logistics_FINAL_508.pdf
204 https://www.masstransitmag.com/management/press-release/21215134/metrolink-metrolink-customer-survey-reveals-essential-workers-represent-core-ridership
205 Gross Domestic Product: Second Quarter 2022, California, Bureau of Economic Analysis, 2022 https://apps.bea.gov/itable/iTable.cfm?ReqID=70&step=1
206 World Economic Outlook Database, International Monetary Fund, 2022 https://www.imf.org/external/datamapper/NGDPD@WEO/OEMDC/ADVEC/WEOWORLD
207 E-1 Population Estimates for Cities, Counties, and the State — January 1, 2021 and 2022, California Department of Finance, 2022 https://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-1/
208 USA Trade Online, State Exports from California, United State Census Bureau, 2021 https://usatrade.census.gov/
209 USA Trade Online, State Imports to California, United State Census Bureau, 2021 https://usatrade.census.gov/
210 US DOT, Bureau of Transportation Statistics, Freight Activity in the U.S Expected to Grow Fifty Percent by 2050, 2021 https://www.bts.gov/newsroom/freight-activity-us-expected-grow-fifty-percent-2050
211 US DOT, Bureau of Transportation Statistics, Freight Activity in the U.S Expected to Grow Fifty Percent by 2050, 2021 https://www.bts.gov/newsroom/freight-activity-us-expected-grow-fifty-percent-2050
212 https://calsta.ca.gov/-/media/calsta-media/documents/capti-july-2021-a11y.pdf
213 "Assembly Bill No. 32." Bill Text - AB-32 Air Pollution: Greenhouse Gases: California Global Warming Solutions Act of 2006., California Legislative Information, https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200520060AB32.

[214] "Senate Bill No. 350." Bill Text - SB-350 Clean Energy and Pollution Reduction Act of 2015., https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350.
[215] "Senate Bill No. 32." Bill Text - SB-32 California Global Warming Solutions Act of 2006: Emissions Limit., https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB32.
[216] California, State of. "Governor Brown Establishes Most Ambitious Greenhouse Gas Reduction Target in North America." Governor Edmund G Brown Jr, https://www.ca.gov/archive/gov39/2015/04/29/news18938/.
[217] "Ahead of Climate Week, Governor Newsom Announces Executive Action to Leverage State's $700 Billion Pension Investments, Transportation Systems and Purchasing Power to Strengthen Climate Resiliency." Office of Governor Gavin Newsom, State of California, 20 Sept. 2019, https://www.gov.ca.gov/2019/09/20/ahead-of-climate-week-governor-newsom-announces-executive-action-to-leverage-states-700-billion-pension-investments-transportation-systems-and-purchasing-power-to-strengthen-climate-resili/.
[218] "Senate Bill No. 210." Bill Text - SB-210 Heavy-Duty Vehicle Inspection and Maintenance Program., https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200SB210.
[219] "Senate Bill No. 44." Bill Text - SB-44 Medium- and Heavy-Duty Vehicles: Comprehensive Strategy., https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200SB44.
[220] Governor Edmund J. Brown. California Department of Transportation, California Air Resources Board, et al. California Sustainable Freight Action Plan. 2016.
221 https://ww2.arb.ca.gov/sites/default/files/2022-08/2022_State_SIP_Strategy.pdf
[222] Caltrans Equity Statement December 2020
[223] "Senate Bill No. 535." Bill Text - California Global Warming Solutions Act of 2006: Greenhouse Gas Reduction Fund https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120SB535
[224] Oehha.ca.gov, https://oehha.ca.gov/calenviroscreen/sb535.
[225] CalEnvironScreen Top 25% Disadvantaged Census Tracts by Air Basin – California Office of Environmental Health Hazard Assessment, CallEnviroScreen 3.0 Data base, 2017, https://data.ca.gov/dataset/calenviroscreen-3-0-results , Analysis and summaries by Fehr & Peers
[226] https://dot.ca.gov/programs/environmental-analysis/stormwater-management-program
[227] https://dot.ca.gov/-/media/dot-media/programs/asset-management/documents/2023_shsmp_draft_02-09-2023_1000.pdf
[228] https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=18366&inline
[229] https://dot.ca.gov/-/media/dot-media/programs/asset-management/documents/2023_shsmp_draft_02-09-2023_1000.pdf
[230] "Search NAICS Codes by Industry." NAICS Association, https://www.naics.com/search-naics-codes-by-industry/.
[231] California Air Resources Board. "Cap-and-Trade Program." California Air Resources Board, https://ww3.arb.ca.gov/cc/capandtrade/capandtrade.htm
[232] "Assembly Bill No. 617" Bill Text - AB-617 Nonvehicular Air Pollution: Criteria Air Pollutants and Toxic Air Contaminants., https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180AB617.
[233] California Air Resources Board. "Community Air Protection Program," California Air Resources Board, https://ww2.arb.ca.gov/capp/about
[234] https://ww2.arb.ca.gov/our-work/programs/community-air-protection-incentives
[235] California Air Resources Board. "Community Air Protection Program," California Air Resources Board, https://ww2.arb.ca.gov/our-work/programs/community-air-protection-program.
[236] https://cleanairactionplan.org/strategies/trucks/
[237] https://www.portofsandiego.org/mcas
[238] Heavy-Duty Omnibus Regulation | California Air Resources Board
[239] https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/freight-planning/plan-accordion/catrkpkgstdy-finalreport-a11y.pdf
[240] "Assembly Bill No. 52." Bill Text - AB-52 Native Americans: California Environmental Quality Act., https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB52.
[241] "Regions Rise Together: Governor's Office of Business and Economic Development Shares New Initiative. California Governor's Office of Business and Economic Development," 10 May 2019, http://www.business.ca.gov/Newsroom/ArticleId/66/regions-rise-together-governors-office-of-business-and-economic-development-shares-new-initiative.
[242] "Trade Corridor Enhancement Program." California Transportation Commission, https://catc.ca.gov/programs/sb1/trade-corridor-enhancement-program.
[243] "Rebuilding California." California State Transportation Agency, https://rebuildingca.ca.gov/.
[244] "Senate Bill 1 (SB1) Technical Performance Measurement Methodology Guidebook." California Transportation Commission, https://catc.ca.gov/-/media/ctc-media/documents/ctc-workshops/2022/sb-1/performance-measurement-guidebook-final-draft.pdf.

[245] "Transportation Planning." California Transportation Commission, https://catc.ca.gov/programs/transportation-planning.
[246]State of California, Department of Finance. (May 2019). E-1 Population Estimates for Cities, Counties and the State with Annual Percent Change –January 1, 2018 and 2019. Sacramento, California.
[247]California Department of Food and Agriculture. (January 20, 2022). California County Agriculture Commissioners' Report Crop Year 2019-2020. Sacramento, CA: California Department of Food and Agriculture.
[248]California Department of Food and Agriculture. (January 20, 2022). California County Agriculture Commissioners' Report Crop Year 2019-2020. Sacramento, CA: California Department of Food and Agriculture.
[249]Humboldt County Association of Governments. (2017). Variety in Rural Options of Mobility, Regional Transportation Plan. Humboldt County Association of Governments.
[250]California Department of Food and Agriculture. (January 20, 2022). California County Agriculture Commissioners' Report Crop Year 2019-2020. Sacramento, CA: California Department of Food and Agriculture.
[251]U.S. Census Bureau QuickFacts. QuickFacts Mendocino County, California: Population Estimates July 1, 2021. https://www.census.gov/quickfacts/mendocinocountycalifornia
[252]California Department of Food and Agriculture. (January 20, 2022). California County Agriculture Commissioners' Report Crop Year 2019-2020. Sacramento, CA: California Department of Food and Agriculture.
[253]Green DOT Transportation Solutions. (2016). 2016 Regional Transportation Plan for Siskiyou County. Transportation Commission: Siskiyou County Local Transportation Commission.
[254]California Department of Food and Agriculture. (December 28, 2018). California County Agriculture Commissioners' Report Crop Year 2016-2017. Sacramento, CA: California Department of Food and Agriculture.
[255] System Metrics Grouc, Inc. (2015). District 3 Goods Movement Study. Marysville, CA. California Department of Transportation.
[256]Volaire Aviation Consulting. (2017). Strategic Initiatives, Humboldt County Airports Division. Eureka, CA: Humboldt County Airports Division, County Equivalent more information. Washington, DC: United States Census Bureau.
[257]Green DOT Transportation Solutions. (2015). Alpine County Regional Transportation Plan. Markleeville, CA: Alpine County Local Transportation Commission.
[258]Amador County Transportation Commission. (2015). Amador County Regional Transportation Plan. Amador County Transportation Commission.
[259]Green DOT Transportation Solutions. (2017). 2017 Calaveras Regional Transportation Plan. San Andreas, CA: Calaveras Council of Governments.
[260]Tuolumne County Transportation Council. (2017). 2016 Tuolumne County Transportation Council Regional Transportation Plan. Sonora, CA: Tuolumne County Transportation Council.
[261]LSC Transportation Consultants, Inc. (2015). 2015 Inyo County Regional Transportation Plan. Independence, CA: Inyo County Transportation Commission
[262]Mono County Local Transportation Commission. (2013). Mono County Regional Transportation Plan. Mammoth Lakes, CA: Mono County Local Transportation Commission.
[263]MTC: San Francisco Bay Area Goods Movement Plan. Feb 2016. https://mtc.ca.gov/our-work/plans-projects/economic-vitality/san-francisco-bay-area-goods-movement-plan
[264] Port of Oakland, 2019, Economic Impact Report. https://www.portofoakland.com/economic-impact-report/
[265] Bay Area Air Quality Management District: West Oakland Community Action Plan. http://www.baaqmd.gov/community-health/community-health-protection-program/west-oakland-community-action-plan
[266] California Department of Finance. "E-1 Population Estimates for Counties, January 1, 2018 and 2019." http://www.dof.ca.gov/Forecasting/Demographics/Estimates/e-1/ (May 1, 2019)
[267] San Joaquin Council of Governments. The San Joaquin Valley Goods Movement Sustainable Implementation Plan", 2017. https://sjvcogs.org/wp-content/uploads/2018/03/R2_SJV_SIP_Report_170914_revised-030918.pdf
[268] San Joaquin Valley Regional Planning Agencies. "SJV I-5/99 Goods Movement Study." http://sjvcogs.org/wp-content/uploads/2017/08/DR1_FresnoCOG_FinalReport_20170710-2.pdf (June 30, 2017). p. 1-1
[269] San Joaquin Valley Regional Planning Agencies. "SJV I-5/99 Goods Movement Study." http://sjvcogs.org/wp-content/uploads/2017/08/DR1_FresnoCOG_FinalReport_20170710-2.pdf (June 30, 2017). p. 1-1
[270] San Joaquin Valley Regional Planning Agencies. "SJV I-5/99 Goods Movement Study." http://sjvcogs.org/wp-content/uploads/2017/08/DR1_FresnoCOG_FinalReport_20170710-2.pdf (June 30, 2017). p. 1-1
[271] Caltrans District 3; System Metrics Group, Inc., et. al. "District 3 Goods Movement Fact Sheet." 2015. Report.
272FHWA, "Freight Analysis Framework." Website. Freight Analysis Framework - FHWA Freight Management and Operations, Accessed in 2019. https://ops.fhwa.dot.gov/freight/freight_analysis/faf/.
[273] Caltrans. "2017 Average Annual Daily Truck Traffic on the California State Highway System.". http://www.dot.ca.gov/trafficops/census/
[274] California Department of Finance. "E-1 Population Estimates for Counties, January 1, 2018 and 2019." http://www.dof.ca.gov/Forecasting/Demographics/Estimates/e-1/ (May 1, 2019)

[275] U.S. Department of Transportation, Maritime Administration. "U.S. Waterborne Foreign Container Trade by U.S. Customs Ports 2000-2017." https://www.maritime.dot.gov/data-reports/data-statistics/us-waterborne-foreign-container-trade-us-customs-ports-2000—-2017
[276] AMBAG, 2012, Central Coast California Commercial Flows Study, https://ambag.org/sites/default/files/documents/Central Coast CA Commercial Flows Study_Final_Revised 6-12-12.pdf.
[277] AMBAG, 2012, Central Coast California Commercial Flows Study, https://ambag.org/sites/default/files/documents/Central Coast CA Commercial Flows Study_Final_Revised 6-12-12.pdf.
[278] Department of Transportation, Freight Analysis Framework, 2019
[279] California Government Operations Agency, Current Employment Statistics, 2020
[280] U.S. Department of Commerce, Bureau of Economic Analysis, 2019
[281] Port of Los Angeles, Annual Facts and Figures Card, https://www.portoflosangeles.org/business/statistics/facts-and-figures
[282] SCAG rail analysis 2022
[283] South Coast AQMD, Historical Air Quality Data, 2022. http://www.aqmd.gov/home/air-quality/historical-air-quality-data
[284] The Port of Los Angeles, Pacific Ports Clean Air Collaborative, 2023 https://www.portoflosangeles.org/environment/air-quality/international-partnerships/pacific-ports-clean-air-collaborative#:~:text=The%20Pacific%20Ports%20Clean%20Air,years%20at%20the%20PPCAC%20Conference.
[285] Inland Empire Comprehensive Multimodal Corridor Plan, 2020.
[286] U.S. Census Bureau, USA Trade Online, 2021.
[287] U.S. Census Bureau, USA Trade Online, 2021
[288] U.S. Census Bureau, USA Trade Online, 2021
[289] U.S. Census Bureau, USA Trade Online, 2021
[290] U.S. Census Bureau, USA Trade Online, 2021
[291] U.S. Department of Commerce, Bureau of Economic Analysis, 2019
[292] U.S. Department of Commerce, Bureau of Economic Analysis, 2019
[293] California Government Operations Agency, Current Employment Statistics, 2020
[294] U.S. Department of Commerce, Bureau of Economic Analysis, 2019
[295] California Government Operations Agency, Current Employment Statistics, 2020
[296] U.S. Department of Commerce, Bureau of Economic Analysis, 2019
[297] Port of Los Angeles, Annual Facts and Figures Card, https://www.portoflosangeles.org/business/statistics/facts-and-figures
[298] Port of Hueneme, Trade Statistics 2021, https://www.portofhueneme.org/trade-statistics/
[299] Port of Los Angeles, Annual Facts and Figures Card, https://www.portoflosangeles.org/business/statistics/facts-and-figures
[300] Port of Los Angeles, Annual Facts and Figures Card, https://www.portoflosangeles.org/business/statistics/facts-and-figures
[301] U.S. Census Bureau, USA Trade Online, 2021
[302] San Pedro Bay Ports, 2023.
[303] San Pedro Bay Ports, 2023
[304] https://polb.com/port-info/news-and-press/port-of-long-beach-takes-another-zero-emissions-step-11-18-2022/
[305] City of Los Angeles, Los Angeles World Airports, Statistics for LAX 2021. https://www.lawa.org/lawa-investor-relations/statistics-for-lax/volume-of-air-traffic
[306] Ontario International Airport Authority, Air Service Statistics 2021, https://www.flyontario.com/air-service/statistics
[307] City of Los Angeles, Los Angeles World Airports, Statistics for LAX 2021. https://www.lawa.org/lawa-investor-relations/statistics-for-lax/volume-of-air-traffic
[308] Federal Airport Administration, Calendar Year 2021 All-Cargo Landed Weight, https://www.faa.gov/sites/faa.gov/files/2022-08/cy21-cargo-airports_0.pdf
[309] Ibid.
[310] Ibid.
[311] Freight Waves, May 2020, Amazon Air picks San Bernardino airport for western hub, https://www.freightwaves.com/news/amazon-air-picks-san-bernardino-airport-for-western-hub.
[312] SCAG Connect SoCal 2020
[313] BNSF Railway, Barstow International Gateway, 2023, https://bnsfcalifornia.com/projects/barstow-international-gateway-big/
[314] SCAG Connect SoCal 2020
[315] SCAG rail analysis 2022.
[316] San Pedro Bay Ports, 2023

[317] San Pedro Bay Ports, 2023
[318] SCAG Connect SoCal 2020
[319] CoStar Industrial Warehouse Data, 2022
[320] SCAG. "2018 SCAG Industrial Warehouse Study." https://scag.ca.gov/Documents/Final_Report_03_30_18.pdf
[321] CoStar Industrial Warehouse Data, 2022
[322] SCAG, Industrial Warehousing Study, 2018
[323] SCAG, Industrial Warehousing Study, 2018
[324] U.S. Department of Commerce, Bureau of Economic Analysis, 2018.
[325] United States Census Bureau. Foreign Trade Profile. 2021 https://www.census.gov/foreign-trade/reference/products/catalog/usatradeonline.html
[326] United States Census Bureau. US Trade Online. 2021. https://www.census.gov/foreign-trade/reference/products/catalog/usatradeonline.html
[327] U.S. Department of Transportation, Bureau of Transportation Statistics (Border Crossing and Entry Data) based on the U.S. Department of Homeland Security, Customs and Border Protection, 2021.
[328] Ibid.
[329] San Diego International Airport: Air Traffic Report Summary for Calendar Year 2021. https://www.san.org/DesktopModules/Bring2mind/DMX/API/Entries/Download?Command=Core_Download&EntryId=15134&language=en-US&PortalId=0&TabId=225
[330] Fixing America's Surface Transportation Act (FAST Act). *H.R. 22*. Congress.gov/114/bills/hr22/BILLS-114hr22enr.pdf.2015.
[331] "Transportation for a New Generation." *U.S. DOT draft National Strategic Freight Plan (2016)*. Transportation.gov/sites/dot.gov/files/docs/DRAFT_NFSP_for_Public_ Comment_508_10%2015%2015%20v1.pdf
[332] "National Highway Freight Network." *U.S. Department of Transportation, Federal Highway Administration*. Ops.fhwa.dot.gov/freight/infrastructure/nfn/index.htm.
[333] National Freight Strategic Plan (2020). https://www.transportation.gov/sites/dot.gov/files/2020-09/NFSP_fullplan_508_0.pdf
[334] Supply Chain Assessment of the Transportation Industrial Base: Freight and Logistics (2022). https://www.transportation.gov/sites/dot.gov/files/2022-03/EO%2014017%20-%20DOT%20Sectoral%20Supply%20Chain%20Assessment%20-%20Freight%20and%20Logistics_FINAL_508.pdf
[335] Executive Order S-3-05, California Gov. Arnold Schwarzenegger (2005). https://www.library.ca.gov/wp-content/uploads/GovernmentPublications/executive-order-proclamation/5129-5130.pdf
[336] Executive Order B-16-12, California Gov. Edmund G. "Jerry" Brown (2012). https://www.library.ca.gov/wp-content/uploads/GovernmentPublications/executive-order-proclamation/39-B-16-12.pdf
[337] Executive Order, B-30-15, California Gov. Edmund G. "Jerry" Brown (2015). https://www.library.ca.gov/wp-content/uploads/GovernmentPublications/executive-order-proclamation/39-B-30-15.pdf
[338] Executive Order, B-32-15, California Gov. Edmund G. "Jerry" Brown (2015). https://www.library.ca.gov/wp-content/uploads/GovernmentPublications/executive-order-proclamation/39-B-32-15.pdf
[339] Executive Order, N-19-19, California Gov. Gavin Newsom (2019). https://www.library.ca.gov/wp-content/uploads/GovernmentPublications/executive-order-proclamation/40-N-19-19.pdf
[340] Executive Order, N-79-20, California Gov. Gavin Newsom (2020). https://www.library.ca.gov/wp-content/uploads/GovernmentPublications/executive-order-proclamation/40-N-79-20.pdf
[341] Executive Order, N-19-21. California Gov. Gavin Newsom (2021). https://www.library.ca.gov/wp-content/uploads/GovernmentPublications/executive-order-proclamation/40-N-19-21.pdf
[342] California Transportation Plan 2050 (2021). https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/ctp-2050-v3-a11y.pdf
[343] Strategic Management Plan 2020-24 (2021). https://dot.ca.gov/-/media/dot-media/programs/safety-programs/documents/shsp/2020-2024-shsp-report-march-2021-a11y.pdf
[344] Climate Action Plan for Transportation Infrastructure (2021). https://calsta.ca.gov/-/media/calsta-media/documents/capti-july-2021-a11y.pdf
[345] California Sustainable Freight Action Plan (2016). https://ww2.arb.ca.gov/sites/default/files/2019-10/CSFAP_FINAL_07272016.pdf
[346] Interregional Transportation Strategic Plan (2021). https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/system-planning/systemplanning/final2021itspv13.pdf
[347] Strategic Highway Safety Plan 2020-24 (2021). https://dot.ca.gov/-/media/dot-media/programs/safety-programs/documents/shsp/2020-2024-shsp-report-march-2021-a11y.pdf
[348] California State Rail Plan (2018). https://dot.ca.gov/-/media/dot-media/programs/rail-mass-transportation/documents/rail-plan/00-toc-and-introcsrpfinal.pdf

[349] Draft Report Safeguarding California Plan Update (2017). *California Natural resources Agency*, *California's Climate Adaptation Strategy*. http://resources.ca.gov/wp-content/uploads/2017/05/DRAFT-Safeguarding-California-Plan-2017-Update.pdf
[350] 2017 Regional Transportation Plan Guidelines for Regional Transportation Planning Agencies, Section 6.12. Dot.ca.gov/hq/tpp/offices/orip/rtp/ docs/2017RTPGuidelinesforRTPAs.pdf
[351] Alameda County Goods Movement Action Plan (2016). Alamedactc.org/files/managed/Document/18249/AlamedaCTC_ GoodsMovementPlan_FINAL.pdf
[352] Goods Movement Border Crossing Study and Analysis". *Southern California Association of Governments*. June 6, 2012. freightworks.org/ DocumentLibrary/Goods-Movement-Border-Crossing-Study-and-Analysis_Final_6-06-12(1).pdf.
[353] "Multi-County Goods Movement Action Plan." *Los Angeles Metro*. 2008. http://media.metro.net/projects_studies/mcgmap/images/02_Vol1_Executive_ Summary_043008.pdf.
[354] "On the Move, Southern California Delivers the Goods." *Southern California Association of Governments.* December 2012. http://www.freightworks.org/ DocumentLibrary/CRGMPIS_Summary_Report_Final.pdf.
[355] "Regional Competitiveness." OECD, http://www.oecd.org/cfe/regional-policy/regionalcompetitiveness.htm
[356] "About." Regional Competitiveness | U.S. Cluster Mapping, http://clustermapping.us/content/regional-competitiveness.
[357] "California Almond Industry Facts," Almond Board of California, 2016 http://www.almonds.com/sites/default/files/2016_almond_industry_factsheet.pdf
[358] American Association of Port Authorities
[359] American Association of Port Authorities
[360] Using four import ports, such as Los Angeles, Seattle, Savannah, and New Yok-New Jersey
[361] Using three import ports, such as Los Angeles, Savannah, and New York-New Jersey
[362] American Association of Port Authorities
[363] American Association of Port Authorities
[364] American Transportation Research Institute (ATRI) 2018
[365] "An Analysis of the Operational Costs of Trucking: 2018 Update." *American Transportation Research Institute*, Oct. 2018.
[366] American Transportation Research Institute (ATRI) 2018
[367] American Transportation Research Institute (ATRI) 2018
[368] American Association of Port Authorities
[369] American Association of Port Authorities
[370] Massachusetts Institute of Technology Living Wage Calculator
[371] A living wage is the minimum income necessary for a worker to meet their basic needs. Needs are defined to include food, housing, and other essential needs such as clothing.
[372] United States, U.S. Bureau of Economic Analysis, Larson, William. *New Estimates of Value of Land of the United States*, 2015.The estimated values were aggregated from valuation of different property types, including agricultural areas, federal land, and developed suburban and urban areas.
[373] Davis, Morris, and Jonathon Heathcote. "The Price and Quantity of Residential Land in the United States." *Journal of Monetary Economics*, vol. 54, no. 8, pp. 2595–2620., http://www.lincolninst.edu/resources. ccessed 11/5/2018,
[374] Electric Power Monthly Average Price of Electricity to Ultimate Customers by End-User Sector Report, U.S. Energy Information Administration Independent Statistics and Analysis, www.eia.gov
[375] *Gasoline and Diesel Fuel Price*, U.S. Energy Information Administration Independent Statistics and Analysis, https://www.eia.gov/petroleum/gasdiesel/.
[376] *Gasoline and Diesel Fuel Price*, U.S. Energy Information Administration Independent Statistics and Analysis, https://www.eia.gov/petroleum/gasdiesel/.
[377] http://www.gaspricewatch.com/CA-california/cities/gas-prices/1.htm
[378]. The Boyd Company, Inc. "*Comparative Distribution Warehousing Costs in Port and Intermodal-Proximate Cities,"2015.*
[379] The Boyd Company, Inc. "*Comparative Distribution Warehousing Costs in Port and Intermodal-Proximate Cities,"2015.*
[380] The Boyd Company, Inc. "*Comparative Distribution Warehousing Costs in Port and Intermodal-Proximate Cities*,"2015.
[381] The Boyd Company, Inc. "*Comparative Distribution Warehousing Costs in Port and Intermodal-Proximate Cities*,"2015.
[382] The Boyd Company, Inc. *"Comparative Distribution Warehousing Costs in Port and Intermodal-Proximate Cities,"*2015.
[383] "Best & Worst States to Start a Business." WalletHub, 8 July 2019, https://wallethub.com/edu/best-states-to-start-a-business/36934/.
[384] Sauter, Michael B., et al. "Economic Climate: The Best (and Worst) States for Business." *USA Today*, Gannett Satellite Information Network, https://www.usatoday.com/story/money/business/2018/03/05/economic-climate-best-and-worst-states-business/376783002/.
[385] staff, CNBC.com. "America's Top States for Business 2018." *CNBC*, CNBC, 7 June 2019, https://www.cnbc.com/2018/07/10/americas-top-states-for-business-2018.html.

[386] Tioga Group
[387] Kolko, Jed Cuellar, et al. "Business Climate Rankings and the California Economy." Public Policy Institue of California.2009
[388] State Business Incentives Database. "The Council for Community and Economic Research."
[389] Council for Community and Economic Research, State Economic Development Program Expenditures Database
[390] Tioga Group
[391] Government of Canada, *Transport Canada*, and Corporate Services. "Asia-Pacific Gateway and Corridor Transportation Infrastructure Fund." Transport Canada, 28 Aug. 2017, https://www.tc.gc.ca/eng/corporate-services/planning-dpr-2013-14-1172.html.
[392] https://www.rupertport.com/our-advantages/
[393] Sep, Leo Ryan, et al. "Canadian Ports and Terminal Operators Target Midwest." *AJOT.COM*, https://www.ajot.com/premium/ajot-canadian-ports-and-terminal-operators-target-midwest.
[394] Government of Canada, Transport Canada, and Corporate Services. "Asia-Pacific Gateway and Corridor Transportation Infrastructure Fund." *Transport Canada*, 28 Feb. 2014, https://www.tc.gc.ca/eng/corporate-services/planning-rpp-2014-2015-1100.html.
[395] "Fast Act, Section 1116 National Highway Freight Program (NHFP) Guidance: Designating and Certifying Critical Rural Freight Corridors and Critical Urban Freight Corridors." U.S. Department of Transportation, Federal Highway Administration. April 26, 2016. Ops.fhwa.dot.gov/fastact/crfc/sec_1116_gdnce.htm.
[396] Unpublished document. California Department of Transportation. "Critical Urban/Rural Freight Corridor Designation Process" Handout. 2017.
[397] Volvo Research and Education Foundations. 2013. "Urban Freight for Livable Cities - How to Deal With Collaboration and Trade-Offs."
[398] Solis, Brian. 2017. "Impatience Is A Virtue: How The On-Demand Economy Is Making Mobile Consumers Impatient." Forbes, 2017. https://www.forbes.com/sites/briansolis/2017/11/20/impatience-is-a-virtue-how-the-on-demand-economy-is-making-mobile-consumers-impatient/#275f8838344c.
[399] Mitman, Meghan, Steve Davis, Ingrid Armet, and Evan Knopf. 2018. "Curbside Management Practitioners Guide." Institute of Transportation Engineers.
[400] World Bank. 2018. "Urban Development." The World Bank. 2018. https://www.worldbank.org/en/topic/urbandevelopment/overview.
[401] Iowa State University. 2019. "Urban Percentage of the Population for States, Historical." Iowa State University. 2019. https://www.icip.iastate.edu/tables/population/urban-pct-states.
[402] Volvo Research and Education Foundations. 2013. "Urban Freight for Livable Cities - How to Deal With Collaboration and Trade-Offs."
[403] National Academies of Sciences, Engineering, and Medicine. 2013. "Smart Growth and Urban Goods Movement." Washington, DC: The National Academies Press.
[404] Litman, Todd. 2018. "Understanding Smart Growth Savings - Evaluating Economic Savings and Benefits of Compact Development, and How They Are Misrepresented By Critics." Victoria Transportation Policy Institute.
[405] Brody, Samuel. 2013. "The Characteristics, Causes, and Consequences of Sprawling Development Patterns in the United States." Nature Education Knowledge 4 (5).
[406] National Academies of Sciences, Engineering, and Medicine. 2016. "NCHRP Report 844: Guide for Integrating Goods and Services Movement by Commercial Vehicles in Smart Growth Environments." Washington, DC: The National Academies Press.
[407] Institute for Local Government. 2015. "The Basics of SB 375." https://www.ca-ilg.org/post/basics-sb-375
[408] California Department of Transportation. 2007. "SB 743 Implementation." http://www.dot.ca.gov/hq/tpp/sb743.html
[409] California Legislative Information. 2018. "SB-50 Planning and zoning: housing development: equitable communities incentive." https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200SB50
[410] Litman, Todd. 2018. "Understanding Smart Growth Savings - Evaluating Economic Savings and Benefits of Compact Development, and How They Are Misrepresented By Critics." Victoria Transportation Policy Institute.
[411] Ibid. xiii
[412] USEPA. 2016. "This Is Smart Growth." United States Environmental Protection Agency.
[413] Ewing, Reid, and Shima Hamidi. 2014. "Measuring Urban Sprawl and Validating Sprawl Measures." National Cancer Institute, National Institutes of Health.
[414] Ewing, Reid, and Shima Hamidi. 2014. "Measuring Urban Sprawl and Validating Sprawl Measures." National Cancer Institute, National Institutes of Health.
[415] Litman, Todd. 2018. "Understanding Smart Growth Savings - Evaluating Economic Savings and Benefits of Compact Development, and How They Are Misrepresented By Critics." Victoria Transportation Policy Institute.
[416] Ahlfeldt, Gabriel, and Elisabetta Pietrostefani. 2017. "Demystifying Compact Urban Growth: Evidence from 300 Studies from Across the World." Coalition for Urban Transitions.

[417] National Academies of Sciences, Engineering, and Medicine. 2013. "Smart Growth and Urban Goods Movement." Washington, DC: The National Academies Press.
[418] Volvo Research and Education Foundations. 2013. "Urban Freight for Livable Cities - How to Deal With Collaboration and Trade-Offs."
[419] Giuliano, Genevieve, Catherine Showalter, Quan Yuan, and Rui Zhang. 2018. "Managing the Impacts of Freight in California." National Center for Sustainable Transportation.
[420] Callard, Abby. 2014. "California Is Home to the Most E-Retail Companies and Employees." Internet Retailer. 2014. https://www.digitalcommerce360.com/2014/05/30/california-home-most-e-retail-companies-and-employees/.
[421] Johnson, Mary. 2018. "Industrial Sector Grows as E-Commerce Gains over Brick-and-Mortar Retail CRE Market." The Business Journals, 2018. https://www.bizjournals.com/bizjournals/news/2018/12/14/industrial-sector-grows-as-e-commerce-gains-over.html.
[422] Volvo Research and Education Foundations. 2013. "Urban Freight for Livable Cities - How to Deal With Collaboration and Trade-Offs."
[423] Bucsky, Peter. 2018. "Autonomous Vehicles and Freight Traffic: Towards Better Efficiency of Road, Rail or Urban Logistics?" Urban Development Issues 58: 41–51.
[424] Ibid.
[425] Viscelli, Steve. 2018. "Driverless? Autonomous Trucks and the Future of the American Trucker." UC Berkeley Center for Labor Research and Education and Working Partnerships USA.
[426] Ibid.
[427] Rhodes, Suzann S., Mark Berndt, Paul Bingham, Joe Bryan, Thomas J. Cherrett, Peter Plumeau, and Roberta Weisbrod. 2012. "Guidebook for Understanding Urban Goods Movement." 14. National Cooperative Freight Research Program.
[428] Volvo Research and Education Foundations. 2013. "Urban Freight for Livable Cities - How to Deal With Collaboration and Trade-Offs."
[429] Ibid.
[430] Schrank, David, Bill Eisele, Tim Lomax, and Jim Bak. 2015. "2015 Urban Mobility Scorecard." Texas A&M Transportation Institute.
[431] Volvo Research and Education Foundations. 2013. "Urban Freight for Livable Cities - How to Deal With Collaboration and Trade-Offs."
[432] Conway, Alison. 2017. "Accommodating Freight (and Emergency Vehicles) in Complete Streets Design." presented at the International Urban Freight Conference, Long Beach, CA.
[433] Teran, Daniel. 2015. "Can Complete Streets and Freight Mobility Coexist? (Part 3): Developing Solutions with a Corridor Study." MacKay Sposito. 2015. http://blog.mackaysposito.com/can-complete-streets-and-freight-mobility-coexist-part-3-developing-solutions-with-a-corridor-study.
[434] Ibid.
[435] Pokorny, Petr, Jerome Drescher, Kelly Pitera, and Thomas Jonsson. 2017. "Accidents between Freight Vehicles and Bicycles, with a Focus on Urban Areas." Transportation Research Procedia 25: 999–1007.
[436] Rubin, Carter. "Make It Count: Santa Monica's Next Big Investment in Safe Biking, Walking, and Yes - Even Scooting." Santa Monica Next, 24 July 2018, http://www.santamonicanext.org/2018/07/make-it-count-santa-monicas-next-big-investment-in-safe-biking-walking-and-yes-even-scooting/.
[437] Volvo Research and Education Foundations. 2013. "Urban Freight for Livable Cities - How to Deal With Collaboration and Trade-Offs."
[438] Mitman, Meghan, Steve Davis, Ingrid Armet, and Evan Knopf. 2018. "Curbside Management Practitioners Guide." Institute of Transportation Engineers.
[439] Holguin-Veras, Jose, Johanna Amaya-Leal, Miguel Jaller, Carlos Gonzalez-Calderon, Ivan Sanchez-Diaz, Xiaokun Wang, Daniel G. Haake, et al. 2015. "Improving Freight System Performance in Metropolitan Areas: A Planning Guide." 33. Washington, DC: National Cooperative Freight Research Program.
[440] Leonardi, Jacques, Michael Browne, Julian Allen, Tom Zunder, and Paulus T. Aditjandra. 2014. "Increase Urban Freight Efficiency with Delivery and Servicing Plan." Research in Transportation Business & Management 12: 73–79.
[441] U.S. Department of Transportation. 2009. "Urban Freight Case Studies: New York." FHWA Office of Freight Management and Operations.
[442] Fehr and Peers. 2014. "Multi-Modal Level of Service Toolkit: Layered Networks." http://asap.fehrandpeers.com/wp-content/uploads/2014/08/MMLOS-Tool-Layered-NetworksMMLOS.pdf
[443] U.S. Department of Transportation. 2009. "Urban Freight Case Studies: New York." FHWA Office of Freight Management and Operations.
[444] Henderson, Maurice. 2016. "Ubiquitous Mobility for Portland - Proposal for U.S. Department of Transportation Beyond Traffic: The Smart City Challenge." Portland Bureau of Transportation. https://cms.dot.gov/sites/dot.gov/files/docs/Portland%20Vision%20Narrative.pdf.
[445] National Academies of Sciences, Engineering, and Medicine. 2013. "Smart Growth and Urban Goods Movement." Washington, DC: The National Academies Press.

[446] Ibid.
[447] Ibid.
[448] Volvo Research and Education Foundations. 2013. "Urban Freight for Livable Cities - How to Deal With Collaboration and Trade-Offs."
[449] Norris, Aaron. 2018. "The Startups Helping Apartment Owners Tackle the Package Problem." Forbes, 2018. https://www.forbes.com/sites/aaronnorris/2018/08/06/the-startups-helping-apartment-owners-tackle-the-package-problem/#6897a3ae4839.
[450] Hannam, Keshia. 2017. "Amazon Has a New Way to Get Stuf Into Your Apartment." Fortune, 2017. http://fortune.com/2017/10/18/amazon-hub-apartment-package-delivery-locker/.
[451] Kusisto, Laura. "Amazon and Big Apartment Landlords Strike Deals on Package Delivery." The Wall Street Journal, Dow Jones & Company, 17 Oct. 2017, https://www.wsj.com/articles/amazon-and-big-apartment-landlords-strike-deals-on-package-delivery-1508261759.
[452] O'Dell, John. 2018. "Udelv Drives Forward With Autonomous Delivery Vans, Expands Service." Trucks, 2018. https://www.trucks.com/2018/10/18/udelv-autonomous-delivery-vans-expands-service/.
[453] Edelstein, Stephen. 2018. "Udelv Autonomous Delivery Vehicle Begins Testing in California." *The Drive*. 2018. https://www.thedrive.com/tech/18113/udelv-autonomous-delivery-vehicle-begins-testing-in-california.
[454] Bandoim, Lana. 2018. "Kroger Is Using Unmanned Autonomous Vehicles To Deliver Groceries In Arizona." Forbes, 2018. https://www.forbes.com/sites/lanabandoim/2018/12/19/kroger-is-using-unmanned-autonomous-vehicles-to-deliver-groceries-in-arizona/#1f9e474a2f57.
[455] Heutger, Matthias. 2017. "DHL: How 3D Printing Is Disrupting the Logistics Industry." Supply Chain Digital, 2017. https://www.supplychaindigital.com/logistics/dhl-how-3d-printing-disrupting-logistics-industry.
[456] Amazon. 2016. "Amazon Prime Air." Amazon. 2016. https://www.amazon.com/Amazon-Prime-Air/b?ie=UTF8&node=8037720011.
[457] Morphy, Erika. 2018. "Miami Developer Adds Drone Port To Residential Tower Rooftop." https://www.globest.com/2018/04/13/miami-developer-adds-drone-port-to-residential-tower-rooftop/
[458] Ahlfeldt, Gabriel, and Elisabetta Pietrostefani. 2017. "Demystifying Compact Urban Growth: Evidence from 300 Studies from Across the World." Coalition for Urban Transitions.
[459] Chunliang, X. 2011. "Vulnerability of Large City and Its Implication in Urban Planning: A Perspective of Intra-Urban Structure." Chinese Geographical Science 21 (2): 204–10. https://www.metrans.org/sites/default/files/Track%207%202%20Conway.pdf.
[460] Lall, S., and U. Deichmann. 2011. Density and Disasters. Oxford: Oxford University Press.
[461] National Academies of Sciences, Engineering, and Medicine. 2013. "Smart Growth and Urban Goods Movement." Washington, DC: The National Academies Press.
[462] National Academies of Science, Engineering, and Medicine 2013. *Strategic Issues Facing Transportation, Volume 1: Scenario Planning for Freight Transportation Infrastructure Investment.*
[463] Caltrans, Division of Transportation Planning, 2019. Analysis, summaries, and Mapping by Fehr & Peers
[464] Caltrans, Division of Transportation Planning, 2019. Analysis, summaries, and Mapping by Fehr & Peers
[465] Caltrans, Division of Transportation Planning, 2019. Analysis, summaries, and Mapping by Fehr & Peers
[466] Caltrans, Division of Transportation Planning, 2019. Analysis, summaries, and Mapping by Fehr & Peers