



California
TRANSPORTATION PLAN
2040
Integrating California's Transportation Future

The logo features a stylized 'C' composed of multiple colored lines (blue, green, yellow, orange, red) on the left. Below the main title is a row of seven circular icons representing different modes of transport: a car, a bus, a train, a ship, a truck, an airplane, and a person walking. The year '2040' is written vertically in a large, bold, blue font on the right side of the logo.



DRAFT-March 2015





TABLE OF CONTENTS

INTRODUCTION-----	1
CHAPTER 1: PURPOSE AND CONTEXT -----	2
CHAPTER 2: THE TRANSPORTATION SYSTEM-----	16
CHAPTER 3: TRENDS AND CHALLENGES-----	22
CHAPTER 4: NATIVE AMERICAN TRANSPORTATION-----	39
CHAPTER 5: REVENUE AND EXPENDITURE-----	44
CHAPTER 6: THE PLAN-----	58
CHAPTER 7: ANALYSIS AND OUTCOMES-----	85
CHAPTER 8: RECOMMENDATIONS AND NEXT STEPS-----	108
ABBREVIATIONS AND ACRONYMS-----	128
APPENDIX A-----	132
CALIFORNIA NATIVE AMERICAN TRIBES, TRUST LANDS AND THE STATE HIGHWAY SYSTEM	
APPENDIX B-----	139
CHAPTER 7 ANALYSIS AND OUTCOMES TECHNICAL REPORT	



WELCOME FROM DIRECTOR

Note: The letter from the Director and an Executive Summary will be included in the final version of this document.

CALTRANS MISSION

Provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability.

CALTRANS VISION

A performance-driven, transparent, and accountable organization that values its people, resources and partners, and meets new challenges through leadership, innovation, and teamwork.



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The California Transportation Plan 2040 (CTP 2040) is a statewide, long-range transportation plan developed to meet the State's future travel needs while reducing greenhouse gas (GHG) emissions. The CTP 2040 calls for a sustainable transportation system that improves mobility for all, strengthens our communities, and enhances our quality of life. To accomplish this, the CTP 2040 presents a set of goals, policies, strategies and performance measures. The goals are:

- Improve Multimodal Mobility and Accessibility for All People;
- Preserve the Multimodal Transportation System;
- Support a Vibrant Economy;
- Improve Public Safety and Security;
- Foster Livable and Healthy Communities and Promote Social Equity; and
- Practice Environmental Stewardship.

The goals were developed in conjunction with a policy advisory committee. The CTP 2040 was formulated through an extensive public involvement process, government to government engagement with tribal communities, and close work with local, regional, state, and federal partners. This consisted of a series of seven public workshops, seven focus groups, multiple advisory committees, as well as direct tribal interaction, listening sessions, and consultation as requested. The result is a transportation policy framework designed to serve all of California's diverse populations and economic interests.

The CTP 2040 is organized into eight chapters, summarized as follows:

Chapter 1: Purpose and Context

Purpose of the CTP 2040, and the planning framework in which the CTP 2040 was created.

Chapter 2: The Transportation System

A detailed description of the current transportation system.

Chapter 3: Trends and Challenges

A review of the major factors influencing today's statewide transportation system.

Chapter 4: Native American Transportation

Transportation issues and rights of the State's Native American population.

Chapter 5: Revenues and Expenditures

Funding challenges and the potential strategies to support California's transportation system through 2040.

Chapter 6: The Plan

Six core goals of the CTP 2040, and the policies, strategies, and performance measures that support them.

Chapter 7: Analysis and Outcomes

Three statewide GHG emission reduction alternatives to meet our legislative requirements.

Chapter 8: Recommendations

The recommendations and next steps to implement the CTP 2040.



CHAPTER 1

PURPOSE AND CONTEXT

CTP 2040 Vision:

California's transportation system is safe, sustainable, universally accessible, and globally competitive. It provides reliable and efficient mobility for people, goods, and services, while meeting the State's greenhouse gas emission reduction goals and preserving the unique character of California's communities.

California's transportation system is multi-modal, and includes many different interconnected modes such as freight, aviation, and rail. This integrated, interconnected, and resilient multimodal system supports a thriving economy, human and environmental health, and social equity.

CTP 2040 Goals:

Achieving this vision relies on attaining the six goals of the CTP 2040, which are discussed fully in Chapter 6:

1. Improve Multimodal Mobility and Accessibility for All People;
2. Preserve the Multimodal Transportation System;
3. Support a Vibrant Economy;
4. Improve Public Safety and Security;
5. Foster Livable and Healthy Communities and Promote Social Equity; and
6. Practice Environmental Stewardship.

In the context of the CTP 2040 vision and goals, this chapter describes the basis for why and how the Plan was prepared, as well as California's multimodal transportation system.

This chapter includes the following sections:

- Purpose of the Plan;
- Planning Framework;
- Measuring Transportation Performance; and
- Public and Partner Engagement.

PURPOSE OF THE PLAN

In the context of the CTP 2040 vision, this document describes California's transportation system and explores major trends that will likely influence travel behavior and transportation decisions over the next 25 years. It outlines goals, policies, strategies, performance measures, and recommendations to achieve that vision. The CTP 2040 is a policy framework designed to guide transportation-related decisions for the betterment of all who live, work, and conduct business in California. Its aim is to help ensure that policy decisions and investments made at all levels of government and within the private sector will work congruently to enhance the State's economy, improve social equity, support local communities, and protect the environment. In developing the CTP 2040, State transportation planners and other stakeholders considered factors such as defining legislation, the latest in applied



technology, performance measures, and requirements needed to meet Californian's mobility. Further, the CTP 2040 is based on the needs expressed by the full breadth of California's diverse demographic – from rural geographical areas to the State's most populous urban centers.

The CTP 2040 is the latest iteration of a statewide transportation plan that began in April 2006 with the release of the CTP 2025. It reflects the evolution of stakeholder expectations to move California's transportation system from a focus on infrastructure, capital improvements, and delivery, to a more sustainable focus that supports equitable economic prosperity in concert with GHG emission reductions. The CTP 2025 was approved in 2006 and updated in 2007 as the CTP 2030, to comply with federal planning requirements that govern the development of statewide transportation plans. These planning requirements are titled SAFETEA-LU (Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users).

While this document retains relevant strategies from the previous CTP 2025 and CTP 2030 update, it also reflects the changing transportation environment. Seminal climate change legislation enacted at the State level over the last decade requires establishment of new priorities affecting all aspects of transportation in California. The key legislation is summarized below:

- **Assembly Bill (AB) 857 (Wiggins, 2002)** Established three planning priorities: promote equitable infill development within existing communities, protect the

State's most valuable environmental and agricultural resources, and encourage efficient development patterns. Requires the State to adopt consistent planning and capital spending priorities.

- **Executive Order (EO) S-3-05 (2005)** Requires continued reduction of transportation-related GHG emissions to a new, more stringent standard of 80 percent below 1990 levels by 2050.
- **AB 32 (Nunez, 2006)** California's landmark *Global Warming Solution Act of 2006*. Requires reducing the State's GHG emissions to 1990 levels by 2020.
- **Senate Bill (SB) 375 (Steinberg, 2008)** Requires Metropolitan Planning Organizations (MPOs) to include sustainable communities strategies (SCS) in their regional transportation plans (RTPs) for the purposes of reducing greenhouse gas (GHG) emissions, aligning planning for transportation and housing, and creating incentives for the implementation of strategies. Each SCS must strive to meet a 2020 and 2035 GHG emissions reduction target provided by the California Air Resources Board (ARB). If the combined measures in an SCS do not meet regional targets, an MPO must prepare an alternative planning strategy (APS), which is not part of the RTP.
- **SB 391 (Liu, 2009)** Requires Caltrans to update the CTP every five years. Requires the CTP to show how the State will achieve statewide GHG emissions reduction to meet the goals of AB 32 and EO S-3-05. Directs Caltrans to consider

“the use of fuels; new vehicle technology; tailpipe emissions reductions; and expansion of public transit, commuter rail, intercity rail, bicycling and walking.” Requires the CTP to identify the state-wide integrated multimodal transportation system needed to achieve these results. In response, Caltrans developed the California Interregional Blueprint (CIB), which laid the foundation for the CTP 2040.

- **EO B-16-2012** Reaffirms EO S-3-05, calling for continued reduction of transportation-related GHG emissions to 80 percent below 1990 levels by 2050.
- **SB 743 (Steinberg, 2013)** Requires the Office of Planning & Research (OPR) to revise California Environmental Quality Act (CEQA) guidelines and establishes criteria for determining transportation impacts of projects within transit priority areas. The criteria emphasize reduction of GHG emissions, development of multimodal transportation networks, and diversity of land uses. Upon certification of the guidelines, the delay of automobile traffic (as described by level of service [LOS] or similar measures of traffic congestion) may not be considered a significant impact except in locations identified in the guidelines.

At its core, the CTP 2040 exemplifies the federal planning process (cooperative, continuing, and comprehensive)¹ and the State planning priorities established by AB 857 (economy, equity, and environment) as it strives to move California toward a more

sustainable transportation system. Sustainability is described as meeting the needs of the present without compromising the ability of future generations to meet their needs.¹ As it applies to transportation, sustainability means that environmental, social, health, and economic transportation decisions will support the needs of current and future generations. Considering these key elements in concert will result in a sustainable legacy for California’s future.

Sustainable practices will help achieve the ambitious 2050 goal for GHG reductions as well as California’s air quality goals, but they require a fundamental, holistic transformation of the transportation systems. This calls for significant innovation and adjustments in how we develop and expand communities, how people travel, how freight is moved, and which fuels are used. The CTP 2040 relies on four main strategies to reduce future GHG emissions for the movement of people and freight:

- Reduce vehicle miles traveled and increase a shift to more sustainable transportation modes (mode shift);
- Efficiently manage, operate and maintain the transportation system (including construction practices);
- Eliminate all emissive vehicles from California roads, and replace them with zero- to near-zero-emissions vehicles (road, rail, transit and air) throughout the State; and
- Improve technology for all modes.

MEASURING TRANSPORTATION PERFORMANCE

Performance-based planning is the application of performance management within the planning process to help agencies achieve desired outcomes for the multimodal transportation system. The nation's first performance- and outcome-based surface transportation program, Moving Ahead for Progress in the 21st Century (MAP-21), was established by the Federal Highway Administration (FHWA) and the Office of Policy and Governmental Affairs and signed into law on July 6, 2012. Its goal is to foster State investment in projects that represent both regional and national goals. Performance management helps ensure efficient and effective investment of federal transpor-

tation funds by refocusing on national transportation goals, increasing accountability and transparency, and improving project decision making. MAP-21 requires metropolitan and statewide transportation planning agencies to incorporate performance goals, measures, and targets when identifying needs and selecting projects.

Performance measures that support the CTP 2040 goals, policies, and strategies are listed in Table 1. These measures were identified through two major efforts with the Strategic Growth Council and the San Diego Association of Governments, and the Caltrans Smart Mobility Framework. Chapter 6 discusses these measures in detail. Transportation professionals should use these measures to identify high-performance, cost-effective investments aligned with State and federal goals.



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TABLE 1. PERFORMANCE MEASURES THAT SUPPORT THE CTP 2040 GOALS, POLICIES, AND STRATEGIES

California TRANSPORTATION PLAN		CTP 2040 Goals, Policies, and Possible Performance Measures (SANDAG & SMF Effort)			
The Vision Sustainability	CTP 2040 Goals and Policies	Performance Measurements			
		CTP 2040 Goal	Measurement		
Economy Manage and Operate an Efficient Integrated System Invest Strategically to Maximize System Performance Provide Viable and Equitable Multimodal Choices Including Active Transportation G2. Preserve the Multimodal Transportation System Apply Sustainable Preventative Maintenance and Rehabilitation Strategies Evaluate Multimodal Life Cycle Costs in Project Decision Making Adapt the Transportation System to Reduce Impacts from Climate Change G3. Support a Vibrant Economy Support Transportation Choices to Enhance Economic Activity Enhance Freight Mobility, Reliability, and Global Competitiveness Seek Sustainable and Flexible Funding to Maintain and Improve the System G4. Improve Public Safety and Security Reduce Fatalities, Serious Injuries, and Collisions Provide for System Security, Emergency/Preparedness, Response, and Recovery G5. Foster Livable and Healthy Communities and Promote Social Equity Expand Engagement in Multimodal Transportation Planning and Decision Making Integrate Health and Social Equity into Transportation Planning and Decision Making G6. Practice Environmental Stewardship Integrate Environmental Considerations in All Stages of Planning and Implementation Conserve and Enhance Natural, Agricultural, and Cultural Resources Reduce Greenhouse Gas Emissions and Other Air Pollutants Transition to a Clean and Energy Efficient Transportation System	Environment Integrate Environmental Considerations in All Stages of Planning and Implementation Conserve and Enhance Natural, Agricultural, and Cultural Resources Reduce Greenhouse Gas Emissions and Other Air Pollutants Transition to a Clean and Energy Efficient Transportation System	6G1. Improve Multimodal Mobility and Accessibility for All People Manage and Operate an Efficient Integrated System Invest Strategically to Maximize System Performance Provide Viable and Equitable Multimodal Choices Including Active Transportation G2. Preserve the Multimodal Transportation System Apply Sustainable Preventative Maintenance and Rehabilitation Strategies Evaluate Multimodal Life Cycle Costs in Project Decision Making Adapt the Transportation System to Reduce Impacts from Climate Change G3. Support a Vibrant Economy Support Transportation Choices to Enhance Economic Activity Enhance Freight Mobility, Reliability, and Global Competitiveness Seek Sustainable and Flexible Funding to Maintain and Improve the System G4. Improve Public Safety and Security Reduce Fatalities, Serious Injuries, and Collisions Provide for System Security, Emergency/Preparedness, Response, and Recovery G5. Foster Livable and Healthy Communities and Promote Social Equity Expand Engagement in Multimodal Transportation Planning and Decision Making Integrate Health and Social Equity into Transportation Planning and Decision Making G6. Practice Environmental Stewardship Integrate Environmental Considerations in All Stages of Planning and Implementation Conserve and Enhance Natural, Agricultural, and Cultural Resources Reduce Greenhouse Gas Emissions and Other Air Pollutants Transition to a Clean and Energy Efficient Transportation System	1 VMT per capita 2 % of Congested Freeway/ Hwy VMT (PeMS) 3 Mode share Travel to Work 4 Congested Arterial VMT (PeMS)* 5 Bike and walk miles traveled* 6 Non work mode share* 7 % of distressed lane miles hwy 8 % of distressed lane miles local roads 9 % of hwy bridge lane miles in need of rehab/replacement 10 % of transit assets that have surpassed FTA useful life period 11 Frwy/hwy travel time reliability: FHWA buffer index (PeMS) 12 Transit/rail travel time reliability* 13 Fatalities/serious injuries per capita 14 Fatalities/serious injuries per VMT 15 Transit accessibility: housing/jobs within .5 miles of stop 16 Travel time to jobs (mean travel time to work) 17 Residential and employment densities (new growth) by EJ and non EJ areas* 18 Housing/transportation affordability index* 19 Acres of ag land changed to urban use 20 CO2 reduction per capita 21 Support for sustainable growth 22 Transit mode share (mode share travel to work, non work mode share) 23 Accessibility and connectivity (transit accessibility, travel time to jobs) 24 Multi-modal travel mobility 25 Multi-modal travel reliability 26 Multi-modal service quality 27 Multi-modal safety (fatalities/injuries per capita/vmt) 28 Design and speed sustainability 29 bike/walk vmt) 30 Climate and energy conservation (vmt per capita) 31 Emissions reduction (co2 reduction per capita) 32 Equitable distribution of impacts 33 Equitable distribution of access and mobility 34 Congestion effects on productivity 35 Efficient use of system resources 36 Network performance optimization 37 Return on investment		
		LEGEND Possible Policy/Performance Measures blue Performance Measures in the Smart Mobility Framework red Starwide Performance Monitoring Indicators for Transportation Planning (SG/SANDAG) SMF SMF PM's not needed, covered by SCS/SANDAG (Data in parenthesis is the SCS/SANDAG TM)			

PLANNING FRAMEWORK

Transportation planning in California is a complex endeavor, reflecting the size and diversity of the State and the multimodal nature of our transportation system. Caltrans is one of many agencies responsible for the State's transportation system. Caltrans guides the statewide vision, and serves regional and interregional needs as the owner-operator of the state highway system. The success of the CTP 2040 ultimately depends on a close collaboration between Caltrans and its partners, California's regional transportation organizations and agencies. The balanced approach described in this plan is based on a comprehensive set of planning documents and other information listed below. Following this list is a brief description of each bulleted item:

- Caltrans' planning initiatives;
- California Interregional Blueprint;
- five Caltrans modal plans;
- regional transportation plans and sustainable communities strategies;
- California High-Speed Rail Business Plan;
- tribal transportation and safety plans;
- California Transportation Commission Statewide Transportation Needs Assessment;
- California Transportation Infrastructure Priorities: Vision and Interim Recommendations;

- Climate Change Scoping Plan;
- Sustainable Freight Transport Initiative; and
- California's Climate Future: The Governor's Environmental Goals and Policies Report (draft).

CALTRANS PLANNING INITIATIVES

In addition to integrating modal plans, the recommendations rely heavily on policy and modeling frameworks of various successful planning initiatives, including:

- California Regional Blueprint Planning Program;
- Smart Mobility Framework;
- Complete Streets Implementation Action Plan 2.0;
- California Essential Habitat Connectivity Study;
- Regional Advance Mitigation Planning and Statewide Advance Mitigation Initiative;
- Caltrans Climate Action Program;
- Strategic Highway Safety Plan; and
- Main Street, California: A Guide for Improving Community and Transportation Vitality.

For more on the Caltrans planning initiatives, please visit: <http://www.dot.ca.gov/hq/tpp/californiatransportationplan2040/programs.shtml>

CALIFORNIA INTERREGIONAL BLUEPRINT (CIB)

SB 391 requires the CTP to address how the State will achieve maximum feasible reductions of GHG emissions by identifying the statewide transportation system needed to achieve these results. The CIB was the first step toward this goal. The CIB integrates Caltrans' five modal plans and multiple planning initiatives that complement RTPs and future land use. Through the CIB pro-

cess, Caltrans developed a set of statewide modeling tools that were used in the development of the CTP 2040 to model various strategies that will achieve the maximum GHG reductions mandated in SB 391.

CALTRANS' FIVE LONG-RANGE MODAL PLANS

The CTP 2040 incorporates the research and findings of Caltrans' five modal plans listed and described in Table 2.

TABLE 2. CURRENT LONG-RANGE TRANSPORTATION PLANS

PLAN	NEXT UPDATE	PLAN FEATURES
HIGHWAY PLAN 2013 Interregional Transportation Strategic Plan 2013 Interregional Transportation Strategic Plan	2015	The first complete update to the 1998 Interregional Transportation Strategic Plan (ITSP) will address significant statute and policy issues that have occurred since then. The goals and objectives from the 1998 ITSP will be completely re-assessed, along with the Focus Routes. The ITSP will be consistent with the CTP 2040 and the Mission, Vision, and Goals of the Department. The 2015 ITSP Update will occur simultaneously with the Interregional Transportation Improvement Program update.
FREIGHT PLAN 2014 California Freight Mobility Plan	2014	This plan will update the project list, develop a new vision and goals, and include sections on air cargo, agriculture, and tribal governments.
RAIL PLAN 2013 California State Rail Plan	2017	This plan will comply with state and federal law and provide a long-term plan for freight and passenger rail, including integrated rail network requirements.
AVIATION PLAN 2011 California Aviation System Plan Policy Element	2016	This plan will include updated programs and directives to better support aviation sustainability in California.
TRANSIT PLAN Statewide Transit Strategic Plan	N/A	This plan will help the state and partners gain a better understanding of present and future roles and responsibilities to support public transportation.

For more information on the Caltrans modal plans, please visit:

<http://www.dot.ca.gov/hq/tpp/californiatransportationplan2040/modal.shtml>

REGIONAL TRANSPORTATION PLANS AND SUSTAINABLE COMMUNITIES STRATEGIES

MPOs and Regional Transportation Planning Agencies (RTPAs) are the entities that receive State and/or federal transportation planning funds to accomplish regional transportation planning activities. Both types of agencies perform essentially the same planning functions in their respective jurisdictions. One of these functions is the development of a policy framework that shapes a respective region's long-range planning goals and is generally presented in the format of an RTP. Unlike the CTP which is not project based, these RTPs include a financially constrained project list. RTPAs and MPOs address transportation from a regional perspective, while the CTP addresses the

connectivity and/or travel between regions.

Unlike their regional counterparts, MPOs are required to develop SCS as an integral part of their RTPs. The SCS present land use, housing, and transportation strategies that are expected to support the region in meeting its GHG emission reduction targets as established by the California Air Resources Board (ARB). After the SCS is adopted by the MPO, the ARB reviews it and accepts or rejects the MPO's determination that it will meet regional GHG emissions reduction targets. If the combined measures in the SCS do not meet the regional targets, the MPO must prepare an alternative planning strategy (APS), which is not part of the RTP. Table 3 shows the GHG emissions reduction target and the ARB's determination for each MPO in California.



Photo: Shasta Regional Transportation Agency

TABLE 3. STATUS OF SUSTAINABLE COMMUNITIES STRATEGIES IN CALIFORNIA REGIONAL TRANSPORTATION PLANS AS OF NOVEMBER 2014

MPO	STATUS OF SUSTAINABLE COMMUNITIES STRATEGY (SCS)	ARB GHG TARGET, 2020	MPO SCS GHG, 2020	ARB TARGET, 2035	MPO SCS GHG, 2035
Butte County Association of Governments	Project kickoff July 2014; anticipated completion (adoption) December 2016.	+1%	-2%	+1%	-2%
Council of Fresno County Governments	Adopted June 2014; under review by ARB.	-5%	-	-10%	-
Kern Council of Governments	Adopted June 2014; under review by ARB.	-5%	-	-10%	-
Kings County Association of Governments	Adopted July 2014; under review by ARB.	-5%	-	-10%	-
Madera County Transportation Commission	Anticipated adoption in 2014.	-5%	SCS not adopted	-10%	SCS not adopted
Merced County Association of Governments	Adopted September 2014; under review by ARB.	-5%	-	-10%	-
Metropolitan Transportation Commission	Adopted December 2013.	-7%	-10.4%	-15%	-16.2%
Association of Monterey Bay Area Governments	Adopted June 2014; under review by ARB.	0%	-	-5%	-
Sacramento Area Council of Governments	Adopted April 2012.	-7%	-10%	-16%	-16%
San Diego Association of Governments	Adopted last RTP/SCS in October 2011; started next RTP/SCS, expected completion in 2015.	-7%	-14%	-13%	-13%
San Joaquin Council of Governments	Adopted June 2014; under review by ARB.	-5%	-	-10%	-
San Luis Obispo Council of Governments	Anticipated adoption in 2015.	-8%	SCS not adopted	-8	SCS not adopted
Santa Barbara County Association of Governments	Adopted August 2013.	0%	-10%	0%	-15.4%
Shasta Regional Transportation Agency	50% complete; anticipated completion/adoption 2015.	0%	SCS not adopted	0%	SCS not adopted
Southern California Association of Governments	Adopted June 2013.	-8%	-9%	-13%	-16%
Stanislaus Council of Governments	Adopted June 2014; under review by ARB.	-5%	-	-10%	-
Tahoe Regional Planning Agency/Tahoe Metropolitan Planning Organization	Adopted 2012.	-7%	-12%	-5%	-7%
Tulare County Association of Governments	Adopted June 2014; under review by ARB.	-5%	-	-10%	-

DID YOU KNOW?

Each Sustainable Communities Strategy (SCS) completed to date demonstrates a comprehensive shift away from business-as-usual. The plans reduce per capita vehicle-miles-traveled (VMT) while offering a host of additional benefits that will improve quality of life for Californians. By 2035, for example, residents in the San Diego area will make nearly one-third of their trips in a mode other than, or in addition to, driving. In Southern California, two-thirds of new housing will be multifamily dwellings. Jobs in high-frequency-transit areas near Sacramento will more than double, making it easier for commuters to get to work. By 2040, the San Francisco Bay Area will experience a 20 percent increase in the region's share of car-free trips. These are just a few examples of the ways that improved regional planning, in coordination with local governments, will reduce per capita VMT and support vibrant, livable communities.

– ARB Scoping Plan, Appendix C, 2013

HIGH-SPEED RAIL BUSINESS PLAN

The California High-Speed Rail Authority (CHSRA) is responsible for planning, designing, building, and operating the first high-speed rail system in the nation. The California high-speed rail will connect the major regions of the state, and is expected to contribute to economic development and a cleaner environment, create jobs, and

preserve agricultural and protected lands. By 2029, the planned system will transport passengers from San Francisco to the Los Angeles basin in under three hours at speeds that can exceed 200 miles per hour. Eventually, the system will extend to Sacramento and San Diego, covering 800 miles with up to 24 stations. In addition, the CHSRA is working with regional partners to implement a statewide rail modernization plan that will invest billions of dollars in local and regional rail lines to meet the State's 21st century transportation needs.²

TRIBAL TRANSPORTATION AND SAFETY PLANS

Native American tribal governments engage in transportation safety planning for their communities. As sovereign nations, Native American tribal governments have the authority to make and approve transportation plans to further their unique community goals. These plans support the planning, construction, maintenance, and operations of roadways and guide the development of transit services on their tribal lands and for the residents of the community. In addition, tribal transportation plans are essential for successful proposals for competitive State and some federal transportation grant programs. The tribal transportation safety plans seek to improve safety on tribal roads for all road users. In Fiscal Year 2012-13, nine California tribes received MAP-21 Tribal Transportation Program Safety Funds to write tribal transportation safety plans for their respective communities.

CALIFORNIA TRANSPORTATION COMMISSION STATEWIDE TRANSPORTATION NEEDS ASSESSMENT

The California Transportation Commission (CTC) allocates funds for the construction of highway, passenger rail, and transit improvements throughout California. The CTC also advises and assists the Secretary of the California State Transportation Agency (CalSTA) and the Legislature to formulate and evaluate state policies and plans for California's transportation programs. To assist with these responsibilities, in 2011 the CTC developed a needs assessment that coordinates a list of transportation projects and programs and identifies related funding requirements that will allow local, State, and regional transportation agencies in California to present a consistent message when communicating statewide needs for preserving, expanding, maintaining, and operating the State's transportation system. The report is designed to address the needs of the statewide transportation system over a ten-year timetable (2011 to 2020).

For more information on the statewide transportation needs assessment, please visit: <http://www.catc.ca.gov/reports/>.

CALIFORNIA TRANSPORTATION INFRASTRUCTURE PRIORITIES: VISION AND INTERIM RECOMMENDATIONS

The CalSTA consists of departments, boards, and offices, each with a unique role to ensure the safety and mobility of California's traveling public. Caltrans is one such department. In an effort to identify the

transportation system needed to achieve long-range goals and determine how it can best be implemented, CalSTA developed the California Transportation Infrastructure Priorities (CTIP) workgroup in April 2013. This workgroup examined the current status and challenges of the State's transportation system and developed the CTIP Vision and Interim Recommendations, which represents both a vision for California's transportation future and a set of immediate action items centered on the concepts of preservation, innovation, integration, reform, and funding. The vision represents a general consensus of the CTIP workgroup and a focus on transportation system objectives of mobility, safety, and sustainability.

For more information on the CTIP, please visit: <http://www.calsta.ca.gov/res/docs/pdfs/2013/CTIP%20Vision%20and%20Interim%20Recommendations.pdf>

ASSEMBLY BILL 32 (CLIMATE CHANGE) SCOPING PLAN

The Global Warming Solutions Act of 2006 (AB 32) required the ARB to prepare a scoping plan to achieve reductions in GHG emissions in California. Approved in December 2008, the AB 32 Scoping Plan provides the outline for actions to reduce California's GHG emissions. In May 2014, the first update to the Scoping Plan was approved. The update builds upon the initial plan with new strategies and recommendations, including climate change priorities to reach current and post-2020 goals. It also identifies opportunities to leverage existing and new funds to further drive GHG emission reductions

and evaluate how to align longer term reduction strategies with State policy priorities.

For more information on the Climate Change Scoping Plan, please visit: <http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm>

SUSTAINABLE FREIGHT TRANSPORT INITIATIVE

On January 23, 2014, ARB adopted Resolution 14-2, which directed staff to engage all interested stakeholders to provide input on the development of a Sustainable Freight Transport Initiative (SFTI) by the end of 2014. The purpose of the SFTI is to identify and prioritize actions that move California toward a sustainable freight transport system characterized by zero or near-zero emissions.

The SFTI will also recognize other freight system priorities, such as maintaining the competitiveness of California's ports and logistics industry; creating jobs in California and training local workers; maintaining the reliability, velocity, and capacity of the California freight transport system; integrating with the national and international freight transportation system; transitioning to cleaner, renewable transportation energy sources; and increasing the system's support for healthy, livable communities.

The SFTI will include recommendations for near-term actions that arise from stakeholder input and technology assessments for truck, rail, ship, commercial harbor craft, air cargo, and cargo handling equipment. ARB staff is also working closely with Caltrans

and the California Freight Advisory Committee to ensure the State's freight efforts are coordinated.

For more information on the SFTI, please visit: <http://www.arb.ca.gov/gmp/sfti/sfti.htm>

CALIFORNIA'S CLIMATE FUTURE: THE GOVERNOR'S ENVIRONMENTAL GOALS AND POLICIES REPORT

The discussion draft of "California's Climate Future – The "Governor's Environmental Goals and Policy Report" (EGPR) for 2013 provides an overview of the State's environmental goals, key steps to achieving them, and a framework of metrics and indicators to help inform decision making at all levels. The EGPR applies to all State departments and agencies, thus allowing for coordination and adoption of common strategies to achieve environmental goals.

For more information on the EGPR, please visit: http://opr.ca.gov/s_egpr.php

PUBLIC AND PARTNER ENGAGEMENT

Caltrans' Public Participation Plan (PPP) is in compliance with federal laws and supports its mission to involve the public in transportation-related decisions and state-wide planning and programming activities.

Planning activities are coordinated with many transportation partners and key stakeholders, and public input is solicited throughout the planning and decision-making process. For the CTP 2040, a series of seven public workshops, seven focus groups, and

multiple advisory committees were conducted, as well as direct tribal interaction, listening sessions, and consultation as requested. Public outreach materials included a summary brochure, a document describing the project scope and timeline, and project status fact sheets in English and Spanish. A user-friendly website was developed that has functioned as a major conduit for distributing project information and soliciting public engagement and input.

The results of early public participation revealed that Californians are aware of transportation trends and the challenges facing the State, such as economic and job growth, air quality and climate impacts, human and environmental health, and freight movement. The public is equally supportive of a fully integrated, multimodal sustainable transportation system that considers mobility and accessibility, modal integration and connectivity, efficient management and operation, safety and security, and preservation.

In addition to public outreach efforts, two committees were formed during plan development – the Policy Advisory Committee (PAC) and the Technical Advisory Committee (TAC) – to serve in an advisory capacity.

POLICY ADVISORY COMMITTEE AND TECHNICAL ADVISORY COMMITTEE

The PAC and the TAC were convened during plan development to provide guidance, direction, and necessary approvals with respect to the continuing, comprehensive, and cooperative State transportation planning process required by federal law. The two multidisciplinary committees in-

cluded representatives from federal, State, regional, and local agencies, and tribal governments; and transportation advocacy groups. Table 4 lists the groups and agencies represented by committee members.

SENATE BILL 391 CONSULTATION AGENCIES

SB 391 identifies specific agencies that should be consulted in the development of the CTP. While some of these groups served on the PAC or TAC, others were asked to review the Plan during development and to provide feedback. The agencies consulted in compliance with SB 391 are as follows:

- California Transportation Commission;
- the Strategic Growth Council;
- the California Air Resources Board (ARB);
- the State Energy Resources Conservation Development Commission (California Energy Commission);
- air quality management districts;
- public transit operators; and
- Regional Transportation Planning Agencies.

TABLE 4. GROUPS AND AGENCIES REPRESENTED ON CTP 2040 ADVISORY COMMITTEES

POLICY ADVISORY COMMITTEE REPRESENTATION	
Association of Monterey Bay Area Governments	Inter-Tribal Council of California
Assembly Transportation Committee	Karuk Tribe
California Air Resources Board	Local Government Commission
California Coastal Commission	Metropolitan Transportation Commission
California Council of Governments	Native American Advisory Committee
California Department of Aging	National Resources Defense Council
California Department of Public Health	Rincon Band of Luiseno Indians
California Energy Commission	Sacramento Area Council of Governments
California High-Speed Rail Authority	San Diego Association of Governments
California State Transportation Agency	San Joaquin Council of Governments
California Transit Association	Senate Staff
California Transportation Commission	Shasta Regional Transportation Agency
California Walks	Southern California Association of Governments
Department of Housing and Community Development	Strategic Growth Council
Department of Rehabilitation	State Independent Living Council
Department of Water Resources	Tehama County Transportation Commission
El Dorado County Transportation Commission	The Nature Conservancy
Federal Highways Administration	Trinidad Rancheria
Glenn County Planning and Public Works Agency	US Environmental Protection Agency
Governor’s Office of Planning and Research	
TECHNICAL ADVISORY COMMITTEE REPRESENTATION	
California Air Resources Board	Metropolitan Transportation Commission
California Energy Commission	Sacramento Area Council of Governments
California State Transportation Agency	San Diego Association of Governments
Federal Highway Administration	Shasta Regional Transportation Agency
Governor’s Office of Planning and Research	Southern California Association of Governments

Endnotes

1. US DOT, “The Transportation Planning Process: Key Issues.” <http://www.planning.dot.gov/documents/briefingbook/bbook.htm>.
2. http://www.hsr.ca.gov/docs/about/business_plans/BPlan_2014_Business_Plan_Final.pdf

CHAPTER 2

THE TRANSPORTATION SYSTEM

California's transportation system is large and complex. The system supports transportation infrastructure, such as railways, roadways, and pipelines; facilities, such as airports and seaports; and a variety of transportation modes, including transit, bicycle, pedestrian, ferries, and vehicles. The transportation system is integrally tied to the physical shape and vitality of California's communities, and is influenced by local land use decisions. Cities, counties, port authorities, private businesses, regional agencies, transit agencies, tribal governments, the State, and the federal government share ownership and operating responsibility for the various parts of the transportation system.

Table 5 presents an overview of the transportation system. Chapter 2 includes more detail about the system's various components including the following:

- State Highway System
- Tribal Roads and Transportation
- Local Roads
- Public Transit
- Rail System
- Aviation
- Seaports
- Bicycle and Pedestrian Facilities



Photo: Caltrans

TABLE 5. CALIFORNIA TRANSPORTATION SYSTEM OVERVIEW

HIGHWAY AND ROAD CENTERLINE* MILES (2012)¹	
State highway system (SHS)	15,147 miles or 50,486 lane miles
County roads	65,044 miles
City roads	75,572 miles
Federally owned roads	16,708 miles
Other jurisdictions	3,347 miles
TOTAL HIGHWAY AND ROADWAY DISTANCE	175,818 MILES
FREIGHT AND PASSENGER RAIL ROUTE MILEAGE²	
Passenger: state corridors	887 miles*
Passenger: interstate AMTRAK corridors	1,663 miles*
Freight: class 1 Railroads	3,928 miles*
Freight: regional and short line railroads	1,317 miles*
Freight: switching and terminal railroads	275 miles
AIR (2013)³	
Commercial service airports	29
General aviation airports	216
Special-use airports	66
Hospital heliports	160
Heliports (fire, police, commuter, private)	505
PORTS & BRIDGES⁴	
California seaports (Both inland and coastal)	12
State owned bridges and other structures (ferry boats, tunnels, tubes, large-crossing & small crossing bridges)	13,133

* Route miles are estimated by adding each agency or railroad company's reported operating route miles (for 2010, the last available year recorded). Thus total route miles are less than shown because some railroad route miles are shared by more than one railroad company or agency.

STATE HIGHWAY SYSTEM

The California State Highway System (SHS) includes over 50,000 lane-miles of pavement; 12,559 bridges; 205,000 culverts and drainage facilities; 87 roadside rest areas; and 29,183 acres of roadside landscaping. While lane miles measure the total distance covered by through lanes, centerline miles

measure just the length of the system. For example, a one-mile length of a three-lane highway would equal one centerline mile but three lane miles.

Approximately 61 percent of the SHS is multilane divided highway, three percent is multilane undivided highway, and 36 percent is two-lane road. Infrastructure for the SHS

also includes Caltrans' maintenance stations, equipment shops, transportation laboratories, and other support facilities. Much of the SHS was built between 1950 and the early 1970s to serve the growing population and economy of the state. Many of these assets are reaching the end of their service life, and most are at an age where they are deteriorating at an accelerating rate.

TRIBAL ROADS AND TRANSPORTATION

California's transportation system is of vital importance to tribal communities. Approximately 91 percent of tribal trust lands are within five miles of the SHS, 43 tribal trust lands are within five miles of a railroad, and 37 tribal trust lands are within five miles of an airport facility. An efficient, interconnected transportation system is therefore vital to tribal economic vitality. California Native American tribes have established a variety of transportation services for tribal members and non-Indian residents in the tribal community, including bus services, ferries, local roads programs, Amtrak Thruway connection service, and goods movement projects. Tribal transportation is a vibrant, diverse, and constantly changing field. (Read more about the state SHS in tribal communities in Chapter 4).

LOCAL ROADS

California's 58 counties and 483 cities own and maintain a network of 140,491 centerline miles of local streets and roads. Local roads account for 82 percent of the state's total publicly maintained centerline miles. Each year, about 146.4 billion vehicle miles – approximately 45 percent of the state's to-

tal vehicle miles – are traveled on this local street network. Conservatively, this network is valued at \$271 billion.⁵

PUBLIC TRANSIT

Public transit in California comprises over 500 local and regional transit providers; ferry boat operations; local, regional, and interregional commuter rail services; light rail services; paratransit agencies that provide transportation services for persons with special mobility needs; transit providers in non-urbanized and rural areas; and the often-isolated tribal communities. In 2010-11, California transit operators provided 1.35 billion unlinked passenger trips. California public transit systems provide connectivity to the National Railway system (Amtrak) as well.

RAIL SYSTEM

California's rail system performance over the past decade underscores the system's importance to the State. Intercity and commuter passenger rail ridership increased during that period and has been robust. At the same time, the freight rail network has become increasingly important for international, domestic, and intrastate trade.

Passenger and freight rail are positioned to help address the challenges of environmental, economic development, and population growth, such as increased travel demand, traffic congestion, and greenhouse gas emissions.

The advent of a statewide high-speed rail system that will be integrated into the existing passenger rail network provides additional opportunities to meet these challenges.

Passenger Rail

California's passenger rail system includes intercity and commuter rail and will eventually include the future California high-speed rail system currently in the planning phase. The three existing intercity rail routes include the Capitol Corridor, San Joaquin, and Pacific Surfliner routes. By 2029, high-speed rail should be implemented from San Francisco to Los Angeles Basin via the State's Central Valley.

The 2013 California State Rail Plan (CSRP) sets a blueprint on how to improve integration of commuter and intercity rail with public transit and other transportation systems – a priority for the State's high-speed rail system. Designing for connectivity enters into virtually every aspect of rail operations, marketing, and capital planning. Intercity and commuter rail systems generally share the same infrastructure with private freight railroads. Funding for intercity rail is supplied by the State. Commuter rail services are funded by local agencies. The high-speed rail system is initially being financed with State and federal funds.

Freight Rail

California is a key state in the national freight rail system. The major California seaports and border ports of entry are gateways to international trade. Trucks and trains move freight through intermodal connec-

tions to and from inland destinations. Unlike other modes of surface transportation, the freight rail system is largely in private ownership. The State generally participates in freight rail projects through its role administering federal funds and through a variety of public-private partnerships. With California freight revenues in 2009 of more than \$378 billion; operating budgets for California's Class I (line haul freight) railroads rival budgets for many other states' departments of transportation.⁶

AVIATION

The State does not own or operate any of the currently permitted 245 public-use airports in California, but monitors the conditions of the aviation system. Airport planning and aviation system planning are related, but they are different endeavors. An airport master plan describes the activities and needs of a particular airport. An aviation system plan describes all the airports in a network of airports, and it guides other plans that consider regional capacity, surface transportation (such as multimodal access to and from an airport), the movement of freight, and overall economic development.⁷ The State helps with both types of planning efforts by monitoring and supporting the efforts of communities and airport managers to improve integration of their airports into planning and economic development programs.

State support typically includes reviewing land use compatibility plans within two miles of an airport; commenting on the aviation component of regional transportation plans;

suggesting potential roles for aviation in multimodal transportation solutions; and demonstrating how airports can play a role in smart growth, sustainable community strategies, and economic development concepts. A recent example is the publication of a report prepared through the Caltrans Division of Aeronautics entitled, “*Caltrans Airport Forecasting Study: The Role of California Airports in Smart Growth and Economic Vitality*”. This study identified practices of airports around the State that are seeing economic success from incorporation of smart growth concepts. Airports are transforming from ‘islands’ within their communities into more robust community partners. The economic potential of California aviation is still expanding, and the integration of multimodal transportation systems tied to sustainable community’s strategies is gaining momentum.

SEAPORTS

California’s system of seaports (“ports”) extends along the California coast, from Humboldt in the north to San Diego in the south, and includes two inland ports that serve the interior of the State (Stockton and West Sacramento). The State is home to twelve deepwater ports, three with international significance (Port of Los Angeles, Port of Long Beach, and Port of Oakland). Nationally, the ports of Los Angeles and Long Beach rank first and second, and Oakland fifth, in the number of 20-foot equivalent units (TEUs) shipped annually.⁸ Combined into one complex, the Ports of Los Angeles and Long Beach ship the sixth highest volume of TEUs in the world.⁹

BICYCLE AND PEDESTRIAN FACILITIES

Bicycle and pedestrian facilities are integral components of the statewide transportation system. Analysis of data from the 2013 California Household Travel Survey found nearly 23 percent of household trips involved walking, biking, or taking public transportation. In 2000, that share was only 11 percent. As shown in Table 6, bicycling and walking for transportation purposes have both experienced a significant increase in popularity, with each doubling its mode share since 2000.¹⁰

Many California cities and counties have created bicycle and pedestrian plans. Some MPOs and RTPAs also have such plans, either included in or in addition to their RTP. Municipalities, the State, and planning organizations are working to standardize the collection of performance data, such as bicycle and pedestrian trip counts. A growing body of statistical information at local and regional levels backs the statewide increase in bicycling and walking identified in the California Household Survey.¹¹



Photo: Caltrans

Bicycle and pedestrian facilities increasingly are included as standard elements in transportation projects. Notable projects include the relatively new east span of the San Francisco – Oakland Bay Bridge, which includes a bicycle and pedestrian pathway. Such facilities are becoming commonplace, not only in large projects but also in smaller

projects, such as shoulder widening and intersection upgrades. Collectively, these facilities promote walking and bicycling. Over time, California will piece together a comprehensive network of bicycle and pedestrian facilities, making these modes a viable transportation choice for more people, more often.

TABLE 6. CALIFORNIA TRANSPORTATION MODE SHARE 2000 TO 2012

MODE	2010-2012 MODE SHARE	2000 MODE SHARE
Auto/van/truck driver	49.3%	60.2%
Auto/van/truck passenger	25.9%	25.8%
Walk trips	16.6%	8.4%
Public transportation trips	4.4%	2.2%
Bicycle trips	1.5%	0.8%
Private transportation trips	0.6%	N/A
School bus trips	0.6%	N/A
Carpool/vanpool	0.6%	N/A
All other	0.5%	0.7%
Total	100.0%	100.0%

Source: Caltrans Travel Forecasting and Analysis branch

Endnotes

1. Executive Fact Booklet, March 2014 http://onramp.dot.ca.gov/docs/2014_EFB-revised.pdf
2. 2013 California State Rail Plan, May 2013 http://californiastaterailplan.dot.ca.gov/docs/Final_Copy_2013_CSRP.pdf
3. US DOT, "The Transportation Planning Process: Key Issues." <http://www.planning.dot.gov/documents/briefingbook/bbook.htm>
4. Caltrans Mile Marker, January 2014 <http://www.dot.ca.gov/ctjournal/MileMarker2014-1/index.html>
5. 2011 Statewide Transportation System Needs Assessment, California Transportation Commission, Oct. 2011.
6. 2011 Statewide Transportation System Needs Assessment, California Transportation Commission, Oct. 2011
7. (NA, 2011 Statewide Transportation System Needs Assessment, California Transportation Commission, Oct. 2011)
8. ATEU is a unit of cargo capacity commonly used to describe the capacity of container ships. It is based on the volume of a 20-foot long container that can be seen stacked on ships and hauled on trucks and trains.
9. 2011 Statewide Transportation System Needs Assessment, California Transportation Commission, Oct. 2011
10. <http://www.dot.ca.gov/hq/paffairs/news/press-rel/14pr021.htm>
11. 2011 Statewide Transportation System Needs Assessment, California Transportation Commission, Oct. 2011

California’s transportation system is influenced by many statewide, national, and international trends that affect travel demand, system operation, and implementation of new projects and services. These trends can present challenges and must be understood in order to accurately predict needs and gaps in the statewide multimodal transportation system. The sections below highlight some economic, demographic, and policy trends and challenges that influence today’s transportation system and should be taken into account in long-range planning. These trends and challenge areas are:

- Demographics;
- Economic prosperity;
- Transportation funding;
- Climate change and GHG reduction;
- Freight mobility;
- Fuel, energy and technology;
- Sustainability in rural communities and small towns;
- Sustainability in tribal communities;
- Public health; and
- Housing and land use.

DEMOGRAPHICS

California is one of the most diverse states in the nation (see Table 7).¹ The annual growth rate is expected to be one percent throughout the forecasted years.² A growing and diversifying population will present challenges for transportation planners.

Transportation entities do not have sufficient resources to respond to anticipated increases in transportation demand by a population that is aging and diversifying. The States’ transportation planning must serve the unique needs of all, while creating a system that can respond and adapt to future shifts in travel preference.

TABLE 7. CALIFORNIA ETHNIC DIVERSITY COMPARED TO NATIONAL ETHNIC DIVERSITY

ETHNIC GROUP	CALIFORNIA	USA
American Indian and Alaska Native alone	1.6%	1.2%
Asian alone	13.6%	5.2%
Black or African American alone	6.3%	12.9%
Hispanic or Latino	36.9%	16.7%
Native Hawaiian and Other Pacific Islander alone	0.5%	0.2%
White alone, not Hispanic or Latino	37.5%	61.4%
Two or more Races	3.6%	2.4%

Source: United States Census Bureau, U.S. Department of Commerce, 2010

POPULATION GROWTH

The State’s population today is over 38 million,³ and it is projected to reach 48 million by 2040.⁴ There are approximately 24 million licensed drivers and 32 million vehicles registered annually in the State.⁵

Population growth amplifies the need to improve the transportation system’s connectivity and efficiency to meet future demands. Today, approximately 95 percent of California’s population lives in urbanized areas. By 2040, the most populous coastal metropolitan areas, such as the San Francisco Bay Area, Los Angeles and San Diego, will

continue to house a majority of the population. However, population in the inland areas of the State are projected to grow at a faster rate (see Table 8),⁶ driven in part by lower cost of living, land availability, and lower development costs. Higher rates of inland growth are expected to continue into the foreseeable future.

California’s population growth before 1990 was largely driven by migration. Prior to 1990, more people moved into California

from other states and countries annually than were gained from the net increase in births (natural increase) to existing California residents. Since 1990, gains from immigration have been offset by domestic migration losses, and the State’s population growth has been fueled mostly by natural increase, despite declining fertility rates. This trend of natural increase is expected to account for most of the State’s future population growth.

TABLE 8: 2010 -2040 PROJECTED POPULATION GROWTH IN HIGH GROWTH INLAND COUNTIES

COUNTY	2010 POPULATION	2040 PROJECTED POPULATION	CHANGE (PERCENT)
Kern	841,000	1,619,000	92%
Madera	151,000	278,000	84%
Sutter	95,000	172,000	82%
San Joaquin	687,000	1,214,000	77%
Merced	256,000	436,000	70%
Yuba	72,000	123,000	70%
Imperial	175,000	295,000	68%
Tulare	443,000	723,000	63%
Riverside	2,192,000	3,462,000	58%

Source: <http://www.dof.ca.gov/research/demographic/reports/projections/P-1/>

MILLENIALS AND AGING

Ranging in age from approximately 20-35, the demographic group commonly known as millennials is anticipated to have a unique impact on transportation. This generation has relied less than previous generations on automobiles – 69 percent of 19-year-olds obtained their drivers’ license in 2011, compared to 87 percent of that group in 1989.⁷ People born in the 1990s travel 18 percent fewer miles and take 4 percent fewer trips than previous generations.⁸ There are many theories as to the reasons for this, includ-

ing the impact of the Great Recession; high fuel prices; teen driving restrictions; new communication technologies; increased acceptance of telecommuting; environmental concerns; and changes in community development, land use, housing, and job center location.

This demographic shift will be significant for the CTP 2040 because millennials will account for a large portion of California’s population in 2040. The recent economic recession may have contributed to people driving less, but factors such as an aging

population, environmental concerns, and delayed marriage and childbirth also influence travel behavior. In order to adequately plan for a transportation system that meets the State's needs in 2040, demographic trends and influential factors should be closely monitored and addressed.

California will surpass the national average for age by 2040 even though it is currently the sixth youngest state in the nation with only 11 percent of its population 65 and older. Baby boomers are the primary reason for this demographic change, as they are projected to make up 19 percent of the population that is 65 years and older by 2030. The ratio between people over the age of 65 and people of working class age (25 to 64) is expected to increase to 36.0 seniors per 100 working age residents by 2030, compared to a 21.6 to 100 ratio in 2010. As people age, they are less likely to drive due to health limitations, requiring alternative transportation modes.

Alternative forms of transportation, such as high-speed rail, transit, carsharing, and active transportation, will be important to accommodate potential shifts in travel behavior. Demographic shifts demonstrate the need for the CTP 2040 to plan for a comprehensive transportation system that incorporates all transportation modes. The CTP 2040 presents an array of transportation options and system recommendations needed to create a comprehensive multi-modal system that connects people to crucial destinations.

ECONOMIC PROSPERITY

California continues to recover from the "Great Recession" that lasted from December 2007 to June 2009. Since the Great Recession, unemployment and housing foreclosures have decreased and the credit rating of municipalities and the State has steadily improved. In 2013, the State regained its title as the eighth-largest economy in the world, with a gross domestic product of \$2 trillion.¹⁰ Even more promising is the State's expected \$2.4 billion surplus in 2014.¹¹ California's positive economic outlook is sustainable by creating an attractive business climate, continuing to build confidence in the economy, and improving the transportation system. Transportation helps stimulate the economy by providing Californians with access to jobs, education, goods and services, and recreational facilities.

Goods and services reach international, national, tribal, and regional markets through the transportation system. California businesses export approximately \$162 billion worth of goods to over 225 foreign countries.¹² With the recent positive economic outlook, businesses have begun to reinvest in the economy by increasing jobs and wages (see Table 9). Future advancements in transportation technology will continue to foster industrial growth and economic opportunities for Californians.

California's economy is dependent on the well-being of businesses and households. Businesses depend on a reliable transportation network to create products and offer services that ultimately reach consumers

TABLE 9. CALIFORNIA'S EMPLOYMENT STATISTICS

YEAR	POPULATION (THOUSANDS)	TOTAL JOBS (THOUSANDS)	TOTAL JOBS MEAN SALARY	TRANSPORTATION JOBS (THOUSANDS)	TRANSPORTATION JOBS MEAN SALARY
2003	35,389	14,513	\$40,640	1,019	\$27,680
2004	35,753	14,535	\$41,510	1,039	\$27,950
2005	35,986	14,724	\$42,510	1005	\$28,950
2006	36,247	15,066	\$44,180	1,034	\$29,360
2007	36,553	15,203	\$45,990	1,013	\$31,050
2008	36,857	15,213	\$48,090	996	\$32,190
2009	37,078	14,533	\$49,550	916	\$33,090
2010	37,309	14,002	\$50,730	894	\$33,620
2011	37,570	14,039	\$51,910	891	\$34,070
2012	37,872	14,304	\$52,350	907	\$34,170
2013	38,205	14,715	\$53,030	947	\$34,220

Source: Bureau of Labor Statistics

at a reasonable cost. Households depend on an integrated, accessible, and dependable transportation network to provide them access to education, jobs, and recreational activities. A sustainable, time-efficient, and cost-effective transportation system helps alleviate increasing business competition from neighboring states and Mexico. The CTP 2040 recommendations encourage policymakers to support an efficient and effective transportation network that is cost effective for businesses and households.

TRANSPORTATION FUNDING

The expected rise in transportation needs and decline in transportation funds present a fundamental problem for California. For nearly thirty years, transportation spending has been underfunded. Caltrans is working closely with the regional transportation agencies and the US Department of Trans-

portation to maximize every dollar of investment in a multimodal system. Nevertheless, a recent assessment prepared by the CTC¹³ highlights deep gaps in funding available for basic transportation system maintenance and operation alone, not to mention addressing population growth and transportation preference shifts. At the same time, the transportation system is under greater pressure to accommodate the mobility needs of California's growing population and underserved groups – such as those with disabilities, veterans, and the elderly – and to address climate change. The aging physical system needs modernization, upkeep, and maintenance to meet expected demand increases. This is impossible without adequate funding.

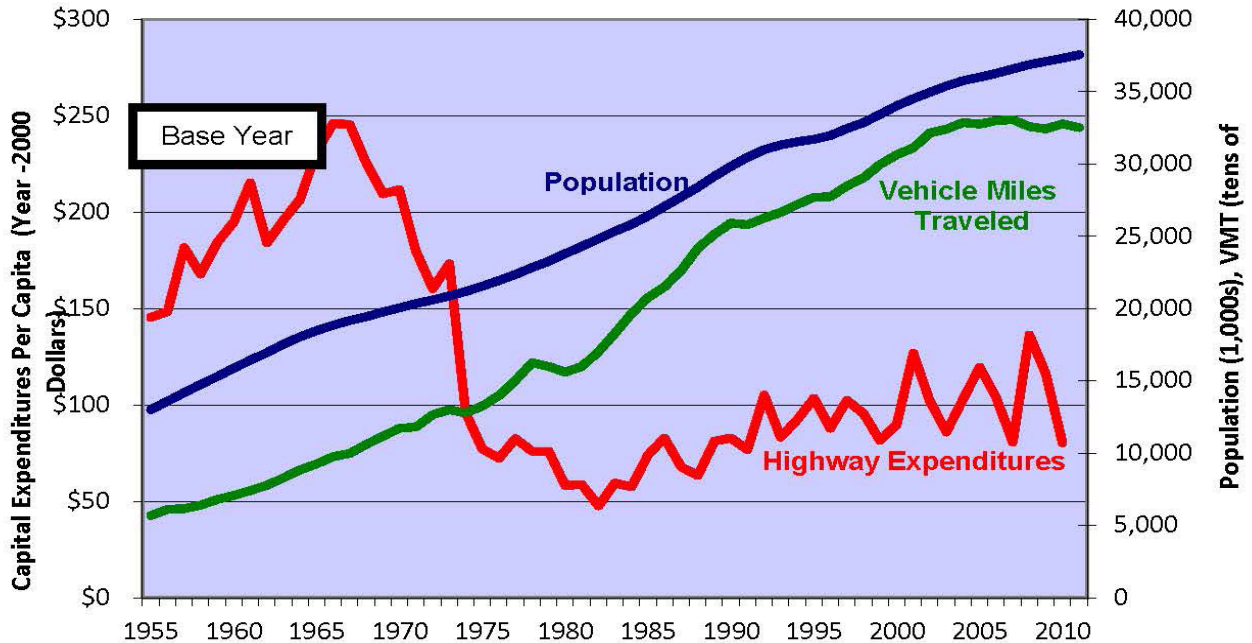
The traditional approach to funding transportation projects in California is based on user fees, including fuel taxes, sales taxes,

vehicle weight fees, transit fares, and tolls. However, more reliable revenue sources are needed. Excise taxes on gasoline and diesel fuels are primary revenue sources for federal and state governments. The State has struggled to raise funds to maintain and improve the transportation infrastructure because these sources have not been indexed for inflation or adjusted for technological advancements and trends. Fuel taxes are collected on a per-gallon basis, which means that lower revenues will be generated if people drive fewer miles or vehicles become more fuel efficient (see Figure 1).

Legislative efforts such as AB 32 to reduce GHG emissions from all sources through improved technology and regulation, and

SB 375 coordinating transportation and land use planning, attempt to decrease GHG emissions from automobiles by promoting active transportation and transit. While improving the natural environment, these legislative mandates also impact long-range funding of transportation projects. To reduce their “carbon footprint,” individuals may buy vehicles that are more fuel efficient, reduce driving by bundling trips, take public transportation more often, or choose to live in communities that offer transportation, housing, and land use options. All of these choices will lessen negative environmental impacts associated with transportation; however, with transportation funding based on user fees, these choices can negatively impact the resources available for trans-

FIGURE 1. HISTORICAL POPULATION, TRAVEL AND PER CAPITA HIGHWAY CAPITAL EXPENDITURES 1955-2010*



* Includes expenditures for local assistance and state highway capital outlay. Source: Office of State Planning-Economic Analysis Branch, 08/2013

portation maintenance and improvements. Thus, new or modified sources of revenue must be developed.

When inflation is taken into account, fuel and excise taxes have not generated an increase in revenue for the past decade. Due to a decrease in purchasing power, the California State Legislature has utilized general obligation bonds in the past to assist with transportation financing. The largest infusion of funds came from Proposition 1B, a \$20 billion transportation bond authorized in 2006. Bonds are loans that provide temporary financial relief, but they also create additional debt to the State's General Fund. Thus, bonds decrease the amount of available funding for other programs or transportation projects in the long run and are not a sustainable option. Moreover, transportation revenues have been further decreased to pay down bond debt and help balance the State budget. These shifts in funding make it difficult to plan and deliver projects cost-effectively.

Transportation funding has been an even greater challenge for Native American tribal communities since most of their funds come from the federal government. Native American tribes do not have a dedicated funding stream from the state, and they do not receive any direct allocation from the Highway Trust Fund like states do. Moreover, tribal transportation projects are rarely included in RTPs, even if they overlap with other local agency projects. California tribes historically receive only one to two percent of the \$450 million available federal funding, even though they represent about 20 percent of

the nation's tribal population.

Transportation funding in California has increased nominally over time, but not in real economic terms. The gas tax has lost almost 37 percent of its buying power since 1993 according to the US Department of Labor's statistics inflation calculator. At the federal and State levels, revenues generated from excise taxes on gasoline and diesel fuels will continue to decrease. Road pricing strategies are being explored to replace fuel taxes to better reflect the cost of driving by charging users by the actual number of miles driven. At the local level, government entities fill this funding gap by supplementing transportation with local revenue sources such as sales tax measures. However, a two-third majority voter approval is required to pass a dedicated transportation tax measure, which represents a hurdle for counties, often depriving them of much-needed funding.¹⁴

Transit receives only about 20 percent of available federal transportation funding, but this trend may change as the physical space available to expand roadway and highway infrastructure reaches its limits. The Bay Area Metropolitan Transportation Commission's (MTC) recent RTP predicts the Commission will spend about 62 percent of its anticipated revenues maintaining and expanding its transit system in the coming decades. A recent RTP from the Southern California Association of Governments (SCAG) estimates that transit will account for 47 percent of its expenditure plan – 20 percent for capital projects and 27 percent for operations and maintenance. Although

transit expenditures in other areas of the State may be lower than in the Bay Area or Los Angeles, other regions are also expected to increase their investment in transit.

CLIMATE CHANGE AND GREENHOUSE GAS REDUCTION

Climate change is one of the most significant issues facing the world today. Studies show that carbon dioxide (CO₂) and GHG emissions contribute to climate change, and the transportation sector is the leading source of GHG emissions in the State.¹⁵

California's infrastructure is already stressed and will face additional burdens from climate risks. The frequency of extreme weather events – such as heat waves, droughts, and torrential rains – is expected to increase over the next century, potentially causing flooding, landslides, wildfires, pavement damage, bridge damage, and rail buckling. Even if the State's GHG emissions were to cease today, some of these effects would be still unavoidable.¹⁶

California is taking mitigation actions to reduce GHG emissions, but no matter how quickly this might happen, California's population will face increasing impacts from emissions that have already occurred. Therefore, we must also implement adaptation strategies to mitigate these impacts in California.¹⁷

Sea-level rise (SLR) is one of the most widely documented risks of climate change, and it will affect all modes of transportation. Sea levels are expected to rise an estimated average of 6.7 inches by 2030.¹⁸ If SLR

increases to the highest projected levels, it will put almost half a million Californians along the ocean coastline and the San Francisco Bay at risk from a 100-year flood event.¹⁹ Adaptation will require that we use the best available science to estimate SLR impacts. These impacts must be addressed at all project planning stages, not just at final project delivery.²⁰

California has achieved worldwide acclaim for its GHG emission reduction efforts. However, given the expected range of climate change impacts, public agencies throughout California, including Caltrans, are assessing the risks posed by potential SLR. Affected planning agencies need to address potential climate change-related vulnerabilities and incorporate climate change resiliency into their long-range transportation documents to reduce the likelihood, magnitude, duration, and cost of disruptions associated with extreme weather.²¹

Climate change will significantly increase the challenge for transportation managers who will need to ensure that reliable transportation routes are available. To effectively address the challenges that a changing climate will bring, climate adaptation and GHG reduction policies must complement one another. National efforts to reduce GHG emissions in transportation explore the use of alternative fuels, new vehicle technologies, pricing strategies, public transportation expansion, and increased use of bicycling and walking as transportation modes.

Transportation decision-makers at all levels are beginning to consider how climate change may affect the transportation system

and the levels of investment required to produce successful “co-benefits” or “wins” simultaneously across economic, environmental, and social measures from within a strategy.²² How these considerations are incorporated into the transportation planning process is emerging as an area of concern.²³



Local Coastal Programs (LCPs) operate alongside general plans in the coastal zone and are the only standard of review for coastal development permits in their respective jurisdictions. Coastal communities should utilize LCPs to implement climate change adaptation measures in the coastal zone, where the impacts of SLR are most intense. Communities will be challenged with implementing many of the climate change adaptation measures to protect both infrastructure and coastal communities, as many of the strategies can be implemented only at the local level through changes in local development policies, including general plan updates. Successful implementation to reduce these impacts will require additional funding in the future.

California has already made a strong commitment to decrease GHG emissions

through its Active Transportation Program, which funds active transportation projects and plans. As the climate continues to change, the decisions made today will impact the future.

FREIGHT MOBILITY

Today’s transportation infrastructure was built at a time when the current volume of goods traveling through California was unimaginable. The freight industry now demands an intricate network of ports, roadways, railways, and airports that not only handles large volumes of freight but also provides efficient, cost effective global shipping. Rail lines and cargo ships are predominately used to move goods over great distances; trucks are favored to move freight to intermodal facilities, distribution centers, manufacturing facilities, and final destinations. Trucks are the sole source of receiving and shipping goods for 78 percent of California communities.²⁴

Freight movement presents many challenges to the natural environment and to local communities in the future. Capacity for freight movement is increasingly becoming an issue, as ports struggle to house containers and truck drivers struggle to find overnight parking. Demands for truck parking exceed the available capacity at public rest areas. Freight movement contributes to traffic congestion, traffic accidents, roadway wear-and-tear, climate change, and health issues. The federal government identified 15 major freight chokepoints and bottlenecks in California in 2011.²⁵ Traffic delay at these chokepoints and bottlenecks make travel

reliability difficult, particularly in urbanized areas.

The movement of goods by the freight industry is an integral piece of the state’s economy. Approximately 1.8 billion tons of goods with a value of \$2 trillion are shipped each year from California²⁶, creating 800,000 freight jobs²⁷.

There are five key gross domestic product regions: the Los Angeles Basin (\$925 billion), the San Francisco Bay Area (\$594 billion), the San Diego region (\$179 billion), the San Joaquin Valley (\$132 billion), and the Sacramento region (\$102 billion).²⁸ The production for these regions will grow over time as the economy naturally expands from productivity and technological innovations. The need to improve the freight network is imminent, as ports from Canada, Mexico, East Coast, and the Gulf Coast have increased their import value. In addition, the Panama Canal expansion (expected completion in 2016) could present a greater challenge to California’s ports in the future.²⁹

Although California faces competition, Caltrans anticipates the freight industry will continue to grow (see Table 10). By investing in its freight network, California can foster economic growth and remain competitive.

Efficiently moving freight minimizes impacts to the environment and communities and supports the State’s economy. Federal and State policymakers have begun to address these challenges by developing the nation’s Primary Freight Network to improve the efficiency of freight movement. In a collaborative effort with public and private entities, Caltrans published the California Freight Mobility Plan in December 2014. This plan guides freight movement planning activities and capital investments. More importantly, the plan established a foundation for an ongoing partnership with the freight industry. Improving advocacy and pooling resources, the partnership can improve freight movement and increase the State’s freight industry’s global competitiveness.

TABLE 10. FREIGHT FORECAST AND TRENDS³⁰

Total shipments by weight (into, out of, and within CA) are projected to grow approx. 180% statewide between 2012 and 2040

Domestic and International outbound shipments from CA will grow faster than inbound shipments

Trucking is currently the predominant freight mode and carries the largest amount of goods, and this is forecast to continue through 2040

Freight moved by truck is expected to increase

Value of shipments is expected to grow two or three times as fast as the weight being transported

Value of shipments will rise, leading to an increase in truck congestion costs

Truck trips will increase, leading to additional damage to the roadways

Current developed and operated system cannot accommodate projected growth



FUEL, ENERGY, AND TECHNOLOGIES

On a per capita basis, consumption of gasoline has been steadily falling since 1990, which is attributed to increased vehicle efficiency. Gasoline consumption is likely to continue to decline and the demand for alternative fuels to increase. Ethanol fuel blends (E-85), electricity, and natural gas are each forecasted to grow at extremely fast rates in response to public demand. California currently has the largest alternative fuel network of any state, with over 1,900 electric vehicle charging and ten hydrogen fueling stations, and an increasing number of natural gas stations.³¹ The CTP 2040 accounts for alternative transportation fuels and the services and infrastructure needed to find favor with the public.

Innovative technology provides opportunities to maximize utilization of the existing transportation system. Such technologies increase throughput on the existing transportation system, allowing for faster, more efficient movement of people and goods.

Two concepts currently being tested are “connected” vehicles – vehicles that can wirelessly communicate with surrounding vehicles, transportation infrastructure, and personal mobile devices – and autonomous driverless vehicles. These approaches leverage existing technologies – sensors, wireless communications systems, navigational software, and automated controls – that can be built into existing vehicles to help prevent crashes, improve traffic flow, and reduce fuel consumption and emis-



Technology is also changing how transportation systems are built and maintained. New materials and application methods are continually sought and developed to improve system performance and longevity, ultimately reducing costs to both transportation agencies and users. In addition, technologies are being implemented that allow better response to inclement weather and incidents. Mitigating or eliminating travel delays is a key component of transportation efficiency.

As the demand for economic and environmentally efficient vehicles grows, new technologies will enter the marketplace. In keeping with the vision of the CTP 2040, the State will continue to demonstrate its environmental stewardship and leadership, priming the market for new technologies with its own vehicle choices and through incentives and integration into transportation systems.

California’s transportation sector accounts for approximately 40 percent of the total energy consumed in the State, nearly all of which is fueled by petroleum. Gasoline and diesel fuel remain the primary transportation

fuels. The Great Recession reduced the demand for gasoline at a faster rate than was previously anticipated. This manifested in a decrease in fuel consumption and change in preferred travel trends, such as choosing to walk or ride public transit. As California recovers from the recession, it remains to be seen whether this pattern toward reduced personal vehicle fuel consumption will continue.

Prior to the recession, California experienced steady growth in gasoline and diesel fuel purchases and vehicle miles traveled (VMT), regularly exceeding the rate of growth in the State's population. Since World War II, this trend has been disrupted only by economic recessions at the State and national levels. In 2005, annual consumption of gasoline fuel peaked at 15.9 billion gallons, and in 2007 annual consumption of diesel fuel peaked at just over 3 billion gallons. Similarly, annual statewide VMT peaked in 2007 at 330 billion miles. On a per-capita basis, consumption of gasoline has been steadily falling since 1990, which is attributed primarily to increased vehicle fuel efficiency. Consumption of diesel fuel appears to rise and fall roughly in direct proportion to the per-capita Gross State Product – in other words, to the economic climate in general.

The fleet of vehicles traveling California's highways and roadways is changing as a result of rising transportation fuel costs, governmental policy affecting fuel mileage and emission standards, and awareness of transportation's impact on the environment.

For now, the system relies primarily on petroleum-based fuels, but this may change by 2040. Emerging alternatives include bio-methane and renewable diesel, hydrogen, butanol, and algae-based fuels. Commercial production of some alternatives is already underway. Market forces will ultimately determine if any become commercially viable. Success may depend on government subsidies or State or federal regulations and policies.

SUSTAINABILITY IN RURAL COMMUNITIES AND SMALL TOWNS

The vehicle fatality rate in rural areas is more than twice that of urban areas.

Over five million Californians, 13 percent of the State's population, live in rural areas.³² Twenty-six of the State's 58 counties are considered rural – each has a population of less than 250,000 with no single urbanized area having more than 50,000. Additionally, many predominantly urban counties such as Los Angeles, San Bernardino, and San Diego also include large non-urban populations. Rural California provides excellent recreational opportunities and plays a vital role in the economy, with billions of dollars in local, national and international food supply exports.³³

Providing sustainable transportation services and active transportation options to a sparsely and widely distributed population presents special transportation challenges that must be considered when planning for

a balanced, interconnected, interregional system. Many State highways act as main streets for these rural towns and provide important bicycle and pedestrian access for residents within the community. One of the most important transportation concerns in rural areas is maintaining the existing road system. With approximately 71 percent of California's highway miles located in rural areas,³⁴ the proportion of highway miles to population creates a far larger responsibility without the economic means to address it. Weather issues accelerate the deterioration of roadways, particularly where flooding, landslides, and snow removal can quickly jeopardize pavement integrity. Rural roads also have additional pavement distress from heavy commercial truck and recreational traffic.

Safety is another significant concern in rural areas. Nationally, over 58 percent of motor vehicle-related fatalities occur in rural areas. The vehicle fatality rate in rural areas is more than twice that of urban areas.³⁵ The higher fatality rate could be attributed to many factors, including rugged terrain; shortened sightlines; unforgiving roadways; driver irresponsibility, including speeding or alcohol use; and longer response time to accidents and distance to medical treatment centers.

Rural area airports provide vital access for lifeline medical emergencies, firefighting, and agricultural operations. These airports also provide links to larger urban airports for passenger and air cargo service. As commercial airports reach passenger and cargo capacity, demand will shift to regional and

rural airports to provide general aviation services. Many rural airport runways need to be extended to accommodate larger aircraft.

For some rural residents, transit service is the only means of transportation. Rural entities are often challenged to provide transit and paratransit services to rural customers that are sparsely distributed over considerable distances. Regional and intercity bus service can be difficult to provide due to low demand, fare box return requirements, and limited resources for operating and maintaining the system.

To date, much of the State's focus on reducing GHG emissions has been on light-duty vehicles in metropolitan areas where the majority of the State's population resides. Rural areas that are not covered by the requirement to adopt an RTP/SCS under SB 375 are undertaking their own efforts to plan more sustainably, and the CTP 2040 supports these rural sustainability efforts. An innovative way to address rural sustainability is to look at the connections of urban and rural parts of a region and plan for the region's future as a whole, rather than considering them as separate entities. The Sacramento Area Council of Governments (SACOG) is taking this approach through their successful Rural-Urban Connections Strategy (RUCS) program.

SACOG'S RURAL-URBAN CONNECTIONS STRATEGY (RUCS)

The RUCS project is looking at the Sacramento region's growth and sustainability objectives from the rural perspective. RUCS strives to be an economic and environmental sustainability strategy for rural areas.

The CTP 2040 sets goals that encourage rural communities to continue embracing their unique values and character – whether on main streets or recreational lands – while offering travelers options to get around by bicycle, on foot, or on transit.

SUSTAINABILITY IN TRIBAL COMMUNITIES

Native American tribes consider sustainability an integral part of responsible living. California Native Americans place a high value on connection to the land, and protecting it is important. Cultural practitioners seek to protect gathering and sacred sites for generations. The State works with tribal communities to design transportation projects that respect environmental and cultural contexts. This is possible only through close collaboration between the State and individual tribal agencies on a government-to-government basis.

Fiscal sustainability is also integral to tribal transportation. Funding must be available so future generations can enjoy the same benefits as current users. To help facilitate this, sixteen tribes in Southern California

have formed the Reservation Transportation Authority (RTA). Its purpose is to construct mutually beneficial projects, leverage limited government funds, and ensure that future needs are met through planning and project development.³⁶ The State can partner with tribes to help them address funding issues and achieve mutually beneficial goals.

Native American tribes face numerous challenges in working toward environmental and fiscal sustainability. While improved transportation allows tribal members access to services, it may also expose culturally valuable and sensitive sites to disturbance and create barriers to entering those sites. Fiscally sustainable funding sources are difficult to secure due to a constantly changing transportation landscape and scarce resources. Partnerships, collaboration, and cooperation will become more important in achieving sustainable tribal transportation. Despite these challenges, many tribes are making significant progress. The Yurok Tribe, for example, has developed a pioneering climate change plan to achieve sustainable development.³⁷

PUBLIC HEALTH

Transportation systems profoundly affect public health, with impacts on communities, public safety, physical activity, the environment, and accessibility of vital goods and services. When properly planned and designed, transportation systems can have a positive effect on public health.³⁸ Major trends in public health and transportation involve forming new partnerships to address the impacts.

The transportation system helps shape communities and vice versa. Transportation and land use decisions can promote public health by making it easier and safer for people to walk, bike, and take public transit. As the connections are made, parties responsible for land use and transportation decisions tend to work together to coordinate plans, projects, and services.

Safety continues to be a major public health concern for transportation. Safety is a concern not only for drivers and passengers but also for pedestrians and bicyclists. The design of transportation infrastructure increasingly takes into consideration public health impacts as well as safe accommodation of all modes. All levels of government have stepped up efforts to encourage more responsible driving habits that will make transportation safer for all users. National and state campaigns have been launched to raise public awareness about the dangers of distracted driving and driving under the influence.³⁹

Limited access to transportation can affect health, particularly among vulnerable populations, such as the poor, the elderly, children, the disabled, and various ethnic communities. These populations may not own cars, may be unable to drive, or may have no convenient, affordable access to reliable public or private transportation. Thus, it is critical to improve transportation access for all people to enjoy the benefits. A safe and accessible transportation system would allow reliable transportation for communities to travel to supermarkets for fresher foods, to integrate daily walking as a form of exer-

cise to meet exercise goals,⁴⁰ and to access better health care facilities, education, jobs, recreation, and other needs that all link to improved health. Transportation solutions at the community level are needed to serve these basic, daily needs.⁴¹

Inactivity is a significant factor in obesity, which contributes to many chronic diseases. Creating opportunities for people to incorporate active transportation opportunities – walking, biking, and public transportation – into everyday travel is important to improving public health. Active transportation is a critical component in developing and implementing SCS's, reducing greenhouse gas emissions, and making regions more enjoyable to live, work, and play.



Photo: Ruben de Rijcke, Wikimedia Commons

The transportation sector is a major source of air pollution, which results from an accumulation of emissions and small particulates in the exhaust from fossil fuel combustion engines on most trucks, cars, trains, planes, and ships.⁴² These emissions are linked to increased incidence of several chronic respiratory and cardiovascular diseases. Federal and State regulations have already done much to improve air quality, but ad-

ditional improvements are needed. New technological advances in alternative fuels and vehicles, together with government policies and industry innovations to support them, are needed to further improve our air quality.⁴³

HOUSING AND LAND USE

Despite the recent lows of the Great Recession from December 2007 to June 2009 and the current recovery, the cost of housing as a proportion of local wages in California continues to rank highest in the nation.⁴⁴ For more than 25 years, the State, local governments, and redevelopment agencies have helped facilitate availability of affordable housing and engage in community development. With the loss of redevelopment agencies in 2013, many local resources that promote the building of affordable housing are no longer available.

A challenge is to develop housing that is affordable, safe, and healthy. Housing in California is becoming an even more important issue as the State's demographics change.⁴⁵ It is increasingly important to consider location efficiency and compact development patterns as methods of restraining housing and transportation costs. Another challenge is promoting a land use development pattern that aligns with where people live and work in urban, suburban, and rural areas. It is crucial that regions work together to provide housing and transportation options for all Californians.

Land use, housing, and transportation plans need to be coordinated between the cities and counties – the entities typically respon-

sible for local land use decisions – and regional agencies and the State, which are responsible for regional and interregional transportation decisions. Planning and land use decisions have a tremendous impact on our communities. Historic land use practices have often contributed to increases in traffic congestion, commute times, and air pollution; the loss of open spaces; and a reliance on automobiles. Now, with the improvement of the housing outlook and new construction, a challenge is to provide residents with a mix of housing options. In more urbanized areas, demand for multi-unit housing near transit is expected to increase.

Past development trends included low-density growth planning, resulting in considerable land consumption and urban sprawl that required higher infrastructure investments. The SCSs and other legislation calls for transportation planning, housing projections, and land use planning to be considered in concert, as opposed to separately. To help preserve open space and discourage sprawl, SB 375 encourages local governments and regions to consider alternative land use patterns that promote compact urban infill. Since each SCS program is part of an RTP effort and ultimately feeds the larger CTP 2040 plan, housing and land use are keys to developing the vision of the CTP 2040.

One solution to discourage urban sprawl and coordinate land use and transportation is to support focused housing development in locations close to transit and multimodal services, with consideration for noise and air quality issues. This is often referred to

as “smart growth” or “transit-oriented development” (TOD) and it has the potential to increase the accessibility, affordability, and diversity of housing, as well as to support new jobs.

Land use development that supports the viability of rural communities, agricultural operations, and natural habitats is essential. The CTP 2040 supports sustainable development to alleviate pressure to develop open spaces and agricultural lands. Location-efficient development within established urban growth boundaries or urban limit lines will help preserve the natural beauty of California, increase agricultural productivity, and promote habitat continuity. Infill development and mixed-used development promote mul-

timodal transportation and encourage more walking, biking, transit use, and shorter auto trips. Mixed-use development typically results in shorter vehicle trips and higher rates of non-motorized travel.

Through the goals, policies, strategies, and performance measures established by this plan, public health, environmental justice, and social equity will be integrated into transportation planning and decision-making for transportation services and housing development statewide. To ensure success, it is critical to create partnerships, build relationships, and collaborate when making housing and land use decisions at local, regional, and State levels.

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CHAPTER 4

NATIVE AMERICAN TRANSPORTATION³⁹



There are 110 federally recognized Native American Tribes throughout California (see Table 11 in Appendix A), each with its own tribal government and whose communities have a variety of unique transportation needs.¹ Tribal governments are sovereign, meaning that they make their own laws and are governed by them. Most communities are in rural areas, and most have tribal lands on a state highway or very near one. To ensure that Native American tribes receive equal access to the transportation system, it is critical that State and local government agencies collaborate with tribal agencies during the transportation planning process. Tribal communities consist of tribal members, non-member Indians, and non-Indians who may be California citizens. Partnerships between tribes and the State are vital to the provision of safe, consistent, high-quality transportation facilities to all Californians. Native American communities rely on an efficient and productive transportation system. The CTP 2040 seeks to coordinate, consult, and cooperate with Native American tribes to promote the vitality of California's transportation system.

NATIVE AMERICAN TRIBES AND THE STATE OF CALIFORNIA

As a result of federal policies implemented in the 1970s to relocate Indians from reservations to urban centers, California has the largest Native American population of any state in the nation. Strong concentrations of Native Americans exist in major cities such as San Francisco, San Jose, and Los An-

geles. From 2000 to 2010, the Native American population increased at a faster rate (18.4 percent) than the State's population as a whole (9.7 percent). In accordance with Governor Brown's EO B-10-11, the State of California engages with Native American groups in consultation and for advancement of environmental justice goals. The State is also required to engage in government-to-government consultation with federally-recognized tribes on State actions that may impact tribes. The State engages in consultation with individual tribal governments on matters affecting their respective lands, cultural heritage sites, and other matters particular to their interests.

Tribal consultation is a vital step in the transportation planning process. Federally recognized tribes are held to be sovereign nations. As such, they possess a right to self-governance—to make and be governed by their own laws. Each tribal government administers essential programs and provides services to both the tribal and non-tribal members of its community. Once a tribe achieves federal recognition status, the US by law, must engage with it in a formal, government-to-government relationship. The US government has a fiduciary obligation to protect tribal lands, assets, resources, and treaty rights for the benefit of tribes and their members.

In addition to supporting Federal laws, such as Section 106 of the National Historic Preservation Act which mandates consultation with tribal governments, Caltrans upholds several additional requirements imposed by the State. Caltrans also complies with

CalSTA's Tribal Consultation Policy, which obligates it to respect tribal sovereignty and pursue good-faith relations with tribes. In addition, Caltrans upholds Director's Policy 19, *"Working with Native American Communities,"* which requires the Department to *"recognize and respect important California Native American rights, sites, traditions and practices."*

CONSULTATION, COORDINATION, AND ENGAGEMENT WITH TRIBAL GOVERNMENTS AND NATIVE AMERICAN COMMUNITIES

Cooperation between non-tribal and tribal governments has resulted in many beneficial transportation projects. For example, collaboration in Sonoma County's Alexander Valley between the County and the Dry Creek Rancheria produced a program for multi-modal transportation improvements. Strong working relationships between regional agencies (MPOs and RTPAs) are particularly important because regional agencies control most transportation funds. Regional agencies have a responsibility to include tribal governments as sovereign governments and land use authorities in the transportation planning process. The San Diego Association of Governments (SANDAG) has successfully worked to respect and include tribes in the planning process. The SANDAG-Tribal Transportation Working Group is a model for Tribal-MPO partnership. In pursuing these partnerships, it is important to ensure that all government agencies involved in transportation, such as the Bureau

of Indian Affairs (BIA) and Federal Highway Administration (FHWA), are included.

TRIBAL LANDS AND THE TRANSPORTATION SYSTEM

Tribal governments provided essential tribal input to the CTP2040 to guide its direction. Through ongoing coordination, tribal governments helped draft policies and practices that will ensure tribal transportation goals and needs are considered and addressed throughout all of the State's long-range plans. Engagement efforts during the development of the CTP 2040 included a series of Tribal listening sessions.

For more information on the Tribal listening sessions, see http://www.dot.ca.gov/hq/tpp/californiatransportationplan2040/native_american_tribal.html.

At the State level, consistency in consultation processes across state modal plans provides greater clarity and transparency in the planning process. Consultation also empowers tribal governments to help shape the transportation system for the benefit of their tribes and to preserve tribal sacred sites in advance of construction. At the planning stages, it is necessary to coordinate with and provide information to tribes about upcoming projects that affect them. During the consultation process, it is important to respect the diversity among California tribal governments and to avoid a one-size-fits-all approach.

Great expanses of California are considered sacred or spiritually significant to the State's Native American populations because they

contain burial grounds, traditional foods and materials, or cultural resources. The federal government holds some of these lands in federal trust, and trust lands are located throughout the State but are heavily concentrated in the areas east and south of Los Angeles and along the Northern California coast. In general, most are situated in rural areas. Many tribal members live on these lands, but not all tribes have reservations or rancherias. Some tribal members from acknowledged or unacknowledged tribes live on allotment lands that the federal government holds in trust for individual allotment owners.

The Reservation Transportation Authority (RTA) is a tribal transportation agency formed by 16 tribes in Southern California. The RTA provides vital transportation infrastructure for the tribes and is a successful example of inter-tribal cooperation. Projects include transit, park and ride, and para-transit improvements.

The State's transportation system provides tribal lands with vital connectivity and access to services. However, given the rural location of most reservations and rancherias, tribal populations often have difficulty accessing the transportation system. This difficulty exists despite the proximity of many tribes to the SHS. About 91 percent of federally recognized tribes occupy trust land within five miles of a State route. Of the 110 federally recognized tribes, 86 (78 percent) occupy tribal land within two miles of State routes, and 39 tribal governments (35 percent) have trust land that actually intersects

with the SHS.² Figures 3, 4 and 5 in Appendix A show the general location of Native American trust lands in California and their proximity to the SHS. (Due to their small size, many of the trust lands are not visible on the maps.)

Since over 90 percent of tribal lands are close to the State highways, improving tribal access to the State transportation systems represents a critical opportunity. Many tribal trust lands offer only one point of ingress and egress to the transportation network; thus, maintenance is crucial. Access is especially important for first responder emergency services, such as ambulance, police, and fire services.

Many tribal members have low incomes and cannot afford private vehicles. These members rely on transit services for access to medical services, socializing, and shopping. To meet the demand, tribes have established a variety of transit, paratransit, and other public transportation programs. The Chemehuevi Tribe, which occupies tribal lands straddling the Colorado River in Southern California, operates a ferry service across the river. Tribes have received federal grants to support transit. In Federal Fiscal Year 2013, five California tribes received \$651,000 in discretionary funds (12.9 percent of the national total for discretionary funds).³ In Federal Fiscal Year 2014, eight tribes received \$531,845 in formula funds (2.1 percent of national total for formula funds).⁴ Partnership opportunities also exist to enhance interregional transportation system access through expanded transit service. Caltrans can also partner with

tribes to construct bicycle and pedestrian improvements on conventional highways through tribal lands. This would be in accordance with the Caltrans guidance on Complete Streets.⁵ More funding is necessary to ensure the continued growth and viability of tribal transit services.

TRANSPORTATION AND ECONOMIC DEVELOPMENT

Native American tribes can reduce unemployment through Tribal Employment Rights Ordinances (TEROs), which are legislative acts of the governing body of a federally-recognized tribe. Employment policies and programs pursuant to a TERO create opportunities for Native Americans. TEROs especially benefit Native Americans in rural counties and in regions with limited economic opportunities, high unemployment rates, and poverty. Examples of such policies include hiring preferences, job skills banks, and training. Caltrans supports these policies and programs and related implementation guidelines.⁶ These guidelines mandate that when Caltrans constructs a project on tribal lands, Caltrans will work with a tribe to implement its TERO ordinance through a Memorandum of Understanding (MOU) with the tribe. This policy ensures that Caltrans partner with tribes to promote their economic development.

Tribal gaming has become a popular way to generate revenue and job opportunities. As of July 2014 the California Gambling Control Commission identified 60 active tribal casino gaming sites throughout the State. These gaming facilities with their complementary

amenities generate significant freight activities for the shipment of food, supplies, building materials, and waste. In 2010, tribal gaming alone generated over \$7.5 billion through operations with more than half (\$3.9 billion) from direct spending at gaming operations and off-reservation trade.⁷ In addition, tribal gaming has created over 52,000 jobs, generating over \$2.7 billion in annual tribal and non-tribal employment income. Many sites are clustered in Southern California and in northern portions of the state, with several scattered throughout the Central Valley. Due to their rural locations, many of these facilities possess only one route for ingress and egress, which is shared by freight, customers, emergency services, and employee traffic. Transportation is thus a vital component of gaming tribes' economic development and contributes to their well-being.

DIVERSITY OF CALIFORNIA TRIBAL COMMUNITIES AND TRANSPORTATION NEEDS

California tribal communities are scattered throughout the State and their transportation needs vary. Most communities are located in rural settings where members must travel far for goods and services; others are in urban locations with more convenient transit, bicycle, road, and pedestrian services. When working with tribal governments, it is important to recognize that each tribe has unique needs that may change over time. For example, the Agua Caliente Band of Cahuilla Indians are located in the urban Coachella Valley. Their transportation needs, which include improving bike lanes and

supporting existing local transit services, are similar to those of other urban communities. The Yurok Tribe is located in rural Northern California, and much of their land lacks convenient local and interregional transportation access. The Yurok Tribe is therefore developing innovative water taxi services to suit their particular needs. Throughout the State, tribal governments are customizing transportation solutions that meet their communities' needs.

Endnotes

1. See Federal Register, Volume 79, Number 19, page 4748
2. California Division of Transportation Planning, March 2010
3. FTA, Fiscal Year 2013 Public Transportation on Indian Reservations Program Project Selections <http://www.gpo.gov/fdsys/pkg/FR-2014-04-15/pdf/2014-08477.pdf>
4. FTA, FY 2014 Apportionment Tables, http://www.fta.dot.gov/12853_14875.html
5. Caltrans Deputy Directive DD 64-R2
6. Caltrans Deputy Directive 19, <http://dot.ca.gov/hq/tpp/offices/ocp/nalb/Images/TEROsigned.pdf>; and Tribal Employment Rights Ordinance (TERO) guidance, http://dot.ca.gov/hq/tpp/offices/ocp/nalb/Images/TERO/TERO_Guide_03_02_2012.pdf, accessed on January 2, 2014.
7. California Nations Indian Gaming Association, http://www.cniga.com/media/pressrelease_detail.php?id=117

Transportation funding in California is insufficient to meet the growing needs of preserving, maintaining, and expanding the transportation system. Traditional transportation revenue sources, such as motor vehicle fuel taxes and fees, will not meet the cost of offsetting inflation, addressing increased transportation demand, complying with new sustainable policies, and supporting technological innovation. Policies that attempt to decrease vehicle miles traveled through active modes and improved vehicle efficiency will continue to reduce fuel consumption. Therefore, a reduction in fuel consumption will correspondingly reduce fuel tax revenues that support transportation and result in a substantial funding shortfall.

The State needs \$538.1 billion worth of transportation improvements over the next ten years, according to the California Transportation Commission's 2011 Statewide Transportation System Needs Assessment. The Needs Assessment also projects the state will produce \$242.2 billion in revenue for the same period – a shortfall of \$296 billion. The exploration of new funding mechanisms and strategies is necessary to close the gap. This chapter provides an overview of transportation revenue sources and expenditures, highlights upcoming financial challenges, and suggests funding strategies to help minimize the funding shortfall.

FUNDING SOURCES

California's transportation system receives funding from a variety of federal, state and local sources. The State assumes responsibility for the federal and state highway

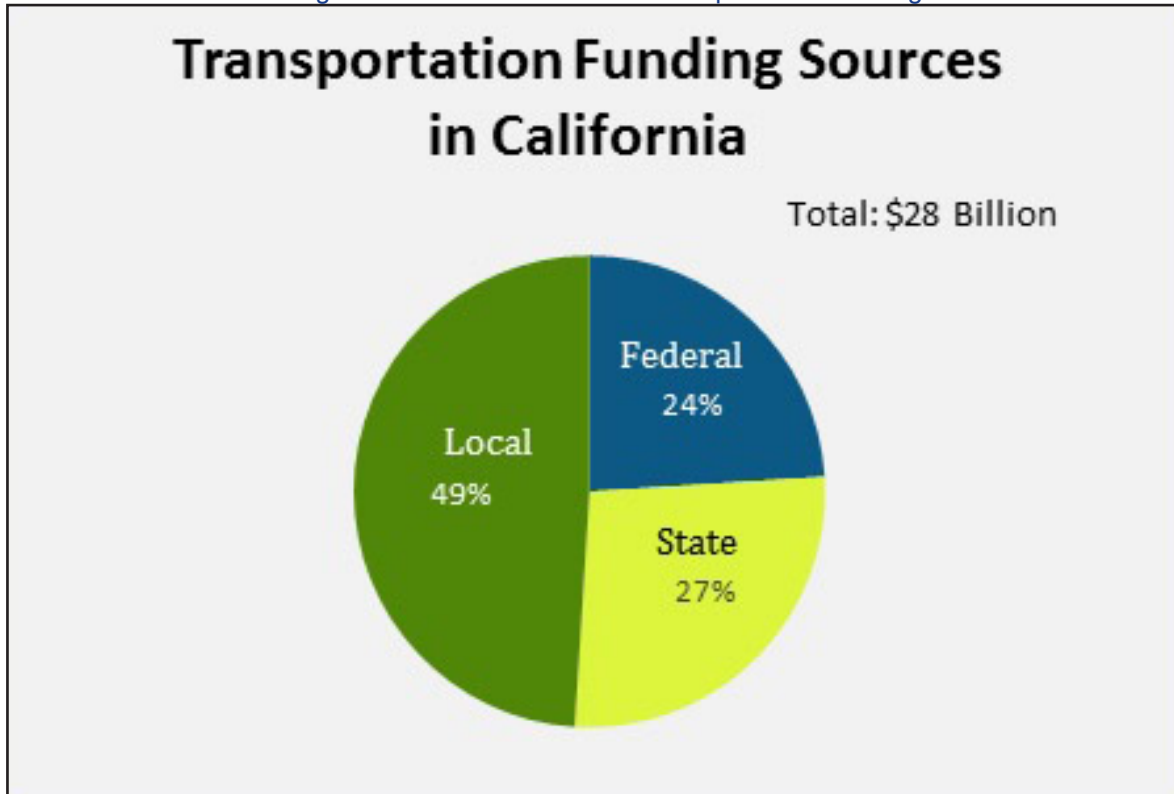
system and some interregional rail systems, while local entities are responsible for streets, roads, and transit systems. The primary source of revenue for the upkeep of the transportation system is the federal and State excise tax imposed on gasoline and diesel fuels. The State collects additional revenue from truck weight fees, State sales tax on diesel fuel, vehicle license fees, and voter-approved bond sales. Local transportation entities obtain revenue through local sales tax measures, local property tax assessments, transit fares, developer fees, and general fund allocations. Statewide figures from the Legislative Analyst's Office indicate roughly \$28 billion in transportation funding is collected annually, with local entities providing nearly half of that figure and federal and State transportation revenue mechanisms providing the other half (see Figure 4).¹

FEDERAL TRANSPORTATION REVENUES

Federal revenue is primarily generated through fuel excise taxes – 18.4 cents per gallon for gasoline and 24.4 cents per gallon for diesel – and the heavy-vehicle use tax (HVUT). Consumers pay the gasoline or diesel excise tax at the time of purchase. The HVUT tax is an annual fee (maximum \$550) paid by truck owners to the Internal Revenue Service (IRS). This tax is assessed on heavy vehicles operating on public highways at registered gross weights equal to or exceeding 55,000 pounds.

Additional funding is allocated based on the federal government's authorization, which sets the maximum amount that can be ap-

Figure 4. FY 13-14 Estimated Transportation Funding



Source: Legislative Analyst's Office, FY 2013-14 Overview of Transportation Funding

propriated to programs each fiscal year over a given period. The current authorization is MAP-21², which covers two fiscal years, from October 1, 2012, to September 30, 2014, and allocates \$105 billion for transportation purposes. Under MAP-21, California received about \$7 billion in funding for fiscal year 2013 and is projected to receive \$5 billion for fiscal year 2014.

Since 2000, lawmakers have been permitted to transfer money from the US Treasury's General Fund to the Highway Trust Fund (HTF) if obligations outpace revenues based on enacted legislation. The Congressional Budget Office estimated that

outlays from the highway account totaled \$44 billion, while revenues amounted to only \$33 billion in 2013. MAP-21 transferred \$6 billion from the General Fund to shrink this gap. Since 2008, \$41 billion has been transferred to the HTF; the figure is expected to grow to \$53 billion by the end of 2014 under MAP-21. This temporary fix could have a significant impact on California if lawmakers decide to stop this discretionary fund transfer, as it receives roughly a fourth of its transportation funding from the federal government. Thus, a sufficient and permanent financial mechanism is needed to stabilize transportation revenue.

Tribal Government Funding Portion

Federally recognized tribes compete with other tribes for limited financial resources, including the programs listed below that are dedicated to tribal governments: Tribal Transportation Program, Federal Lands Transportation Program, Federal Lands Access Program, Federal Lands Planning Program,³ Tribal High Priority Projects Program,⁴ and Public Transportation on Indian Reservations (see Table 12).⁵

In the last decade, Pacific Region California Tribes have received the majority of their transportation funding from two formula-based programs – the Indian Reservation Roads (IRR) program pursuant to SAFETEA-LU, and the Tribal Transportation Program (TTP) pursuant to MAP-21. Tribes receive MAP-21 funds through TTP, a federal funding pool for tribes similar to the separate MAP-21 funding pool for states. Although California is home to 20 percent of the total number of tribes in the contiguous

TABLE 12. TRIBAL GOVERNMENT FINANCIAL PROGRAMS

PROGRAM	FUNDING SOURCE	DESCRIPTION
Tribal Transportation Program	Highway Account	Provides access to basic community services for tribal communities. This program replaces the Indian Reservation program.
Federal Lands Transportation Program	Highway Account	Provides funding for projects that provide access to or within federal or tribal land.
Federal Lands Access Program	Highway Account	Provides funding to improve access to transportation facilities that are located on or adjacent to, or that provide access to federal or tribal land.
Federal Lands Planning Program	Highway Account	Provides funding for transportation planning activities on federal lands or tribal facilities, similar to the Statewide and Metropolitan transportation planning funding.
Tribal High Priority Projects Program	General Fund	Supplements the Tribal Transportation Program (TTP) by providing funding to tribal communities for high priority projects, or emergency-disaster projects.
Public Transportation Indian Reservations	Mass Transit Account	Provides funding for capital, operating, planning, and administrative expenses for public transit projects for rural tribal communities.

US, in FY 2008, it received just \$5,817,473 – 1.88 percent – of the \$301,828,758 allocated for the IRR Program. Amounts allocated to Pacific Region California tribes have gradually increased since then. In FY 2011, they received \$21,769,438.79 of the total, \$346,697,578 (6.3 percent). In 2012, MAP-21 changed the funding formula for the TTP. For FY 2014, the authorized total share for Pacific Region California tribes is \$23,516,937.65, 6.8 percent of the total. In addition, Congress approved a one-time allocation of 60 percent of FY 2011 allocations as “transitional funding.” This resulted in an additional allocation of \$13,061,663.31 for Pacific Region California tribes.

STATE TRANSPORTATION REVENUES

The State generates transportation revenues by assessing fuel excise and sales taxes, general obligation bonds, and weight fees. Article XIX of the California Constitution stipulates that revenue collected from certain sources be used for specified purposes. For example, revenue collected from transportation sources, such as motor vehicle fuels or vehicle weight fees, can be used only on transportation – highway and roadway needs, public transportation, or paying off transportation debt obligations.

Gasoline Fuel Taxes

A State excise tax on gasoline is the principal source of California’s transportation revenue. It consists of a fixed tax of 18 cents (base excise tax) and a variable-rate tax (price-based excise tax) as established by the Fuel Tax Swap of 2010, for each gallon of gasoline sold. The Fuel Tax Swap was

first enacted in 2010 by AB x8-6 and SB 70. Due to conflicts created by the passage of Propositions 22 and 26 by voters, the Legislature reenacted the Fuel Tax Swap through AB 105 (2011). As a result, the sales tax on gasoline was replaced with the price-based excise tax. The California Board of Equalization (BOE) is required to adjust this rate annually to ensure the amount of tax revenue generated is equal to what would have been generated before the Fuel Tax Swap was enacted. The passage of AB 105 also authorized the redirection of weight fees from the SHA to the General Fund to pay off obligation bond debt service for specified voter-approved transportation bonds. Together, the base and price-based excise taxes generate approximately \$6 billion, which is deposited into the State Highway Account (SHA). Table 13 illustrates the current gasoline tax per gallon.

For fiscal year 2014-15, the 36-cents-per-gallon State excise tax alone will generate a little over \$2 billion.⁶ The first portion of funding is set aside to backfill truck weight fees lost from the Fuel Tax Swap that were reallocated to pay off transportation debt obligations. The remaining funds in the SHA are allocated to the State Transportation Improvement Program (STIP) for construction projects, the State Highway Operations Protection Program (SHOPP) for highway maintenance and operation, and local roadway projects.

TABLE 13. 2014 GASOLINE TAXES PER GALLON

NAME OF TAX	AMOUNT PER GALLON
State Excise Tax (base state excise and price-based excise taxes)	36.00¢
Average state taxes and fees for local purposes (counties/special districts tax, Bradley-Burns local tax, local public safety fund, underground storage fee, etc.)	12.97¢
Total state taxes and fees	48.97¢
Total taxes and fees paid (including Federal 18.4¢)	67.37¢

Source: California Board of Equalization⁷

Diesel Fuel Taxes

The State imposes a fuel excise tax and a sales and use tax on retail sales of diesel fuel that applies to general consumers. Beginning in 2011, the Fuel Tax Swap decreased the State excise tax on diesel from 18 to 10 cents. This tax will increase to 11 cents in FY 14-15. The Fuel Tax Swap subjects the retail sale of diesel fuel to an additional sales and use tax. Therefore, sales of diesel fuel are subject to the statewide rate of 7.5 percent, any applicable district tax rates, plus the additional sales and use tax rate applicable to diesel fuel. The additional sales and use tax rate for diesel changed over several years. The current additional

sales and use tax rate for diesel fuel is fixed at 1.75 percent, effective July 1, 2014. Table 14 illustrates the current diesel tax per gallon.

These taxes will generate approximately \$156 million in 2015 to fund local mass transportation efforts through the State Transit Assistance (STA) program for regional and county purposes. Of the 7.5-percent-per-gallon base sales and use tax for diesel fuel, 4.75 percent is split between state and local governments. Half of this revenue goes to the STA program, while the other half goes to support the State’s intercity rail and other mass transportation efforts.

TABLE 14. 2014 DIESEL TAXES PER GALLON

NAME OF TAX	AMOUNT PER GALLON
State Excise Tax	11.00¢
Statutory increase in sales tax rate	34.06¢
Total State Taxes and Fees	44.16¢
Total Taxes and Fees Paid (including Federal 24.4¢)	68.56¢

Source: California Board of Equalization⁸

Transportation Bonds

Debt financing or borrowing is a method of raising large amounts of startup capital for more expensive infrastructure projects.

The bond issues can be general obligation (backed either by the General Fund or by transportation taxes and fees) or revenue bonds (backed by project- and location-specific potential revenues). The State infre-

quently issues general obligation bonds to finance capital improvement projects for highways, rail, and transit. Proposition 1B – Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006 – was the largest transportation proposition to pass to date, authorizing the State to sell \$20 billion in bonds for transportation projects. Most recently, in 2008, voters passed Proposition 1A – Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century, which provided \$9.95 billion to fund construction of California’s high-speed rail and connecting systems.

Another funding mechanism used by the State is Grant Anticipation Revenue Vehicles (GARVEE) bonds. GARVEE bonds are tax-exempt bonds backed by future federal aid highway funding. The State uses GARVEE bonds to finance the construction of critical transportation infrastructure projects. In accordance with CTC policy, GARVEE bonds have a maximum term of 12 years.

Truck Weight Fees

In addition to the federal heavy-vehicle utility tax (HVUT), commercial trucks pay State weight fees based on declared gross vehicle weight. This fee generates approximately \$900 million per year. The money is used to compensate for the additional pavement distress caused by trucks on the roadway. As mentioned above, the State Legislature redirected this revenue from the State Highway Account to the General Fund to pay the debt-service cost on transportation bonds in 2011.

Vehicle License Fees

The vehicle license fee (VLF) was established in 1935 by the State Legislature in lieu of a property tax on vehicles. The formula for the VLF is based on the purchase price of the vehicle when acquired. The VLF is paid upon initial and annual vehicle registration renewal. Currently, it is calculated at 0.65 percent of the vehicle purchase price the first year, decreasing each year for the first eleven years or until the title of the vehicle is transferred.⁹

Cap and Trade

AB 32 established the goal of reducing GHG emissions to 1990 levels by 2020. To meet this goal, the ARB adopted “cap and trade,” a market mechanism that places a “cap” on emissions for entities responsible for 85 percent of the State’s GHG emissions. As part of the cap-and-trade program, ARB conducts quarterly auctions and sells emission allowances. These auctions will likely generate billions of dollars in State revenue over the coming years. Through SB 862, Greenhouse gas emission reduction, the Governor’s FY 2014-15 budget appropriated \$850 million in auction revenue to various State programs, including programs related to sustainable communities, clean transportation, energy efficiency, natural resources, and waste diversion. The 2014-15 budget allocated \$250 million to the California High-Speed Rail Authority and provided an ongoing commitment of 25 percent of future proceeds. Caltrans received \$25 million to oversee the Low Carbon Transit Operations Program and another \$25 million for Transit and Intercity Rail Capital Program. The

Strategic Growth Council received \$130 million to coordinate the Affordable Housing and Sustainable Communities Program and ARB received \$200 million to oversee the Low-Carbon Transportation Program (see Table 15).¹⁰ On June 15, 2014, the Legislature approved the 2014-15 Budget Bill and related trailer bills that support the budget. SB 862 establishes long-term funding for the cap and trade program. Beginning FY 2015-16, SB 862 dedicates 60 percent of cap-and-trade revenue to all of the mentioned

programs, while the remaining 40 percent of cap-and-trade revenue is not dedicated to any specific purpose. The Legislature will allocate the remaining funds to meet specific objectives in the future. Initially, fuel costs may rise in the short run, but the creation of a carbon market would spur technological innovation and clean energy investments that lead to better efficiency and sustainability in the long run.¹¹

TABLE 15. CAP AND TRADE: SUSTAINABLE COMMUNITIES AND CLEAN TRANSPORTATION PROGRAMS

DEPARTMENT	PROGRAM	FY 14-15 FUNDING AMOUNT (MILLIONS)
High-Speed Rail Authority	High-Speed Rail Project Covers initial construction of Central Valley segment and environmental and design work on the system. This program will receive 25% of future proceeds.	\$250
Caltrans	Low Carbon Transit Operations Program Funds bus and rail service projects that target disadvantage communities, reduce greenhouse gases, and improve mobility. This program will receive 5% of future proceeds.	\$25
Caltrans	Transit and Intercity Rail Capital Program Funds bus and rail capital improvement projects that target disadvantaged communities, expand rail systems, reduce greenhouse gases, improve safety, and enhance connectivity to high-speed rail. This program will receive 10 percent of future proceeds.	\$25
Strategic Growth Council	Affordable Housing and Sustainable Communities Program Funds “sustainable community” initiatives, such as transit-oriented development. This program will receive 20 percent of future proceeds; half must be spent on affordable housing projects.	\$130
Air Resources Board	Clean Transportation Program Funds a range of programmatic activities, such as incentive programs for zero- and low-emissions passenger vehicles, clean buses and trucks, and sustainable freight technology.	\$200



Active Transportation Program

Governor Jerry Brown signed SB 99 on September 26, 2013, allocating \$129.5 million from the federal trust fund and the State Highway Account to create the Active Transportation Program (ATP). This program provides funding for non-motorized transportation, such as walking and bicycling, and includes “safe routes to school,” and pedestrian, bicycle, and trail projects. Disadvantaged communities must receive 25 percent of the program’s funding. The ATP Program also receives federal funds from Safe Routes to School (SRTS), the former Transportation Enhancement Program, and the Bikeway Account. The California Transportation Commission (CTC) is responsible for adopting guidelines and programming Active Transportation Program projects. Caltrans is responsible for recommending projects to CTC and monitoring awarded applicants. The purpose of ATP is to encourage increased use of active modes of transportation with the following specific goals:

- increase the proportion of trips accomplished by biking and walking;
- increase safety and mobility for non-motorized users;
- advance the active transportation efforts of regional agencies to achieve GHG emission reduction goals;
- enhance public health;
- ensure that disadvantaged communities fully share in the benefits of the program; and

- provide a broad spectrum of projects to benefit many types of active transportation users.

LOCAL REVENUES

Local revenue provides funding for highways, streets, roads, bike routes, pedestrian pathways, transit service, and freight services. These local funding sources derive primarily from a sales and use tax on the sale of goods, including gasoline and diesel fuel, voter-approved local sales tax initiatives, transit fares, property taxes, developer fees, and special district taxes, such as an infrastructure financing district (IFD) taxes. IFDs, which require 55 percent voter approval, generate revenue for local infrastructure improvements – including transportation projects – much in the same way a Mello-Roos tax generates funding for public school infrastructure improvements or additional services by increasing the local residential property tax rate. Governor Brown enacted SB 628 on Sept. 29, 2014, directing IFDs to focus on specific infrastructure projects

Transportation Development Act

The Transportation Development Act (TDA) of 1971 allows counties to self-impose a 0.25 percent sales tax for general goods to be used for transportation purposes. The California Board of Equalization collects the revenue and returns the money to each participating county on a pro rata basis.

Self-Help Counties and Local Sales Tax Measures

The State Constitution authorizes counties to impose an additional local sales tax up

to 1 percent if the measure receives super-majority approval (more than 65 percent of votes cast). Counties with such voter-approved local sales tax initiatives are “self-help counties.” Currently, 81 percent of Californians live in self-help counties.¹² Currently, there are 20 voter-approved self-help counties. These counties use transportation sales tax measures to fund highway, freight, transit, bicycle, pedestrian, and other mobility initiatives. Further, six counties have implemented a permanent 0.5 percent sales tax to fund four transit districts in their region. Statewide, self-help counties generate over \$3 billion per year from local sales tax measures. Over the course of the next three decades, self-help counties are expected to spend over \$95 billion on California’s transportation system.

Local General Funds

Cities and counties are required by law to spend a certain amount of their general funds on streets and roads as a precondition to receiving their share of the state fuel tax revenue. Cities and counties receive 36 percent of the fuel excise tax revenues, while the SHA gets 64 percent.

EXPENDITURES

California has steadily increased its spending on transportation over the course of many decades. Federal and State revenues are deposited into the SHA and then allocated for interregional and regional transportation improvement, maintenance and operation, local assistance, and non-capital outlay. The State’s primary infrastructure investment areas are: 1) highways, 2) local

streets and roads, 3) mass transportation, 4) intercity rail and 5) high-speed rail.

Highways

From 2001-2011, the State spent about \$56 billion on highway infrastructure projects that included design, construction, and staff oversight. Spending on highway projects has increased in recent years due to the infusion of Proposition 1B bond funding.

Additional funding includes:

- State Transportation Improvement Program (STIP) – Funds expansion projects that add capacity to the transportation network and consists of two components: Caltrans’ Interregional Transportation Improvement Program (ITIP) and regional transportation planning agencies’ Regional Transportation Improvement Program (RTIP). Approximately 25 percent of overall STIP funding goes toward the ITIP, while 75 percent goes toward the RTIP. ITIP focuses on improving region-to-region transportation, and RTIP focuses on improving transportation within a region.
- State Highway Operation and Protection Plan (SHOPP) – Provides funding for pavement rehabilitation, operation, and safety improvements on state highways and bridges,

Local Streets and Roads

Over the past decade, roughly \$19 billion has been distributed to local entities, and annual State funding for local roads has increased over the years. This includes:

- Local Assistance Program – Caltrans oversees distribution of more than \$1 billion in federal and State funding annually to over 600 cities, counties, and regional agencies. The program provides recipients with the opportunity to improve their transportation infrastructure or provide additional transportation services.

Mass Transportation

Capital expenditures for mass transportation have fluctuated over the past ten years. Expended State funds have varied from \$200 million to \$1.5 billion per year. During this period, funding sources shifted from special funds to bonds. This includes:

- Public Transportation Account (PTA) – Provides funding for local transit, as outlined in the Transportation Development Act. Proposition 22 (2010) requires revenue generated from the State’s 4.75 percent base portion of the sales tax on diesel fuel to be split equally between the State and local transit agencies. The additional 1.75 percent on top of base sales tax is dedicated to the State Transit Assistance fund (STA) for operation and capital purpose.

Intercity Rail

Caltrans manages two intercity routes collectively known as Amtrak California: the Pacific Surfliner and the San Joaquin. The Pacific Surfliner operates between San Luis Obispo and San Diego, and the San Joaquin operates from Oakland to Bakersfield via Sacramento. Bus service is provided to connect these intercity rail lines. In addition, the State financially supports a third rail line,

the Capitol Corridor (managed by the Capitol Corridor Joint Powers Authority). This line operates between San Jose and Auburn. These three services provide access for more than five million passengers annually to more than 130 destinations throughout California and parts of Nevada. From 2005 to 2009, over \$2.8 billion had been either invested or reserved for capital funding for California’s intercity passenger rail service.¹³



Photo: Caltrans

High-Speed Rail

Compared to other transportation expenditures, spending on high-speed rail has been minimal over the years. In the future, however, high-speed rail construction costs alone will represent a significant portion of transportation expenditures. This includes:

- California’s Global Warming Solutions Act of 2006 (AB 32) – Established a market-based compliance mechanism known as the “cap and trade” program. Governor Brown earmarked \$250 million in FY 2014-15 for the California High-Speed Rail Authority through emission permit revenues collected under AB 32, to fund the first phase in the Central

Valley and to complete further environmental and design work of the statewide system. In addition, the State budget will commit 25 percent of future cap-and-trade revenues to complete the system.

FUNDING CHALLENGES

The State's highway system has steadily deteriorated over the past decades and has experienced increasing maintenance costs and congestion. Based on the 2013 Caltrans' State of the Pavement Report, it is estimated that 16 percent of California's highway miles are in poor condition, and that this figure may increase to 34 percent over the next 10 years. Pavement needs are expected to total \$2.8 billion per year over the next decade, but only \$685 million per year in funding will be available.¹⁴ Caltrans spends only 10 percent (approximately \$1.5 billion) of its annual budget on routine infrastructure maintenance. Further, local streets and roads will need \$82 billion over the next 10 years for maintenance purposes alone. Through a combination of deteriorating infrastructure and increasing demand and bond debt, it is uncertain that California will be able to meet its future transportation needs.

DECREASING REVENUE

The decrease in transportation revenue can be attributed to a variety of causes, including not indexing the excise fuel tax to match inflation, and the decline in gasoline and diesel consumption due to the availability of more fuel-efficient and alternative-energy vehicles. Further, the economic recession led to a decrease in sales tax revenue,

which correspondingly decreased transportation revenue. Revenue is expected to further decrease as a result of the Corporate Average Fuel Economy regulation passed in 2012, which requires an increase in car and light-truck fuel economy to 54.5 miles per gallon by 2025.¹⁵ This policy may bring about a rebound effect: The reduction in vehicle operating costs due to increased mileage will boost disposable income, possibly inducing Californians to drive more.

BOND DEBT

As bond funding remains an option, lengthy debt repayments, such as Proposition 1B, will continue to draw from future revenue that could be used to fund the transportation system. The State Legislature has begun to allocate additional resources to pay down California's debt obligations. As mentioned previously, truck weight fees were redirected to pay the debt owed on bonds. The FY 2013-14 Governor's budget decreased Caltrans' bond fund expenditures by approximately \$1.5 billion, or 39 percent from previous years. The State has attempted to avoid borrowing additional money to decrease its overall debt service.

TRIBAL GOVERNMENT FUNDING AND PARTNERSHIPS

In the Tribal Listening Sessions conducted as preparation for creating this plan, tribal government representatives noted that funding is the main transportation difficulty they face. Transportation funding is vital for providing needed community services and sustaining vibrant and diverse tribal economies. Funding for tribal transportation proj-

ects is also necessary for facilities needed by tribal communities in their mostly rural settings.

Planning funds are essential in helping tribes develop their transportation systems. Transportation plans are required for several programs and are the foundation of successful transportation systems. A crucial component of planning, and therefore funding, is data. Many tribal governments lack sufficient data for planning and funding purposes because of high recreational weekend travel, which is not usually counted in traffic studies; lack of funding; and rural locations. As a result, many tribes experience difficulties accessing transportation funding.

Accessing transportation funding is a priority goal of California tribal governments. As stated previously, Native American tribes are sovereign governments. In California, much transportation funding is controlled by local governments or regional agencies. Tribes must therefore compete with cities, counties, and other local agencies for limited funds. This intense competition makes it difficult for tribal governments to access needed funding and provide essential services to their communities. New strategies are required to improve tribal transportation systems.

Innovative funding mechanisms are critical in providing better funding access. Partnerships between tribes, local governments, and regional agencies create new opportunities in transportation and provide mutually beneficial solutions to community problems. Building collaborative and cooperative relationships helps ensure maximum ben-

efits and efficiency for all. In addition, other creative solutions could empower tribal governments to develop their transportation networks. These solutions may include partnerships with multiple tribal governments in tribal transportation funding districts, a separate funding reservation for tribes, and special transportation districts.

STRATEGIES TO REDUCE THE FUNDING GAP

Reliance on unstable revenue sources has created a challenge: how to maintain the current infrastructure and meet future demand. Federal and State initiatives to reduce gasoline and diesel fuel consumption make the creation of stable funding sources even more imperative. In hopes of closing the \$296 billion revenue shortfall over the next decade, alternative funding sources such as pay-as-you-go taxes and fees, new excise taxes, sales taxes, and other user fees must be explored.

PAY-AS-YOU-GO TAXES AND FEES

As automobile manufacturers increase production of more fuel-efficient vehicles and governments encourage sustainable communities, revenue from the excise tax on fuel will shrink. California's Legislature has begun to take the initiative to address this issue through the passage of AB 2032 (2004), which, for a fee, permits single-occupancy vehicles in selected areas to use designated high-occupancy vehicle lanes (carpool lanes) during peak commute periods. The development of new revenue mechanisms will be critical to replace the

outdated fuel excise tax and reduce the revenue shortfall.

Decision makers may consider an excise tax on alternative fuels, carbon, or vehicle miles traveled. As vehicles convert to alternative fuels, such as electricity or biodiesel, a kilowatt or per-gallon biodiesel excise tax should be considered. Decision makers are also exploring the idea of implementing a per-ton carbon tax that would generate around \$3-4 billion a year. Finally, a mileage based pricing strategy could be implemented. Oregon is currently exploring this under their Road Usage Charge program. A similar effort in California has been introduced through SB 1077, which requires the Department of Motor Vehicles to develop and implement a pilot program to assess implementing a vehicle-miles-traveled tax by July 1, 2015.

Endnotes

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ADDITIONAL SALES TAX

Although some Californians view the Fuel Tax Swap of 2010 as an additional tax on gasoline and diesel fuel, the program was intended to be revenue-neutral and provide the State Legislature with more flexibility to allocate transportation revenue.¹⁶ Californians could raise the sales tax across the State or within local jurisdictions for transportation purposes. Local voters could also extend or increase the sales tax measures already in place for local transportation purposes.

8. *ibid*
9. CA DMV. (n.d.) Frequently Asked Questions FAQ. CA DMV. Retrieved from https://www.dmv.ca.gov/portal/dmv/detail/faq/faq_vlf/!ut/p/a1/IZDBasMwEES_pYc-cxa7tKlaOlg1264QeCqqli5EVO1GxZbkIUfr1IX0PoXsYG-Fhm9i1IqEFaFcxVeTNZNSxebpvq9eWQlAVWBT1y5FVZ-vp8P57TYZfAJEqS23vkbIMsYGj1Z31nfdHaDOW-wV_MqTR-j6ZdlpcwHR0rRnCd2RTjMkzxo1YSrvCGZlc5awpG1TECBk-fredbuHjn4Fvj3BqEOn3aX-6xljlb8TYfol6Xr_KihBXzNc8Sx-65F9YfD_Vj8PVPsRvvDEdw48gy6sLvsRyC409_SOtTWg!!/dl5/d5/L2dBISEvZOFBIS9nQSEh/?urile=wcm%3Apath%3A%2Fdmv_content_en%2Fdmv%2Ffaq%2Ffaq_vlf
10. LAO. (2014). Cap-and-Trade Revenue Auction Plan. Retrieved from <http://www.lao.ca.gov/reports/2014/budget/cap-and-trade/auction-revenue-expenditure-022414.pdf>
11. California Air Resource Board. (n.d.). What is Cap-and-Trade? CA ARB. Retrieved from <http://www.arb.ca.gov/cc/capandtrade/capandtrade.htm>
12. Self-Help Counties Coalition. (n.d.) California's Economy Fueled by Local Sales Tax Measures. Self-Help Counties Coalition. Retrieved from http://www.selfhelpcounties.org/Brochure_Self-HelpCounties_011813.pdf

13. Caltrans. (2009). California State Rail Plan: 2007-08 to 2017-18. Caltrans. Retrieved from http://www.dot.ca.gov/hq/rail/documents/SRP07_-_FINAL_Apprvd.pdf

14. Division of Maintenance Pavement Program (2013). 2013 State of the Pavement Report. Caltrans. Retrieved from http://dot.ca.gov/hq/maint/Pavement/Pavement_Program/PDF/2013_SOP_FINAL-Dec_2013-1-24-13.pdf

15. The White House: Office of Press Secretary. (2012). Obama Administration Finalizes Historic 54.5 MPG Fuel Efficiency Standards. The White House. Retrieved from <http://www.whitehouse.gov/the-press-office/2012/08/28/obama-administration-finalizes-historic-545-mpg-fuel-efficiency-standard>

16. BOE: http://www.boe.ca.gov/taxprograms/excise_gas_tax.htm

California’s transportation system must provide equitable and effective mobility and accessibility. To enhance California’s economy and livability, it should be safe, sustainable, integrated and efficient. The CTP 2040 supports this vision with six core goals:

1. Improve multimodal mobility and accessibility for all people
2. Preserve the multimodal transportation system
3. Support a vibrant economy
4. Improve public safety and security
5. Foster livable and healthy communities and promote social equity
6. Practice environmental stewardship

This chapter explains the goals, and presents the policies, implementation strategies, and performance measures designed to ensure their completion, as illustrated in Figure 5. Although the challenges and background of each issue were covered in previous chapters, they have been restated briefly under each goal so that transportation professionals wishing to consult the document in their daily work will find an easily accessible resource. The chapter also addresses equity, the environment, and the economy and demonstrates a commitment to a cooperative, continuing, and comprehensive planning process.

It is anticipated that the strategies outlined here will achieve California’s goals for a more sustainable and equitable transportation system, achieve substantial GHG



FIGURE 5. TRANSFORMING “VISION” INTO “ACTION”

emission reductions, conserve energy, and produce economic, consumer, and health benefits, creating better communities for Californians.

The performance measures outlined for each goal are a set of metrics carefully designed to support the policy framework. These metrics should be used throughout the State by transportation professionals to monitor progress toward desired performance outcomes. A subset of these measures has been forecast to the year 2040; the data comprise the technical output of the plan shown in Chapter 7: Analysis and Outcomes. The forecast represents a reasonable prediction of how each of the CTP 2040 alternatives will perform in creating jobs, supporting system performance, and reducing GHG emissions.

READING THIS CHAPTER

The information in this chapter is structured and labeled in a hierarchical format from broad goals to specific strategies. Each goal is defined and explained in terms of tools that potentially can be used to achieve it. It is followed by a list of succinct policies, strategies, and performance measures that can be read at a glance.

- Goals are labeled “G” and numbered for easy identification (e.g., G1).
- Policies are prefixed by the goal they support (e.g., G1), are labeled “P” for “policy,” and are numbered for easy identification (e.g., G1-P1).
- Strategies are prefixed by the policy they support (e.g., P1), are labeled “S” for “strategy,” and are numbered for easy identification (e.g., G1-P1-S1).
- Performance measures (PM) are listed for each goal. Transportation professionals should use these measures to identify high-performance, cost-effective investments aligned with State and federal goals (e.g., PM1).

G1: IMPROVE MULTIMODAL MOBILITY AND ACCESSIBILITY FOR ALL PEOPLE

What people want most from a transportation system is that it gets them where they need to go – reliably, safely, and at a reasonable cost, without sacrificing the environment, public health, or community character. Mobility and accessibility for the movement of goods and services is vital to the State’s interests. The previous CTP emphasized that building new roads alone cannot provide for anticipated demand. Transportation planning must link with land use planning. Additionally, investments are needed for capacity enhancements, and to manage the system and demand efficiently, provide viable transportation choices, and increase connectivity among all modes. Reduced funding and the need to reduce GHG emis-

sions make the case that adding automobile capacity is not the answer.

CONNECTED CORRIDORS PROGRAM

In collaboration with University of California Berkeley Partners for Advanced Transportation Technology, Caltrans is working to develop the Connected Corridors Program. The program will integrate new transportation management technologies with existing approaches for a coordinated transportation network with diverse traffic management options. A pilot site will assess the technical actions and policy changes needed to improve performance in congested state transportation corridors.

To make the most of the existing system, transportation investments must promote the greatest mobility and efficient use of the

entire system. In rural areas, there must be a balance of viable and realistic transportation options. Improved multimodal mobility and accessibility is best achieved by providing a fluid, well-integrated multimodal option such as transit, and managing the existing system to optimize performance.

TRAFFIC MANAGEMENT SYSTEM

Promoting a sustainable multimodal transportation system requires optimizing the existing system. Increasingly, transportation agencies are finding Traffic Management System (TMS) approaches to be the most effective and economical way to improve system performance. Caltrans defines TMS as “business processes and associated tools, field elements, and communication systems that help maximize the productivity of the transportation system.”

Some of the more widely used TMS tools include coordination of traffic signals along a corridor, changeable message signs that display real-time road and weather information, ramp meters that control the timing of vehicle entry onto highways, and traffic incident management. TMS can also refer to lane management strategies, such as high-occupancy vehicle lanes and toll lanes.

Optimizing multimodal system performance through TMS strategies is not a new concept; however, TMS offers much more potential to serve future mobility needs than has previously been leveraged. By investing in more TMS infrastructure and by better maintaining existing devices, system management can move from reactive to active, and eventually to predictive traffic manage-

ment – relieving congestion before it even occurs.

A critical aspect of traffic management is providing travelers with real-time data about traffic conditions via their mobile phones, allowing them to select the optimal mode of travel on a moment’s notice.

CALIFORNIA’S MILEAGE BASED PRICING STRATEGY

The State is exploring a new funding system, a usage-based charge, to replace the gas tax for highly fuel-efficient vehicles. Governor Jerry Brown signed into law SB 1077, “Vehicles: Road Usage Charge Pilot Program” which will explore the benefits and disadvantages. A first step is to create a Technical Advisory Committee. Its goal is to study gas tax alternatives and offer recommendations on how to design and assess a pilot program. The Transportation Agency mandates that the pilot program be implemented in California by January 1, 2017.

Giving the public accurate, real-time information allows them to become partners in multimodal system management.

Another new technology that supports predictive TMS is the innovative concept of connected vehicles, currently in its testing stage.



Photo: Caltrans

Connected vehicles will be able to communicate with one another as well as with the traffic management system itself to warn drivers and the system of potential hazards in time to avoid them. Another idea currently undergoing exploration is automated vehicle platooning, in which frequently updated sensor-generated information about the locations and motions of the other vehicles allows clusters of vehicles to drive very close together at “cruising” speed without colliding. The concept of Integrated Corridor Management (ICM) is also in development to improve traffic flow from highways to surface streets. Together, these technologies should pave the way for widespread deployment of fully automated vehicles.¹

Another potential opportunity for enhancing system management is the development and implementation of Corridor System Management Plans (CSMP). CSMPs outline the multijurisdictional and multimodal management of congested corridors. A CSMP results in a listing and phasing plan of recommended improvements and strat-

egies such as ramp metering; changeable message signs; transit; rail, port, and airport facilities; and system expansion projects to preserve or improve performance within the corridor.

For more information, visit <http://www.dot.ca.gov/hq/tpp/corridor-mobility/>

TRANSPORTATION DEMAND MANAGEMENT

While TMS methods revolve around the system itself, Transportation Demand Management (TDM) strategies focus on travelers and how they use the system. Through incentives or disincentives of different types of travel, TDM measures often encourage travelers to reduce or eliminate single occupant vehicles trips, particularly during heavy commute periods. TDM strategies urge travelers to consider alternatives such as ridesharing options, using transit, telecommuting, working flexible hours, and biking or walking. Pricing strategies are one of the most effective but controversial demand management methods. When faced with direct trip costs, travelers often consider modes such as transit and other transportation options. For travel demand strategies to be effective, travelers must have viable options for travel other than the single occupant vehicle. Some examples of TDMs include tolling, pricing and parking strategies, and high-occupancy toll (HOT) lanes. Ports have implemented some TDM strategies by charging truckers for peak-time service.]

Optimizing the existing system is critical for achieving transportation system sustainability. This system must also be truly mul-

timodal with well-integrated transportation options. Promoting viable, affordable and easily accessible multimodal options serves to reduce vehicle miles traveled and lower GHG emissions, and to accommodate those who cannot or choose not to drive, thereby establishing a more equitable transportation system for users of all income levels.

TRANSIT AND ACTIVE TRANSPORTATION (BICYCLING AND WALKING)

Establishing a robust and flexible transit system is a critical component of an effective multimodal transportation system. Such a system includes commuter rail, intercity rail, ferry, and various types of bus services. Transit provides innumerable benefits to California – environmentally, economically, and socially. Benefits include GHG emission reductions, congestion relief, access to employment, and a social safety-net for people who cannot or choose not to drive. For many people living in rural areas and predominately isolated Native American tribal lands, transit services (often inefficient) are the only means for accessing health care and other vital resources. Many transportation agencies throughout the State recognize the inherent value in transit and are looking at improving transit.² Transit is often safer than driving and also contributes to VMT reduction.³ California's high-speed rail will be integrated with local and regional rail systems to create a seamless traveling experience.

Innovative forms of transportation will become all the more important in the coming decades as California's demographics and attitudes about driving and vehicle owner-

ship change. Much evidence shows that the millennial generation of younger people born in the 1980s to the early 2000s does not share their parents' and grandparents' passion for driving and car culture.⁴ For many reasons including environmental concerns and financial savings, young people are choosing other transportation modes.

ACTIVE TRANSPORTATION

A statewide effort is underway to identify long-term goals for mode shift to active transportation. The Health in All Policies Task Force will identify and explore existing goals from California's regions to support active transportation.

Bicycling and walking are attractive and flexible transportation options for shorter trips, and often share many of the same automobile facilities. Transportation options work even better when combined with a comprehensive transit system. Proximity to integrated facilities provide people with easy, quick, and inexpensive access to work, school, shopping, health care, social services, and other desirable destinations. There are transportation programs for students such as Safe Routes to Schools (SRTS), which aims to increase the number of children who walk or bicycle to school.

A proven best practice to ensure multimodal accessibility is having Complete Streets, which are roadways designed to enable safe access for all users. A Complete Street is planned, designed, operated, and main-

tained in a way that is appropriate to the function and context of the roadway, whether rural, suburban, or urban. With Complete Streets, bicycling, walking, and transit is integrated with and equal to automobile use and provides commuters with viable travel choices and an opportunity to decrease auto mode share, VMT, and GHG. The result is a more balanced and equitable transportation system among all modes of travel. In order to be truly balanced, considerations must also include freight access.

HIGH-SPEED RAIL INTEGRATION

The “Blended System” concept for HSR provides an overall framework for a statewide passenger rail system that integrates high-speed trains with existing intercity and commuter/regional rail systems. This integration entails coordinated infrastructure, scheduling, ticketing and operations, with the goal of providing a fully integrated trip from origin to destination.

Having easy access to desirable destinations and to needed goods and services is critical to a high quality of life for people of any age and level of ability. While many younger Californians are driving less by choice, by 2040 the number of older and disabled Californians who are physically unable to drive will dramatically increase. Older people and those with disabilities rely on transit, specialized transportation services, and volunteer drivers to remain healthy and socially engaged. The California

Department of Aging suggests a systems approach to mobility called Mobility Management. Mobility Management emphasizes movement of people instead of vehicles. Mobility Management prioritizes the discrete travel needs of each individual consumer throughout an entire trip, not just the portion traveled on one mode or another. The focus is on improvements to the effectiveness, efficiency, and quality of the travel services being delivered and improvements in the availability of information about those services. Instrumental to the success of Mobility Management is a transportation plan that strengthens and enhances the effectiveness of Consolidated Transportation Services Agencies (CTSAs). CTSAs coordinate local and regional transportation services to the disabled, the elderly, youth, and low-income individuals.



Photo: Caltrans

POLICIES (P)

G1-P1 Manage and operate an efficient integrated system.

G1-P2 Invest strategically to optimize system performance.

G1-P3 Provide viable and equitable multi-modal choices, including active transportation.

STRATEGIES (S)

P1-S1 Think in terms of the mobility of people and freight rather than the throughput of vehicles.

P1-S2 Implement transportation demand management: pricing measures, parking policies, traffic calming, complete streets policies, and telecommuting.

P1-S3 Implement programs to reduce vehicle trips while preserving personal mobility, such as employee transit incentives, telecommute programs, carsharing, parking policies, public education programs, and other strategies that enhance and complement land use and transit strategies.

P1-S4 Continue incremental improvements to the State's intercity and commuter passenger rail system, while providing for connectivity to a future high-speed rail network, and local transit and tribal transit networks.

P1-S5 Establish methods for evaluating levels of service for all modes in support of an integrated, multimodal transportation system.

P2-S6 Focus on cost-effective strategies, such as intelligent transportation systems that employ proven methods and technology to improve performance.

P2-S7 Identify multimodal funding that invests in multiple strategies to yield the highest results.

P3-S8 Provide safe, convenient, and continuous pedestrian and bicycle routes that interface with and complement a multimodal

transportation system.

P3-S9 Expand repair and upgrade existing roadways to increase access for walking, bicycling, public transit use, and freight use.

P3-S10 Incorporate safe facilities for pedestrians, bicyclists and transit into roadway capacity and rehabilitation projects.

P3-S11 Using a "Complete Streets" approach, plan transportation projects so as to integrate the needs of those traveling via diverse modes, while also being mindful of freight needs.

PERFORMANCE MEASURES (PM)

PM1* VMT per capita

PM2* Percent of congested freeway/highway VMT - Performance Measurement System (PeMS)

PM3* Mode-share travel to work

PM4* Congested arterial VMT (PeMS)

PM5* Bike and walk miles traveled

PM6* Non-work mode share

PM7* Freeway/highway travel time reliability: FHWA buffer index (PeMS)

PM8* Transit/rail travel time reliability

PM9* Transit accessibility: housing/jobs within 0.5 miles of stop

PM10* Travel time to jobs (mean travel time to work)

PM11* CO2 reduction per capita

PM12[^] Multimodal travel mobility

PM13[^] Multimodal travel reliability

PM14[^] Multimodal service quality

* PMs identified in the Statewide Performance Monitoring Indicators for Transportation Planning Final Report http://www.dot.ca.gov/hq/tpp/offices/ocp/ATLC/documents/august_15_2013/document_links/indicator.pdf

[^] PMs identified in Smart Mobility 2010 A Call to Action for the New Decade <http://www.dot.ca.gov/hq/tpp/offices/ocp/smf.html>

G2: PRESERVE THE MULTIMODAL TRANSPORTATION SYSTEM

California’s multimodal transportation system is in jeopardy. Investments to preserve it have not kept pace with the demands, and the underfunding has led to the decay of one of the State’s greatest assets. Failing to adequately invest in the restoration of California’s roads, highways, bridges, airports, seaports, railways, border crossings, bicycle and pedestrian facilities, and public transit infrastructure will only lead to further decay and a deterioration of service. As the multimodal transportation system grows increasingly unreliable, the state will become less attractive to businesses, residents, and tourists, exacerbating the revenue problems at a time when the State can least afford it.⁵

Maintaining the existing road system is one of the most significant transportation concerns in California. California ranked 48th in the nation in terms of highway conditions, with more than half of our highway lanes either in distressed condition or in need of preventive maintenance.⁶ Roadway main-

tenance also continues to be one of the major issues in rural areas. Approximately 46 percent of the State’s road miles are located in rural areas, and this proportion of road-miles-to-population creates huge economic challenges.

Poor roadway conditions are costly to motorists. Maintaining the highway system has a 10-to-1 return on investment over delayed replacement.⁷ With increasing public scrutiny, government agencies are under great obligation to demonstrate their stewardship of public funds. The California State Transportation Agency (CalSTA) recommends regions and local governments fully implement the “fix-it first” policy to preserve the state highway system. Therefore, the new focus is on system maintenance rather than expansion.⁸ Regional planning agencies are seeing the urgency and are already responding to this request. The Bay Area, for example, plans to spend nearly 90 percent of its available funding to support preservation of existing facilities.⁹

With limited resources, asset management carries rising importance as a strategic approach to managing our transportation infrastructure. The goal with asset management is to maximize the performance of the system with the limited resources available. The US Department of Transportation now requires states to develop a risk-based asset management plan for bridges and pavement on the National Highway System to preserve transportation assets and increase system performance.

Caltrans maintains 50,000 lane miles which carry nearly 35 million vehicles per year.

Life-cycle cost analysis (LCCA) is an analytical technique that identifies the most cost-effective pavement investment for the long term and is the key to maximizing project investments. As annual pavement maintenance needs far outpace dependable funding, Caltrans is turning to high-tech strategies, including recycling and innovative treatments, to make pavement last longer. Cold-in-place recycling allows Caltrans to recycle and reprocess existing pavement without leaving the construction site. This method, coupled with the use of rubberized hot-mix asphalt and warm-mix asphalt, has reduced GHG by more than 61,000 tons. By employing these aggressive, quick, and preventive treatments, we can avoid more costly repairs in the future. Another emerging technology to reduce GHG is “cool pavements.” The term refers to paving materials that reflect more solar energy, enhance water evaporation, or have been otherwise modified to remain cooler than conventional pavements.¹⁰

Caltrans is also turning to advanced technology to keep the system in top condition. Pavement Management System software (PaveM) targets future repairs that do the most good for the least amount of money.¹¹

Preservation of the state’s transit system is more important than ever as baby boomers age, making them one of the fastest growing groups requiring transportation services. Regions are beginning to plan for the projected increase in the senior population with increased funding for transit and paratransit maintenance and preservation. Maintaining infrastructure that encourages non-motor-

ized travel, such as complete streets policies, is another important factor in maintaining mobility for those unable to drive.¹²

Climate change is another serious threat to California’s infrastructure. Extreme weather, including events such as heat waves, droughts, and torrential rains, is predicted for the future, which will add even more stress to pavement and bridge infrastructure.¹³ Sea level rise (SLR) is perhaps the best documented and most accepted impact of climate change, putting all modes of transportation near the coast, Delta, and Bay at risk of flooding and erosion.¹⁴ The level of change remains uncertain but is estimated to rise an average of 6.7 inches by 2030.¹⁵ To improve public access planning efforts, more information is needed about how SLR could affect public access areas and recreation throughout the state. Many currently accessible beach areas have the potential to become inaccessible due to impacts from SLR. Shoreline armoring and emerging headlands could isolate connected beaches with sea-level rise, which will block lateral access.¹⁶

These uncertainties create huge challenges for transportation managers who need to ensure that reliable transportation routes are available.¹⁷ This includes planning for freight infrastructure impacts on harbors and ports, freight highway routes, airports, access roads, freight rail tracks, and bridges.

A sustainable multimodal transportation system is one in good repair. California must meet the challenge of its decaying infrastructure with a large increase in capital investments by all levels of government

and the private sector. Simply put, California needs a dedicated funding source that can keep up with preservation needs.



POLICIES (P)

G2-P1 Apply sustainable (renewable and reusable resources) preventive maintenance and rehabilitation strategies.

G2-P2 Evaluate multimodal life-cycle costs in project decision making.

G2-P3 Adapt the multimodal transportation system to reduce impacts from climate change.

STRATEGIES (S)

P1-S1 Use research, technology, innovative techniques, and new materials to extend the life of the multimodal system and to monitor defects so they can be addressed cost-effectively without risk to public safety.

P1-S2 Develop and implement a risk-based asset management plan, using cost-benefit analysis to prioritize investments.

P1-S3 Acquire sustainable funding for maintenance and preservation (e.g., the SHOPP program).

P2-S4 Implement a strategic approach for assessing and prioritizing transit assets to bring the public transit system into good repair (FTA MAP-21 Transit Asset Management Guide).

P2-S5 Evaluate and enhance life-cycle cost tools to fit preservation needs.

P2-S6 Employ partnership planning with local governments to achieve equitable decision making.

P2-S7 Implement pavement maintenance programs using best practices for all roads.

P2-S8 Preserve and maintain roads and transportation facilities in good repair.

P2-S9 Reduce the number of distressed roads and bridges.

P3-S10 Use available sea-level-rise tools to prioritize and mitigate impacts to the multimodal system.

P3-S11 Incorporate system impacts from climate change, risk, and vulnerability assessments into collaborative and proactive planning, design, construction, operations, and maintenance activities to provide affected agencies and freight partners with the ability to adapt and recover from rising sea levels.

PERFORMANCE MEASURES (PM)

PM1* Percent of distressed lane miles highway

PM2* Percent of distressed lane miles local roads

PM3* Percent of highway bridge lane miles in need of rehab/replacement

PM4* Percent of transit assets that have surpassed FTA useful life period

* PMs identified in the Statewide Performance Monitoring Indicators for Transportation Planning Final Report http://www.dot.ca.gov/hq/tpp/offices/ocp/ATLC/documents/august_15_2013/document_links/indicator.pdf

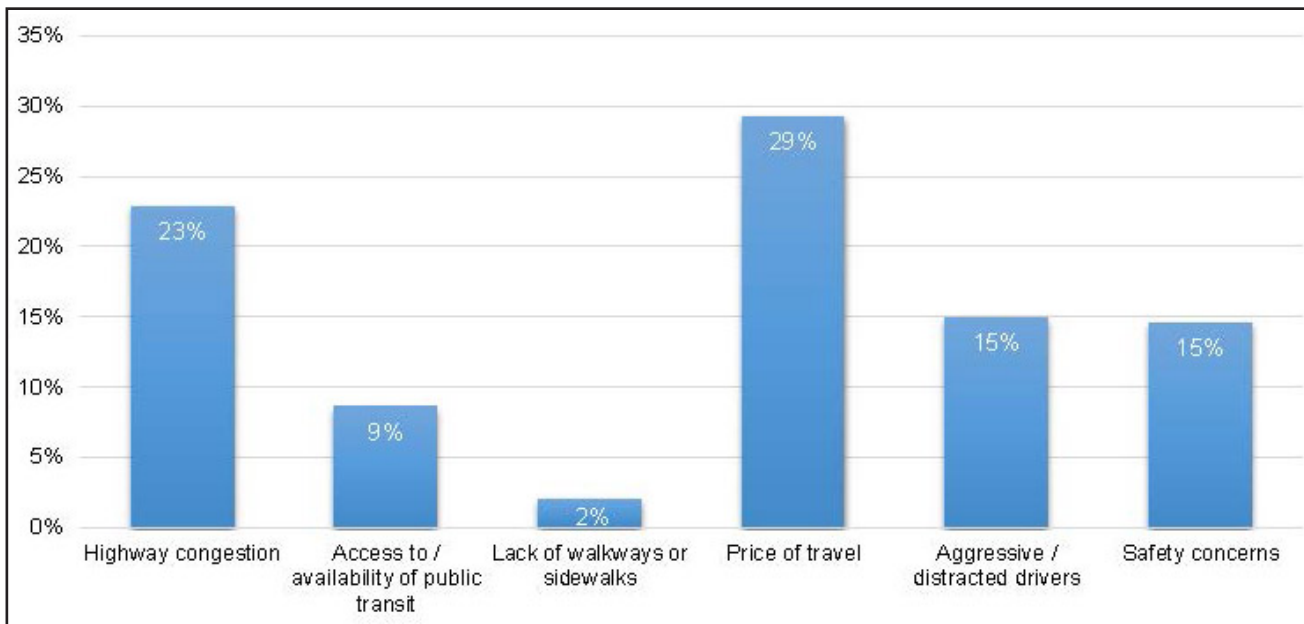
G3: SUPPORT A VIBRANT ECONOMY

Transportation is integral to the economy, providing households with access to jobs, education, training, markets, and leisure activities, and allowing businesses to conduct local, regional, and global transactions. However, transportation inefficiencies, such as service disruptions and congestion, result in economic and social costs that affect the state’s environment and economy.

SUPPORTING HOUSEHOLDS THROUGH TRANSPORTATION CHOICES

With respect to transportation, the chief concerns of California residents are the price of travel and highway congestion (see Figure 6).¹⁸ Across all socioeconomic lines, California households spend roughly 15-19 percent of their income on travel, making it the second or third largest item in their budget.¹⁹ Highway congestion leads to additional vehicle operation costs and productivity losses by restricting access to employment and retail markets.²⁰ A comprehensive multi-modal transportation system provides everyone with efficient and economical travel options, such as walking, biking and transit, potentially reducing travel expenditures. A multimodal system also decreases congestion costs by distributing transportation traffic

FIGURE 6. RELATIVE IMPORTANCE OF TRANSPORTATION ISSUES AMONG THE PUBLIC



Source: Portillo, D. (2013). National Household Travel Survey California Data. Planning Horizons. Caltrans. Retrieved from http://www.dot.ca.gov/hq/tpp/offices/owd/past_files/PlanningHorizonsOFTA_12_11nopic.pptx



across multiple modes. Reducing travel costs yields an increase to discretionary income and allows individuals the option to spend more on goods and services, further promoting a vibrant economy. Moreover, a comprehensive multimodal system increases access to education and employment opportunities, amenities, and health care (discussed in Goal 5), all of which enhance the quality of life, preserving California's image as a "dream" destination for people throughout the nation and around the globe.

SUPPORTING BUSINESSES THROUGH TRANSPORTATION CHOICES

Transportation is a key component in the State's business climate and economic growth. The growth of business clusters – such as Silicon Valley as a center of technology, the Central Valley's agriculture industry, and Southern California's entertainment industry – depend on a comprehensive transportation system to attract a skilled workforce and foster innovation in transportation logistic techniques.²¹ For example, some employers recognize that providing shuttle services can improve the quality of their workforce by expanding their employment reach to neighboring regions. This type of service is attractive to the employer and employee alike because it removes household transportation commute barriers. Moreover, the ability to reach, attract, and retain a skilled workforce helps support innovative business clusters that can spur economic growth.

California is an attractive global gateway for businesses because of its geographic positioning and travel mode options. State, regional, and local economies rely on a well-connected, efficient, reliable, and flexible transportation system to meet consumption, affordability, and productivity demands by consumers and businesses. Goods can be imported and exported internationally through California ports and transferred nationally through rail to freight hubs such as Chicago, St. Louis, and New Orleans.²² Failure to meet increased demand or improve service quality may cause businesses to relocate or establish in neighboring states or countries that can meet their transportation demands.

The integration of non-motorized modes can also induce Californians to support and shop at local businesses. The implementation of complete streets can serve as an attractor for local investment, business opportunities, and consumption,²³ leading to a stronger local economy. When consumers support locally-owned businesses, an increase in area wealth occurs through additional jobs, revenue, and the recirculation of money within the community.

Transportation costs affect prices for goods and services. An efficient and reliable transportation system results in lower consumer prices because businesses are able to increase productivity, while decreasing overhead costs.²⁴ Furthermore, capital is readily available for businesses to invest in other areas because there is no longer a need to keep a surplus of goods in stock with timely delivery.

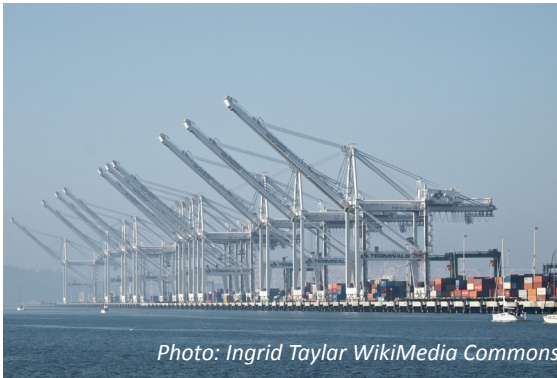


Photo: Ingrid Taylor Wikimedia Commons

CALIFORNIA BENEFITS FROM A MULTIMODAL SYSTEM

An expansive multimodal transportation system can spur job and rural growth, increase income equality, and increase economic resilience. Roughly, 900,000 jobs are directly linked to transportation in California.²⁵ The design and construction of pedestrian pathways, bicycle routes, and rail and transit corridors can lead to job and middle-income wage growth for communities, while infusing money into the economy and enhancing the system. A well-connected transportation system also increases access to rural areas that depend on tourism, helping them to survive and thrive.

Multimodal connectivity is critical in linking local, regional, national, or international areas and reducing the burden on the State Highway System. The explosive increase in e-commerce, with goods delivered directly to consumers in widely dispersed locations, has created an increased demand for freight movement that shows no signs of slowing. In a vigorously competitive global marketplace, not fully funding the transportation system could place the state's economy at risk.

FUNDING AND COLLABORATION NEEDED

Ensuring the long-term sustainability of the transportation system is difficult when funding is unstable and inflexible and collaboration efforts disjointed. Transportation funding is unstable because it is highly dependent on fuel excise taxes, sales taxes, bonds, and local self-help revenues (see Chapter 3). Moreover, statutory designations of some revenue sources further decrease funding flexibility.²⁶

Limited funds and heavy restrictions on their use can result in reactive responses rather than collaborative, proactive planning for the long term.

Creation of stable and flexible revenue mechanisms allows decision makers to address emerging trends and needs that will support the State's economy. Additional transportation revenue that can be discretionarily applied can increase connectivity through innovative developments, such as a catenary system (overhead railway electrification) for moving goods, or expanding active transportation and transit. New, more stable revenue mechanisms can also help California address social and environmental issues, such as ARB's GHG emissions trading program (Cap and Trade).

Before implementing any new revenue mechanism such as a fee, or a tax, as identified in Chapter 3, decision makers must understand its impact on economic, equity and the environment. In addition, the allocations must be guided by the principle of maintaining the existing infrastructure while

providing for the maintenance of any new infrastructure. If stable and flexible revenue mechanisms are achieved, decision makers could conduct long-range planning that fosters economic growth.

Successful long-term planning is achievable only through a collaborative process. Collaboration between public and private stakeholders ensures the built system addresses future needs and functions appropriately. Public-private partnerships can be beneficial when constructing a comprehensive transportation system by decreasing cost for the State and increasing returns for businesses. Failure to collaborate may result in lost economic opportunity.

EFFORTS TO SUPPORT A VIBRANT ECONOMY

Goal 3 supports a vibrant economy by suggesting policies, strategies, and performance measures that enable Caltrans to adapt to emerging trends, while meeting the needs of all Californians. Careful consideration to households and businesses must be given when creating a dependable, reliable, and cost-effective transportation system that is supportive of a vibrant economy for all users.

POLICIES (P)

G3-P1 Support transportation choices to enhance economic activity.

G3-P2 Enhance freight mobility, reliability and global competitiveness.

G3-P3 Seek sustainable and flexible funding to maintain and improve the system.

STRATEGIES (S)

P1-S1 Develop and promote incentive programs designed to encourage efficient travel and utilization of active modes (e.g., complete streets).

P1-S2 Utilize technology to inform travelers of the best available travel options in terms of both time and cost.

P1-S3 Develop and promote efforts to improve reliability and efficiency through optimization of existing street and freeway capacity.

P2-S4 Develop and promote multimodal links between neighborhoods, job centers, and regional institutions centers.

P2-S5 Promote and negotiate cross-jurisdictional coordination to bring about improved efficiencies and connectivity, including at ports of entry, for the movement of people, goods, services and information.

P2-S6 Research, develop, demonstrate, and deploy cost-effective technologies and operational strategies to expedite goods movement, improve safety, and reduce congestion.

P2-S7 Seek creation of national, state, and regional dedicated funding programs for freight transportation.

P3-S8 Research, develop and propose transparent active revenue sources that fully address current and future transportation system management needs.

P3-S9 Utilize reauthorization funding opportunities, such as Moving Ahead for Progress in the 21st Century (MAP-21), while advocating for policies consistent with the economic, environmental and equity values of California.

P3-S10 Promote flexible funding for transportation problems that have significant public benefits, regardless of facility ownership and/or jurisdiction.

PERFORMANCE MEASURES (PM)

PM1* Travel time to jobs (mean travel time to work)

PM2^ Congestion effects on productivity

PM3^ Efficient use of system resources

PM4^ Network performance optimization

PM5^ Return on investment

* PMs identified in the Statewide Performance Monitoring Indicators for Transportation Planning Final Report

^ PMs identified in the Smart Mobility 2010 A Call to Action for the New Decade

G4: IMPROVE PUBLIC SAFETY AND SECURITY

The safety portion of this goal is based on the overarching Caltrans Strategic Highway Safety Plan (SHSP), a comprehensive, data-driven effort to reduce fatalities and serious injuries on all public roads in California. Security refers to the system’s ability to prevent and to have a plan for quick response and recovery from catastrophic natural and manmade events.

The SHSP captures data and identifies trends for the entire State, including serious injuries, fatalities, and fatality rates. This provides an opportunity to collaborate and develop meaningful strategies and performance measures with regional transportation partners, putting an emphasis on safety challenge areas. The SHSP will address strategies for managing and maintaining multimodal facilities, such as public local streets and roads, bus and rail transit, and bicycle and pedestrian travel ways. The CTP 2040 provides this high-level framework and is an opportunity to achieve consistency with State, tribal, regional, and local agency modal and strategic plans. In addition, the CTP 2040 allows for consistency at the federal level with US DOT, FHWA, FTA, and FAA in complying with rules and regulations for MAP-21.

MAP-21 strongly encourages states to develop safety and security strategies that reduce fatalities and serious injuries by improving emergency response and recovery times and increasing preparedness.

Equally important, the State is responsible for updating Transportation Systems Management and Operations (TSMO) strategies to improve the performance of existing transportation facilities for the purpose of relieving vehicular congestion and maximizing the safety and mobility of people and goods. Security integration improvements for new and existing regional, program, and project-level activities include lighting in or adjacent to a public transportation system, such as bus stops, subway stations, parking lots and garages as well as increased cam-

era surveillance and emergency telephones of an area in or adjacent to the multimodal system. MAP-21 requires the State and metropolitan planning organizations (MPOs) to improve safety and security emergency management efforts focusing on securing the State's critical transportation infrastructure, such as California's highways and bridges, major seaports, airports, and transit systems and environmental considerations for safer transportation system best practices.

Caltrans has five statewide modal plans. Each modal plan defines and specifies the safety and security requirements and approaches that provide outreach and education, and performance measures and monitoring for each of these five plans. For example, the 2013 California State Rail Plan addresses developed and implemented safety and security programs, such as Be Track Smart, Positive Train Control, and at-grade crossing warning systems. Caltrans encourages a proactive approach addressing potential risks that concern the safety and security for all modes of travel within and through California.

Personal safety and security for all modes of travel is paramount in creating a safe and secure environment for all citizens, neighborhoods, and communities and ensuring peace of mind. The investment in safety and security improvements is a proactive and a preventative approach in prioritizing and implementing a course of action for the public's welfare. Caltrans, in collaboration with federal, State, tribal, regional, and local agencies, has seen positive results from

the investment in safety improvements to the multimodal system from previous traffic and modal safety efforts, such as collision prevention programs, roadway infrastructure improvements, enforcement, public education, and advances in state-of-the-art safety technology.

POLICIES (P)

G4-P1 Reduce fatalities, serious injuries, and collisions.

G4-P2 Provide for system security, emergency preparedness, response, and recovery.

STRATEGIES (S)

P1-S1 Identify performance measures and targets that guide Caltrans divisions and transportation partner agency stakeholders to the most effective safety strategies and countermeasures.

P1-S2 Improve and update SHSP and develop performance-based measures.

P1-S3 Improve Positive Train Control (PTC) technology on all intercity and commuter passenger rail.

P1-S4 Invest in at-grade railroad crossing safety on over 10,000 at-grade (level) railroad crossings.

P1-S5 Improve outreach and education for Operation Lifesaver to prevent collisions, injuries, and fatalities on and around railroad tracks and highway rail grade crossings.

P1-S6 Improve outreach, early involvement and engagement for tribal, rural and older drivers, and pedestrian safety challenge areas.

P1-S7 Improve outreach and education on bicycle and pedestrian fatalities and serious injuries by providing expertise on bicycle and pedestrian safety practices, mobility aspects, and accessibility focusing on intersection and road and rail crossings.

P2-S8 Improve outreach, education, and implementation of Crime Prevention through Environmental Design (CPTED) approach deters crime and provides security through environmental design in transportation systems.

P2-S9 Improve airport and airline security, including the security of airport connectivity.

P2-S10 Improve outreach and education for local Emergency Operations Plan (EOP) coordination and resiliency best management practices.

P2-S11 Improve outreach and education in the National Response Framework and Incident Command System (ICS) which is the systematic tool for the command, control, and coordination of emergency response.

PERFORMANCE MEASURES (PMS)

PM1* Fatalities/serious injuries per capita

PM2* Fatalities/serious injuries per VMT

PM3^ Multi-modal travel reliability

PM4^ Design and speed suitability

* PMs identified in the Statewide Performance Mon-

itoring Indicators for Transportation Planning Final Report http://www.dot.ca.gov/hq/tpp/offices/ocp/ATLC/documents/august_15_2013/document_links/indicator.pdf

^ PMs identified in Smart Mobility 2010 A Call to Action for the New Decade <http://www.dot.ca.gov/hq/tpp/offices/ocp/smf.html>

G5: FOSTER LIVABLE AND HEALTHY COMMUNITIES AND PROMOTE SOCIAL EQUITY

A healthy and sustainable community promotes equity among people from all walks of life, strengthens the economy, protects the environment, and promotes public health and safety.²⁷ Healthy communities play an integral role in making California a “dream” destination for millions across the country and around the globe. Population growth, demographic changes, the health-related impacts of transportation policy, and costs of auto-focused development challenge efforts to maintain a state-of-the-art transportation system. Solutions must support community aesthetics, the natural and built environment, and sustainable living. In addition, social equity in a safe and healthy community must balance cultural and historic values when addressing transportation planning impacts. Such values include maintaining affordable housing, neighborhood preservation, rural character, agricultural lands, and access to healthy food, the vitality of downtowns and main streets, and protecting natural habitats. In particular, we must preserve culturally sensitive, historic, and Native American tribal lands and resources. Each community is different and may require individual strategies for fostering livability and social equity.

A key strategic tool is Caltrans *Smart Mobility 2010: A Call to Action for the New Decade*, commonly referred to as the Smart Mobility Framework (SMF). SMF core principles include location efficiency, reliable mobility, health and safety, environmental stewardship, social equity, and a robust economy. The SMF integrates transportation and land use by applying principles of location efficiency, complete streets, connected multimodal networks, housing near destinations for all income levels, and protection of parks and open space. This framework is designed to help keep California communities livable and supportive of healthy lifestyles while allowing each to maintain its unique community identity. State and federal laws such as AB 1358 require Caltrans and local agencies to promote and facilitate forms of “active transport,” such as bicycling and walking, and to meet the transportation needs of all users. SMF planning ensures that transit, pedestrian, and bicycle routes are complete, safe, and accessible, promoting livable streets.

SMF calls for participation and partnership by agencies at all levels of government, the private sector, and the community.²⁸ In addition, a “context-sensitive solutions” (CSS) approach that engages the community to determine needs and solutions and ensure community support has been useful in the transportation planning and decision-making process. These approaches are innovative and inclusive; help balance community, aesthetic, historic, and environmental values; promote social equity; and support transportation safety, maintenance, and performance goals. Another tool, ITHiM (Integrated

Transport and Health Impact Model), allows agencies to assess the success of transportation programs by changes in the residents’ physical activity levels and provides information about health benefits and risks and GHG reductions. Together, these innovative tools make it possible for agencies across the State to integrate transportation and land use considerations with multimodal and sustainable transportation strategies.

Smart Mobility FRAMEWORK

Smart Mobility moves people and freight while enhancing California’s economic, environmental, and human resources by emphasizing:

- *Convenient and safe multimodal travel*
- *Speed suitability*
- *Accessibility*
- *Management of the circulation network*
- *Efficient use of land*

URBANFOOTPRINT

UrbanFootprint is a modeling tool that allows for detailed mapping and ‘painting’ of land use and transport futures and can work at regional, sub-regional, and local planning scales. It includes the ability to analyze scenarios based on a full range of fiscal, environmental, and public health metrics.

The model is in use by a broad range of public agencies and organizations such as Sacramento Area Council of Governments (SACOG), San Diego Association of Governments (SANDAG), and the Southern California Association of Governments (SCAG).

The CTP 2040 synchronizes land use and transportation planning to support livable, healthy communities. This includes ensuring consistency with SCS land use decisions and State, regional, and local plans. Healthy community strategies include utilizing location-efficient development, encouraging development that uses less “green” or undeveloped land and more “brownfield” – redeveloped, recycled, or repurposed land. Current and future freight facilities should also have compatible surrounding land uses. Other strategies apply smart growth principles to help ensure access to public transportation and transportation options for accessing jobs and services, and support safe routes to schools.

The CTP 2040 puts forth strategies that assist maintaining and creating healthier communities throughout the State. A key component of healthy communities is incor-

porating the three E’s (Equity, Environment, and Economy). This includes viable integration of transportation modes and land use development, as well as creating destinations closer to together. There needs to be a focus on improving interregional transit service and “first mile – last mile” transit access strategies that provide greater opportunities for transit supportive development at transit stations located along State highways. Historically, many lower income communities have had to bear negative impacts of transportation projects. Thus, it is crucial that an equal distribution of impacts and benefits be considered in communities across the State.

These approaches encourage community involvement to balance regional and local interest. By engaging the public early and throughout land use and transportation planning processes, decisions will be made that better reflect a community’s values and interests. Fortunately, with new technologies, it is easier than ever for the public to get involved in planning their communities. Stakeholders and citizens often test and vote on land use scenarios created by simulated computer modeling. With inclusive engagement, the public can help define and implement their community’s vision and goals that support livable and healthy communities.

The CTP 2040 specifically calls out public participation strategies as a way to ensure a diversity of stakeholders, including those traditionally underserved, are involved early and often in the transportation planning discussions. This supports the goal of fostering livable and healthy communities.

POLICIES (P)

G5-P1 Expand collaboration and community engagement in multimodal transportation planning and decision making.

G5-P2 Integrate multimodal transportation and land use development.

G5-P3 Integrate health and social equity in transportation planning and decision making.

STRATEGIES (S)

P1-S1 Involve businesses, communities, community-based organizations, goods movement stakeholders, environmental justice communities, Native American tribal governments, and institutions early in the transportation planning and decision-making process.

P1-S2 Design and implement public participation strategies to include those traditionally underrepresented and underserved, including low income, the aging and the disabled, in the public planning and decision-making process.

P1-S3 Develop partnerships with schools to support increased use of public and transit options, walking, and bicycling among students and teachers (Safe Routes to School).

P1-S4 Incorporate community values and support context sensitive solutions for multimodal transportation facilities and creating sustainable infrastructure.

P2-S5 Encourage increased densities and mix of land uses, and other “smart growth”

principles to support transit service, walking, and bicycling.



P2-S6 Where appropriate, promote housing and land use development in coordination with multimodal transportation options; includes implementing the Smart Mobility Framework principles at regional and local levels (including rural, suburban and urbanized settings).

P2-S7 Provide incentives for the most efficient use of land while being sensitive to regional, rural, and other community differences.

P2-S8 Promote incentives that reward employers that locate near transit or housing; and developers that build housing near employment centers.

P2-S9 Target funding toward existing communities – through strategies like transit-oriented, mixed-use development and land recycling – to increase community revitalization and the efficiency of public works investments and safeguard rural landscapes.

P3-S10 Develop models that integrate land use, transportation, health, and environmental issues.

P3-S11 Identify sustainability and equity indicators (such as access to public transit, safe transportation, recreation, healthy food, economic opportunities, and medical services) to enhance current transportation system performance measures.

P3-S12 Partner with stakeholders to educate the public about the health-related impacts of mobility and land-use decisions, including near-roadway health, quality of life, and physical activity impacts, and the impacts of their travel choices.

PERFORMANCE MEASURES (PM)

- PM1* Bike and walk miles traveled
- PM2* Fatalities/serious injuries per capita
- PM3* Transit accessibility: housing/jobs within 0.5 miles of stop
- PM4* Residential and employment densities (new growth) by Environmental Justice (EJ) and non-EJ areas
- PM5* Housing/transportation affordability index
- PM6* Acres of agricultural land changed to urban use
- PM7* CO2 reduction per capita
- PM8^ Support for sustainable growth
- PM9^ Equitable distribution of impacts
- PM10^ Equitable distribution of access and

mobility

* PMs identified in the Statewide Performance Monitoring Indicators for Transportation Planning Final Report. See http://www.dot.ca.gov/hq/tpp/offices/ocp/ATLC/documents/august_15_2013/document_links/indicator.pdf

^ PMs identified in Smart Mobility 2010 A Call to Action for the New Decade. See <http://www.dot.ca.gov/hq/tpp/offices/ocp/smf.html>

G6: PRACTICE ENVIRONMENTAL STEWARDSHIP

The built environment of transportation infrastructure and facilities is often perceived to be in conflict with the natural environment due to such things as heat island effects, flooding, and runoff. The CTP 2040 is anchored with the 3 E's of sustainable planning, including "environment." Planning for environmental sustainability includes strategies for new fuel technologies, alternative transportation modes to single-occupancy vehicles, cleaner freight vehicles, as well as conservation of natural resources.



Photo: Caltrans

ARB VISION TOOL

Vision for Clean Air: A Framework for Air Quality and Climate Planning takes a coordinated look at strategies to meet California’s multiple air quality and climate goals well into the future. A quantitative demonstration of the needed technology and energy transformation provides a foundation for future integrated air quality and climate program development.

The purpose of this goal is to present strategies that preserve the State’s valuable natural, cultural, and agricultural resources, while avoiding costly project overruns and delays in planning and developing transportation infrastructure. Sustainability involves planning for balanced and long-term stewardship of economic and environmental resources, now and for the future.

NATURAL AND CULTURAL RESOURCES

The CTP 2040 strategies ensure consideration for natural and historic resources during the project development phases. This includes Native American and other cultural resources. The CTP 2040 encourages those working in the transportation sector to address issues collaboratively with partners in the resources arena and to partner on solutions. The challenge ahead is balancing transportation and land use needs with GHG emissions reduction mandates while considering environmental resources. As Figure 7 indicates, environmental considerations should be included in all phases of a project.

MITIGATION AND ADAPTATION

Early consultation and evaluation of environmental resource data ensures that transportation plans are integrated with other regional planning efforts, such as habitat conservation plans, integrated regional water management plans, housing elements and local general plans, local coastal programs and state forestry plans. This proactive consultation helps to identify environmental impacts of planned infrastructure projects and early opportunities to avoid natural resource impacts, and guide mitigation and planning decision making. Regional Advance Mitigation Planning (RAMP) and Statewide Advance Mitigation Initiative (SAMI) are two examples of proactive regional or large-scale advance mitigation planning. In addition, shifts to active transportation contribute to both mitigation and adaptation.

The RAMP and SAMI programs plan ahead for anticipated mitigation requirements before projects are in the final stages of environmental review, when the need to identify specific mitigation measures can delay project approvals. Working together, natural resource and infrastructure agencies can identify appropriate mitigation early in project timelines, avoiding permitting and regulatory delays. This allows public mitigation dollars to stretch further by securing and conserving valuable natural resources on a more economically and ecologically efficient scale and before related real estate values escalate.

FIGURE 7. DEVELOPMENT OF A PROJECT²⁹



A more integrated, proactive and consistent approach guided by landscape and watershed-level resource planning is needed. Most states, including California, have a State Wildlife Action Plan (SWAP) that can be used as a guide along with other federally developed or certified plans such as forest, coastal zone management, watershed management, and habitat conservation, which supports wildlife corridors and mitigation strategies. The California Department of Fish and Wildlife is presently updating the 2015 SWAP that creates an ecological-

ly-based framework for decision making.

GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

Depletion of fossil fuels is a greater conservation and stewardship discussion beyond just California's transportation planning. GHG emissions produced from fossil fuel use have a direct link to the environment through global warming and climate change. More than 30 million Californians living in coastal communities are vulnerable to accelerated sea level rise and shoreline erosion--

threats to major transportation corridors and ports as well as other critical infrastructure along the coast. California is also vulnerable to rising temperatures, changing precipitation patterns, and increased storm surge and intensity.

Transportation use is the largest source of carbon dioxide (CO₂) from the combustion of fossil fuels, accounting for almost 40 percent of GHG emissions in California. Presently, the California Natural Resource Agency is preparing *Safeguarding California: Reducing Climate Risk* which provides policy guidance for state decision makers, and is part of continuing efforts to reduce impacts and prepare for climate risks. Agencies including Caltrans are preparing sea-level rise vulnerability studies.

ZERO-EMISSION VEHICLE (ZEV)

By 2025:

- *Over 1.5 million ZEVs will be on California roads and their market share will be expanding;*
- *Californians will have easy access to zero-emission vehicle infrastructure*
- *ZEVs include battery-electric vehicles, plug-in hybrid-electric vehicles, and hydrogen fuel-cell-electric vehicles. These technologies can be used in passenger cars, trucks and transit buses.*

In addition to the depletion of fossil fuels, transportation fuel use also has a direct impact on air quality, and in turn, overall community health. Transportation and “traditional” air quality planning must be fully integrated, including an understanding of the interrelationship between congestion, travel growth, and transportation-related emissions. The CTP 2040 encourages such integrated planning with partner agencies such as ARB. In June 2014, ARB adopted the first update to the climate change scoping plan. This describes the approach California will take to reduce GHG to achieve the goal of reducing emissions to 1990 levels by 2020. While air pollutant exhaust is decreasing due to improved vehicle emission controls and fuel requirements, an increase of vehicle miles traveled and congestion limit the effectiveness of emission control programs and generate increases in other emissions that are very difficult to control.

The Office of Planning and Research is currently developing new CEQA guidelines in response to SB 743 (Steinberg). SB 743 establishes criteria for determining the significance of transportation impacts of projects within transit priority areas that promote the “...reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses.”

A challenge ahead at the State and the regional planning level is consultation and comparison of plans, maps, and data with natural resources and the resulting mitigation and consultation that may be required. The key will be determining how to mainstream the consideration of environmental

issues during the early planning process in order to adequately address environmental concerns.

The CTP 2040 strategies respond to public opinion and State policy regarding lowering fuel consumption, institutionalizing energy efficiency measures into planning, project development, operations, and maintenance of State transportation facilities, fleets, buildings, and equipment. These strategies require an adequate level of funding beyond current programming, as well as a concerted effort and collaboration on the part of the State, regional, and local agencies.

POLICIES (P)

G6-P1 Integrate environmental considerations in all stages of planning and implementation.

G6-P2 Conserve and enhance natural, agricultural, and cultural resources.

G6-P3 Reduce greenhouse gas emissions and other air pollutants.

G6-P4 Transform to a clean and energy efficient transportation system.

STRATEGIES (S)

P1-S1 Identify and promote opportunities to retrofit or adapt facility designs to further enhance, minimize, and reduce the impact to the environment, such as the effects of climate change on facilities and natural ecosystems, including fragmentation for wildlife habitats and reduce impacts on water quality.

P1-S2 Link transportation planning decisions with resources and environmental planning to enhance and preserve the environment.

P1-S3 Incorporate mitigation and adaptation measures into transportation plans and projects early in the process.

P2-S4 Build partnerships and develop strategies for meeting state conservation goals to protect ecosystems, preserve large contiguous and viable tracts of habitat to offset adverse impacts, and determine the most valuable land for preserving and other strategies.

P2-S5 Encourage and facilitate partnerships that integrate conservation and infrastructure planning at regional scales (such as, watershed planning, and Natural Community Conservation Plans). Support projects such as the Essential Habitat Connectivity Project that guide future regional connectivity analysis, planning and implementation and continue to support advanced conservation planning and flexible funding to streamline these activities.

P2-S6 Pool mitigation funding for multiple projects to encourage integrated, large-scale mitigation and support new policies and legislation that promote earlier mitigation.

P2-S7 Establish a multi-agency consultation process for statewide and regional transportation plan development that minimizes impacts to natural resources and ecological systems (as required by MAP-21). This includes conducting early, frequent and ongoing consultations with state, federal, tribal

and other resource entities responsible for natural resources, environmental protection, conservation, and historic and cultural preservation.

P2-S8 Provide guidance to enhance environmental stewardship and sustainability at the regional and local levels.

P3-S9 Support efforts to reduce GHGs, such as California cap-and-trade program, high-speed rail, and zero and low emission vehicles.

P3-S10 Improve links between land use planning and climate adaptation planning by using the tools such as the previous California Regional Blueprint Program and SCSs to better integrate adaptation strategies into regional plans.

Endnotes

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P4-S11 Ensure transportation systems, including multimodal options, are more efficient through smart land use, operational improvements, and Intelligent Transportation Systems.

P4-S12 Provide early funding for ZEV charging and infrastructure.

PERFORMANCE MEASURES (PM)

PM1* Acres of agricultural land changed to urban use

PM2* CO2 reduction per capita

* PMs identified in the Statewide Performance Monitoring Indicators for Transportation Planning Final Report (http://www.dot.ca.gov/hq/tpp/offices/ocp/ATLC/documents/august_15_2013/document_links/indicator.pdf)

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CHAPTER 7

ANALYSIS AND OUTCOMES

The CTP 2040 differs from predecessor plans by including analyses of transportation improvement strategies, fuels, and vehicle technologies that provide for the maximum feasible reductions in greenhouse gas (GHG) emissions, as required under SB 391. SB 391 requires Caltrans to analyze how to attain a statewide reduction of greenhouse gas emissions to 1990 levels by 2020, and 80 percent below 1990 levels by 2050. Additionally, CTP 2040 evaluates the economic benefits of the Plan's transportation, fuel, and vehicle technology strategies.

The CTP 2040 analytics were conducted using software tools such as the new California Statewide Travel Demand Model (CSTDm), ARB's Vision Model, and TREDIS (Transportation Economic Development Impact System). Additionally, prior research on the effects of transportation strategies was also consulted.

This chapter presents a summary of the analysis and outcomes. There is an appendix that follows (The Chapter 7 Analysis and Outcomes Technical Report) which shows more details about the findings and analysis.

CTP 2040 ALTERNATIVES

To model and analyze the potential effectiveness of various packages of VMT and GHG emission reduction strategies, projects, and vehicle technologies, Caltrans developed three alternatives. The CTP 2040 forecasts future travel behavior and strategies to identify how California will meet SB 391 goals.

CTP 2040 FUTURE LAND USE ASSUMPTIONS

SB 391 is linked to MPO-level land use forecasting (through SB 375) by requiring Caltrans to assess how implementation of SCS will ultimately contribute to statewide GHG reductions. SCSs developed by California's MPOs have included significant changes to future land use assumptions and regional growth patterns compared with prior regional plans, including greater linkages between land use development and transportation planning to reduce dependence on auto travel and to reduce GHG emissions.

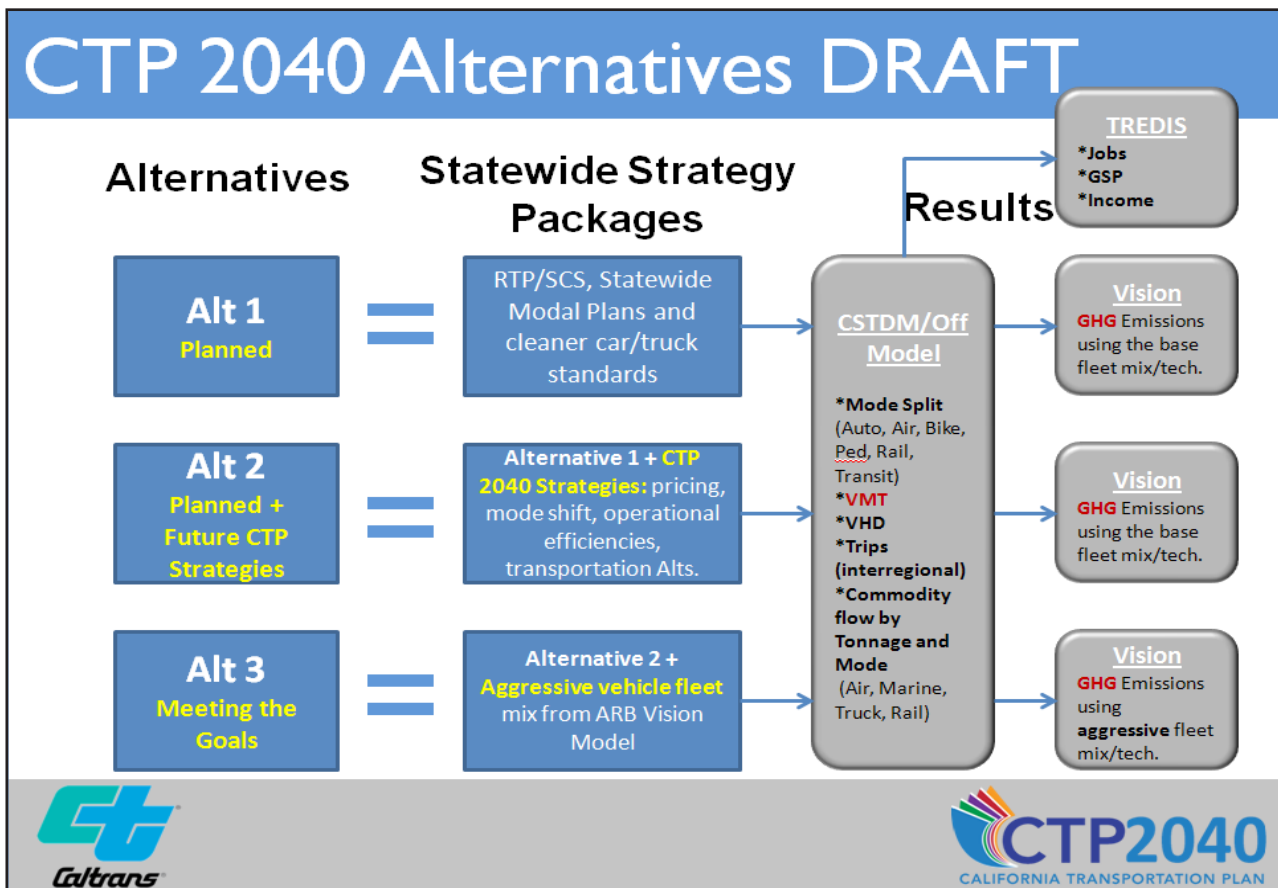
For the purposes of SB 391, Caltrans chose to use the SCS land use assumptions directly in the California CSTDm. Alternative land use strategies have not been assessed for the CTP 2040, given that land use planning is solely under the purview of local and regional agencies. However, recent research has shown that transportation-efficient land uses can reduce auto dependencies and also improves public health through more use of active transportation. Caltrans recognizes that growth in more transportation efficient land uses can provide even greater reductions in GHG emissions beyond those modeled in the CTP 2040.

Alternative 1 starts with SCSs from around the state, and the State modal plans. Alternative 2 applies statewide transportation strategies designed to reduce GHG emissions to the SCS's and State modal plans. Alternative 3 adds in future vehicle and fuel technologies to the statewide transportation strategies. These alternatives are designed to show the GHG reductions that may be achieved by different mixes of transportation strategies and technology. Each alternative will be evaluated for performance in a base year of 2010, 2020, 2040, and 2050. Figure

8 shows the alternatives, and how they feed into the models.

1. Alternative 1 - Planned (Current MPO SCSs and State Modal Plans)
2. Alternative 2 - Planned + Proposed Strategies (Current MPO SCSs and State Modal Plans plus Transportation Strategies)
3. Alternative 3 - Planned + Proposed Strategies + Future Vehicle and Fuel Technology (Meeting the Goals Through Vehicle and Fuel Technologies).

FIGURE 8. DRAFT CTP 2040 ALTERNATIVES MODELING (CALTRANS)



KEY COMPONENTS OF THE CTP 2040 ALTERNATIVES

ALTERNATIVE 1: CURRENT MPO AND STATE MODAL PLANS

- MPO Sustainable Communities Strategies land use and transportation plans, effective Spring 2013. Caltrans' Modal Plans, including:
 - The California Aviation System Plan (CASP),
 - California Freight Mobility Plan (CFMP),
 - Interregional Transportation Strategic Plan (ITSP),
 - California State Rail Plan (CSRP), and
 - Statewide Transit
- The current mix of fuel efficiency and vehicle technology were determined by the ARB Advanced Clean Cars and In-Use Standards.

ALTERNATIVE 2: CURRENT PLANS + PROPOSED STRATEGIES

- MPO Sustainable Communities Strategies (same as Alternative 1)
- Caltrans' Modal Plans (same as Alternative 1)
- Fuel and vehicle technologies (same as Alternative 1)
- CTP 2040 package of GHG reduction

transportation strategies

ALTERNATIVE 3: MEETING THE GOALS

- MPO Sustainable Communities Strategies (same as Alternative 1 and 2)
- Caltrans' Modal Plans (same as Alternatives 1 and 2)
- CTP 2040 package of GHG reduction strategies (same as Alternative 2)
- A fleet mix of additional future fuel efficiencies and vehicle technologies, as assessed by ARBs Vision for Clean Air model, designed to meet the GHG emission reduction goals for 2020 and 2050

THE TOOLS

To address the new technical elements identified by SB 391, the CTP 2040 needed performance and analysis tools to estimate current and projected future impacts of transportation-related strategies on statewide GHG emissions, system performance, and economic activity. The tools used for the analysis include:

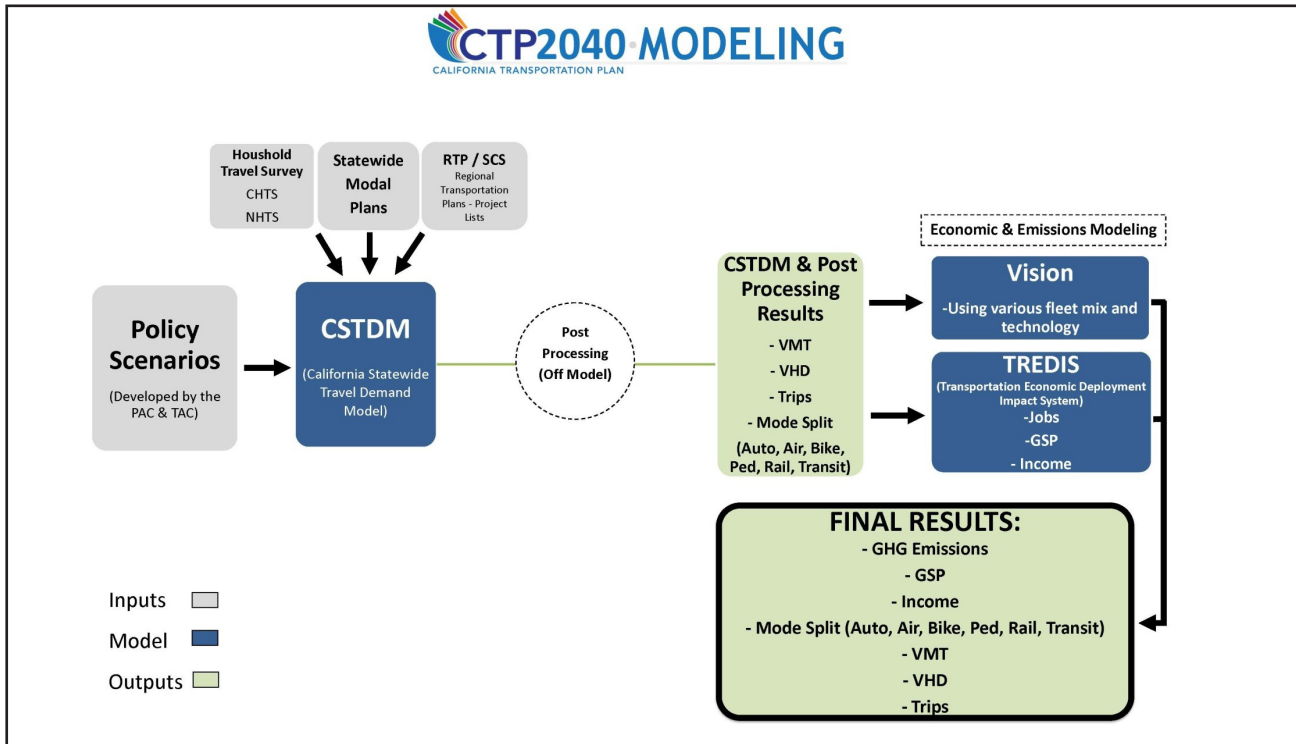
- California Statewide Travel Demand Model (CSTDM),
- California Statewide Freight Forecasting Model (CSFFM),
- ARB's EMISSION FACtors model (EM-FAC) and Vision for Clean Air (VISION), and
- Transportation Economic Demand Impact System (TREDIS) Model.

Induced and latent demands are two important and controversial topics for both environmentalists and transportation practitioners. Induced or latent demand is widely used to describe the observed increase in traffic volume that occurs soon after a new highway is opened or a previously congested highway is widened.¹ Additional information on how the CSTDM accounts for induced and latent demand can be found in the Chapter 7 Tech-

nical Report in Appendix B.

The following is a brief description of the tools, their individual functions, and how they contribute to the overall analysis. Figure 9 is a graphical representation of the modeling process information flows and interactions.

FIGURE 9. CTP 2040 MODELING PROCESS (CALTRANS)



CALIFORNIA STATEWIDE TRAVEL DEMAND MODEL²

The CSTDM is a multimodal, tour-based, travel demand model covering the entire state that represents both personal and commercial travel. It incorporates statewide networks for roads, rail, bus, and air travel.

It uses the 2011 California Household Travel Survey and the 2010 United States Census and incorporates regional estimates of zonal land use, employment, and population for model calibration and base-year assignment. The CSTDM outputs (vehicle miles traveled, vehicle hours of delay, trips, etc.) are used in the subsequent emissions and

economic benefit analyses. The CSTDM addresses the vehicle activity aspect for the CTP 2040.

EMISSIONS FACTOR³

The Emissions Factor (EMFAC) model is used to assess emissions from on-road passenger vehicles. The latest version of the model, EMFAC2011, was released in September 2011. The EMFAC2011 release is needed to support the ARB regulatory and air quality planning efforts and to meet the FHWA transportation planning requirements. EMFAC2011 includes the latest data on California's car and truck fleets and travel activity. The model also reflects the emission benefits of ARB's recent rulemakings, including on-road diesel fleet rules, Pavley Clean Car Standards, and the Low-Carbon Fuel Standard.⁴ CSTDM outputs are then input to EMFAC2011 to calculate future transportation-related emissions for California. The EMFAC model addresses the emissions quantification of the vehicle activity from the CSTDM, as required by SB 391.

AIR RESOURCES BOARD VISION⁵

The ARB VISION model is used for air quality and climate emissions planning. The model evaluates strategies to meet California's multiple air quality and climate change goals well into the future (to the year 2050). The model's exploration of the technology and energy transformation needed to meet goals provides a foundation for future integrated air quality and climate change program development. It addresses future changes in vehicle technology, vehicle efficiency, alternative fuels, and activity

changes, and evaluates their impacts on emissions above and beyond on-road diesel fleet rules, Advanced Clean Car Standards, and the Low-Carbon Fuel Standard required by SB 391.

TRANSPORTATION ECONOMIC DEVELOPMENT IMPACT SYSTEM

TREDIS was developed by Economic Development Research Group, Inc. TREDIS is an integrated economic analysis system for transportation planning and project assessment and is designed to analyze the macro-economic impacts of long-range plans such as the CTP 2040. TREDIS assesses costs, benefits, and economic impacts across a range of economic responses and societal perspectives of passenger and freight travel across all modes. TREDIS will assess the economic impacts from the CSTDM as it relates to passenger and freight travel information. TREDIS addresses the economic forecasts from the vehicle activity of the CSTDM required by SB 391 for the CTP 2040.

VMT/GHG REDUCTION STRATEGIES USED IN THE ALTERNATIVES

Regionally significant GHG reduction strategies pertaining to transportation are already being identified by the MPO RTPs/SCSs as required by SB 375. The CTP 2040, with guidance from the PAC and TAC, takes the regional analysis further with 15 statewide transportation strategies included in Alternatives 2 and 3 designed to provide maximum reductions in vehicle miles traveled (VMT), thus reducing green house gas (GHG) emissions. The transportation strategies were divided into four categories:

- Pricing;
- Transportation Alternatives;
- Mode Shift; and
- Operational Efficiency.

Table 17 shows the 15 transportation VMT reduction strategies and their categories. The CTP 2040 PAC and TAC were consulted and helped to guide the selection of specific strategies contained in Alternatives 2 and 3. During PAC and TAC involvement, additional input was gathered from all of the State's 44 MPOs and RTPAs. This was necessary to identify any gaps and overlap in regional transportation strategies. Based on this input, 15 transportation VMT reduction strategies were developed.

The transportation strategies comprise a range of options. A key element of the analysis was to convert the impact of each strategy into equivalent changes in VMT. Most of the strategies can be readily described

in terms of VMT change; however, some measures had to be converted into equivalent VMT savings. Please see the Chapter 7 Technical Report for a more in-depth review of each transportation strategy.

Transportation strategy analyses were conducted using the CSTDM, or off-model from research gleaned from ARB Policy Briefs or MPO SCSs. One important consideration is whether the individual transportation strategies represented a policy or an objective. Policies were specific proposals that could be evaluated for potential effectiveness. For example, road pricing, i.e., a policy to increase the cost of driving, was evaluated using the CSTDM and produced a substantial decrease in statewide VMT. On the other hand, the transportation strategy to double the mode share of bicycling is an objective – and not based on a specific policy (or policies). Specific policies may ultimately be developed to achieve the objective of increasing bicycling usage.

The range of transportation strategies were narrowed to those presented in this chapter. Road capacity enhancing strategies were rejected due to concerns these would ultimately increase VMT. In addition, transportation strategies were intended to be assessed on a statewide basis – and not just in specific regions.

TABLE 17. DRAFT CTP 2040 TRANSPORTATION VMT REDUCTION STRATEGIES MATRIX

Category / Strategy	Assumption	Evaluation Method: Source	Policy or Objective	VMT Reduction (estimated)
Pricing				
Road Pricing Strategy	75% increase in auto operating cost	CSTDM	Policy	-17%
Transportation Alternatives				
Telecommute/ Work at Home	2.1% increase in work at home rate	Off-Model: SACOG	Objective	-0.39%
Increased carpoolers	5% increase in carpool vehicles	Off-Model: Calculated using CSTDM data	Objective	-2.9%
Increased Car Sharing	Net 5% increase in adoption rates -- short distance travel	Off-Model: MTC, CARB Draft Policy Brief	Objective	-1.1%
Mode Shift				
Transit Service Improvements	All transit services doubled; transit speeds doubled, free transfers, reduced transfer wait times	CSTDM	Policy	-6% (includes Transit Service Improvements and HSR fare reductions)
High Speed Rail	HSR fares reduced by 50%	CSTDM	Policy	Included as part of transit service improvements
Bus Rapid Transit	Ridership change from converting Local Bus Routes to BRT	Off Model: TCRP 118, CSTDM Data	Policy	-0.07%
Expand Bike	Doubled bicycle shares	Off Model: CSTDM Data	Objective	-0.41%
Expand Pedestrian	Double walk shares	Off Model: CSTDM Data	Objective	-0.43%
Carpool Lane Occupancy Requirements	Increase minimum 2+ occupancy to 3+	CSTDM	Policy	-0.80%
Increased HOV Lanes	Added HOV lanes, Interregional connectors; Fill missing gaps (mixed flow lanes converted to HOV)	CSTDM	Policy	TBD
Operational Efficiency				
Incident/Emergency Management	Implementation of Caltrans System Management and Operations Plan	Off Model: Caltrans	Policy	-1.0% equivalent VMT savings
Caltrans' (TMS) Master Plan	Implementation of TMS Master Plan	Off Model: Caltrans	Policy	-1.2% equivalent VMT savings
ITS/TSM	Implementation of ITS/ TSM strategies	Off Model: SACOG	Policy	-0.62%
Eco-driving	Reduced fuel consumption through changes in driving habits	Off Model: ARB Policy Brief	Objective	-0.23% equivalent VMT savings

Category 1: Pricing Strategies

ROAD PRICING STRATEGY

Industry analysts have predicted that road pricing will be among the most effective strategies in reducing VMT and GHG emissions. A forecast based on the CSTDM seemed to confirm this assumption, where the 73 percent increase on the cost of driving translated into a 17 percent reduction in VMT. The Chapter 7 Technical Report outlines the VMT reductions associated with different levels of increased road pricing strategies.

Category 2: Transportation Alternatives

TELECOMMUTING STRATEGY

Telecommuting is the practice of working from home by employees who would otherwise travel to a workplace. Telecommuting usually requires the ability to communicate with coworkers electronically, by telephone, email, text message and/or videoconference. Alternatively, telecommuters may work from a “telecommuting center,” also called a “telecenter,” that provides desk space, Internet access, and other basic support services but is located closer to home than the established workplace.⁶ The CTP 2040 assumes a statewide implementation of the telecommuting strategy.

The impact of increased telecommuting as an alternative to commuting was analyzed by SACOG as part of their Metropolitan Transportation Plan (MTP).⁷ SACOG forecasted a 0.39 percent VMT reduction as a result of more people working from home. The CTP 2040 used this assumption.

CARPOOLING STRATEGY

The CTP 2040 assumes a 5 percent increase in the rate of carpooling statewide. Using data from the CSTDM, this carpooling strategy was estimated to reduce VMT by 2.9 percent statewide. The full set of assumptions used to calculate VMT reduction for increased carpooling is presented in the Chapter 7 Technical Report.

CARSHARING STRATEGY

Carsharing allows people to rent cars for a period of time extending from as little as 30 minutes, up to a full week. Carsharing services have been available in urbanized areas for over a decade, and in that time the number of subscribers and available vehicles has grown.⁸ The CTP 2040 assumes an aggressive implementation to increase the use of carsharing.

At the individual household level, carsharing could increase or decrease VMT. Carsharing may increase VMT for households that do not own automobiles, but other households with cars may choose to forego auto ownership (or own fewer vehicles) in favor of carsharing. An ARB Policy Brief examined two studies that found, “[R]eductions in VMT among vehicle-owners (or previous owners) who joined carsharing outweighed increases in VMT among non-owners who had joined at the time of the study. As a result, carsharing appears to have reduced VMT overall by about a quarter to a third among those who have participated.”⁹

MTC analyzed carsharing as part of their 2012 Regional Transportation Plan.¹⁰ They

assumed carsharing would increase region-wide due to new policies, such as the introduction of peer-to-peer carshare exchanges (which allows an individual to rent out his/her private vehicle when not in use), and one-way carsharing (in which vehicles are picked up in one location and returned to another). MTC assumed a net five percent increase in carsharing region-wide, with higher rates of penetration assumed in urbanized areas where carsharing already exists than in suburban areas where carsharing is beginning to be introduced. For the CTP 2040, a 5% increase in carsharing was assumed, and this resulted in a statewide reduction in VMT of 1.1 percent.

Category 3: Mode Shift

TRANSIT SERVICE IMPROVEMENTS STRATEGY

Many different transit service-related improvements can be used to increase transit ridership. For CTP 2040, an aggressive set of transit improvements was assumed for this draft strategy. Transit service levels were assumed to double over 2040 baseline conditions, transit speeds for all services were assumed to have been doubled, transit fares for all services were assumed to be free, and widespread timed transfers were also included.

The draft transit strategy has garnered a lot of attention as potentially unrealistic and unaffordable. However, the intention has been to identify the maximum VMT reductions from transportation strategies. Thus, the aggressive transit improvement strategy was devised. In particular, the transit strategy was also designed to help offset road pricing

by making transit a more viable option.

Combined with the next strategy – reduced fares for high speed rail – this strategy reduced statewide VMT by 6.0 percent. More details are provided in the Chapter 7 Technical Report.

REDUCED HIGH-SPEED RAIL FARES STRATEGY

The HSR system in the CTP 2040 is the same as assumed in the 2013 California State Rail Plan with service operating between the Los Angeles Region, San Joaquin Valley, and San Francisco Bay Area. HSR service levels and speeds are not changed from Alternative 1, but HSR fares are assumed to be reduced by 50 percent. The transit service improvements strategy appendix presents more details.

BUS RAPID TRANSIT STRATEGY

This strategy assumes that 20 percent of local bus services are converted to Bus Rapid Transit (BRT). *TCRP Report 118: Bus Rapid Transit Practitioner's Guide*¹¹ reviewed BRT improvements to local bus systems. Specific sets of improvements were not considered; rather, a combination of BRT improvements was assumed to meet the assumption of this strategy. Such improvements can include exclusive rights-of-way; limited-stop service; signal priority; “branding” of the system; and other elements that enhance customer satisfaction.

The BRT strategy assumed that 20 percent of the local bus routes (or routes containing 20 percent of local bus riders) were converted from local bus to BRT. Using a series of assumptions, a modest VMT reduction of 0.07 percent was calculated.

EXPANSION OF BICYCLE USE STRATEGY

The CTP 2040 assumes an aggressive implementation of the expansion of bicycle use, where the bicycle mode share is assumed to have doubled. Within the model, this objective assumed a VMT decrease statewide of 0.4 percent. Please see the Chapter 7 Technical Report in Appendix B for details.



Photo: Caltrans

EXPANSION OF PEDESTRIAN ACTIVITIES STRATEGY

The CTP 2040 assumes an aggressive expansion of walking – a doubling of pedestrian mode shares. This objective assumed a VMT decrease statewide of 0.4 percent. Please see the Chapter 7 Technical Report for details in Appendix B.

CARPOOL LANE REQUIREMENTS STRATEGY

Carpool lane occupancies were increased

from 2+ persons to 3+ persons for all carpool lanes statewide. Carpool lanes with 3+ occupancy rates were not modified; thus, a uniform 3+ carpool occupancy was assessed. This strategy was evaluated using the CSTDM and yielded a modest reduction of VMT by 0.8 percent statewide.

HOV LANES

The high-occupancy vehicle (HOV) lane system is a strategy used to maximize the people-carrying capacity of California freeways. HOV lanes, often referred to as “carpool lanes,” are managed lanes that limit access to vehicles with higher occupancy (currently these lanes vary between two or more, and three or more people). The high-occupancy toll (HOT), or express, lanes provide preferential access for HOV or toll payment.¹² The CTP 2040 assumes implementation of fully utilizing the existing capacity in the HOV and HOT lanes for complete system operational efficiencies.

Based on discussions with the TAC and PAC, it was assumed that the completion of the statewide HOV network will not result in additional highway capacity; rather, new HOV lanes will be converted from existing mixed flow lanes. These new HOV lanes will be primarily added in interregional corridors so carpool vehicles can travel on HOV lanes in a seamless manner between regions.

The VMT impacts of this strategy have not been evaluated using the CSTDM as of the current date of this report. This strategy will be evaluated in the near future, and included in a subsequent report revision.

Category 4: Operational Efficiency

INCIDENT AND EMERGENCY MANAGEMENT STRATEGY

Incident management programs identify, analyze, and correct minor and major traffic incidents to help mitigate traffic backups as well as increase public safety. Incident management programs generally include three primary functions: 1) traffic surveillance – detecting and verifying traffic incidents, 2) clearance – coordinating emergency response teams to the site of the incident, and 3) traveler information – notifying motorists of the incident through changeable message signs to provide time to select a route that avoids the incident.¹³ Incident and emergency management is one component of Caltrans’ Transportation System Management and Operation (TSMO) program. The CTP 2040 assumes the implementation of all components of TSMO.

CALTRANS’ TRANSPORTATION MANAGEMENT SYSTEM MASTER PLAN STRATEGY

Caltrans’ TMS Master Plan focuses on three core processes that help regain lost productivity in congestion. The three core processes include traffic control and management systems, incident management systems, and advance traveler information systems. All three processes rely on real-time, advanced detection systems. These TMS processes and their associated detection systems represent a nucleus for the Caltrans’ traffic operations strategies, form a critical part of the overall system management strategy, and are the focus of this report.¹⁴ The TMS Master Plan is one component of Caltrans’ TSMO program. The

CTP 2040 assumes the implementation of all components of TSMO.

INTELLIGENT TRANSPORTATION SYSTEM ELEMENTS STRATEGY

Intelligent transportation systems (ITS) encompass a broad range of information communications and control technologies that improve the safety, efficiency, and performance of the surface transportation system. ITS technologies provide the traveling public with accurate, real-time information, allowing them to make more informed and efficient travel decisions.¹⁵ The CTP 2040 assumes an aggressive deployment of ITS.

ECO-DRIVING STRATEGY

An ARB Policy Brief defined eco-driving as “a style of driving that saves energy, improving fuel economy and reducing tailpipe emissions per mile traveled. Eco-driving tactics include accelerating slowly, cruising at more moderate speeds, avoiding sudden braking, and idling less, as well as selecting routes that allow more of this sort of driving.”¹⁶ The ARB referenced studies of fuel savings that found, on average, 2.3 percent fuel savings for drivers using eco-driving tactics. For the purpose of analysis for the CTP, eco-driving is analyzed as an off-model aspirational objective of a 10 percent adoption rate. Applying the 10 percent eco-driving adoption rate to the 2.3 percent fuel savings yields a net fuel savings of 0.23 percent. An additional assumption of a 1:1 relationship between fuel savings and equivalent VMT reduction was made.

CSTDM ALTERNATIVES EQUITY ANALYSIS

The CTP 2040 Alternatives 2 and 3 increase road pricing - expressed as auto operating costs (the costs of fuel and routine maintenance) - by 73 percent above Alternative 1 levels. This substantial increase in the cost of driving led some members of the PAC and TAC to question whether low-income travelers would be adversely impacted. To address these concerns, two transportation VMT reduction strategies were examined. First, just the road pricing strategy was tested, then both the road pricing strategy and

the transit improvements strategies were tested together.

California travelers were divided into three household income groups described in 2010 constant dollars – low (0 to \$25,000), medium (\$25,000-\$100,000) and high (greater than \$100,000). Mode shares analysis for the road pricing strategy showed fairly small changes in mode shares. Drive-alone for low income travelers was reduced from 25 percent to 23 percent for the road pricing strategy in Alternative 1 as shown in Table 18. Changes to non-auto modes also showed modest changes for low income travelers.

TABLE 18. YEAR 2040 SHORT DISTANCE PERSONAL TRAVEL MODEL MODE SHARES BY INCOME GROUPS (CSTDM)

		Drive Alone	HOV 2	HOV3+	Transit	Bike/Walk	Total
Low Income	Alt 1	25%	28%	19%	10%	19%	100%
	Road Pricing (RP)	23%	27%	18%	11%	21%	100%
	RP + Transit	17%	26%	17%	17%	23%	100%
Med Income	Alt 1	34%	30%	22%	5%	9%	100%
	Road Pricing	33%	30%	22%	5%	10%	100%
	RP + Transit	28%	30%	21%	10%	11%	100%
High Income	Alt 1	44%	28%	20%	3%	5%	100%
	Road Pricing	43%	28%	20%	3%	6%	100%
	RP + Transit	38%	29%	20%	7%	6%	100%
All	Alt 1	36%	29%	21%	5%	9%	100%
	Road Pricing	34%	29%	21%	6%	10%	100%
	RP + Transit	29%	29%	20%	10%	11%	100%

When the road pricing strategy was analyzed in conjunction with improved transit services, the changes to mode shares were more dramatic. Low-income drive-alone shares dropped to 17 percent. The transit-mode share rides rose from 10 percent under Alternative 1 to 11 percent for the road pricing strategy, and up to 17 percent for the road pricing strategy plus transit improvements.

This analysis indicated that effecting significant modal changes required both increases to the cost of driving and improvements to

transit services. Thus, the impacts of the road pricing strategy can be mitigated—in terms of transportation accessibility—by simultaneously improving transit services. Additionally, the mix of road pricing strategy and improved transit services had the added benefit of also increasing bike/walk mode shares. Table 18 presents the mode share by percentage for income groups, while Table 19 shows the percent change in each mode related to the transportation strategies (road pricing and transit) relative to Alternative 1. This table helps to more clearly show the relative changes for each mode.

TABLE 19. YEAR 2040 SHORT DISTANCE PERSONAL TRAVEL MODE CHANGES IN MODE SHARES (COMPARED TO ALTERNATIVE 1) (CSTDM)

		Drive Alone	HOV 2	HOV3+	Transit	Bike/Walk
Low In-come	Road Pricing (RP)	-8%	-3%	-4%	11%	9%
	RP + Transit	-32%	-11%	-11%	65%	13%
Med In-come	Road Pricing	-4%	0%	-1%	11%	11%
	RP + Transit	-20%	-2%	-3%	102%	19%
High In-come	Road Pricing	-2%	1%	0%	10%	12%
	RP + Transit	-14%	1%	0%	155%	23%
Total	Road Pricing	-4%	0%	-1%	11%	11%
	RP + Transit	-19%	-2%	-3%	100%	18%

PERFORMANCE AND RESULTS OF THE CTP 2040 ALTERNATIVES

This evaluation shows the forecasted GHG emissions reduction, system performance, and economic benefits of the CTP 2040’s three alternatives. For more in-depth documentation of the results and analysis, please refer to the Chapter 7 Technical Report in Appendix B.

VMT REDUCTIONS

VMT was calculated for CTP Alternatives 1 and 2 using the CSTDM. This data was then incorporated into ARB’s VISION Model to determine total GHG emissions and fuel demand from 2010 to 2050. The types of vehicles highlighted in this analysis were light duty vehicles (LDV), heavy duty vehicles (HDV), HSR, aviation (intrastate), and rail (passenger and freight). The same VMT reduction numbers are used for Alternatives 2 & 3. Table 20 and Figure 10 below display total daily VMT in billions of miles for Alternative 1 in 2010 (the base year), 2020, and 2040, and the 2020 & 2040 VMT for Alternatives 2 & 3, as well as the percentage of reduction in VMT between Alternative 1 and Alternatives 2 & 3. CTP transportation strat-

egies under Alternatives 2 & 3 resulted in a VMT reduction of 30 percent in 2040.

Vehicle miles traveled (VMT) is the total number of miles traveled on all roadways by all vehicles. VMT per capita is the total number of miles traveled per person. VMT per capita has been calculated using two methods– first, by dividing personal travel VMT by the state population and second, by including all personal and truck travel. Personal VMT is expected to decline for Alternative 1 conditions due to the impacts of the regional SCSs. However, truck VMT is projected to increase over time, so total VMT per capita decreases somewhat less across CTP Alternatives when truck travel is included. See Table 21 and Figure 11 for a summary of the VMT results.

	2010	2020	2040
Alternative 1			
LDV	189.7	208	251
HDV	74	73.5	83
Total	264	282	334
% Difference from 2010		7%	27%
Alternatives 2 and 3			
LDV	-	204	161.9
HDV	-	73	71.3
Total	-	276	233
% Difference from 2010		5%	-12%

FIGURE 10. CHANGE IN DAILY VMT BY ALTERNATIVE RELATIVE TO 2010 (CSTDM)

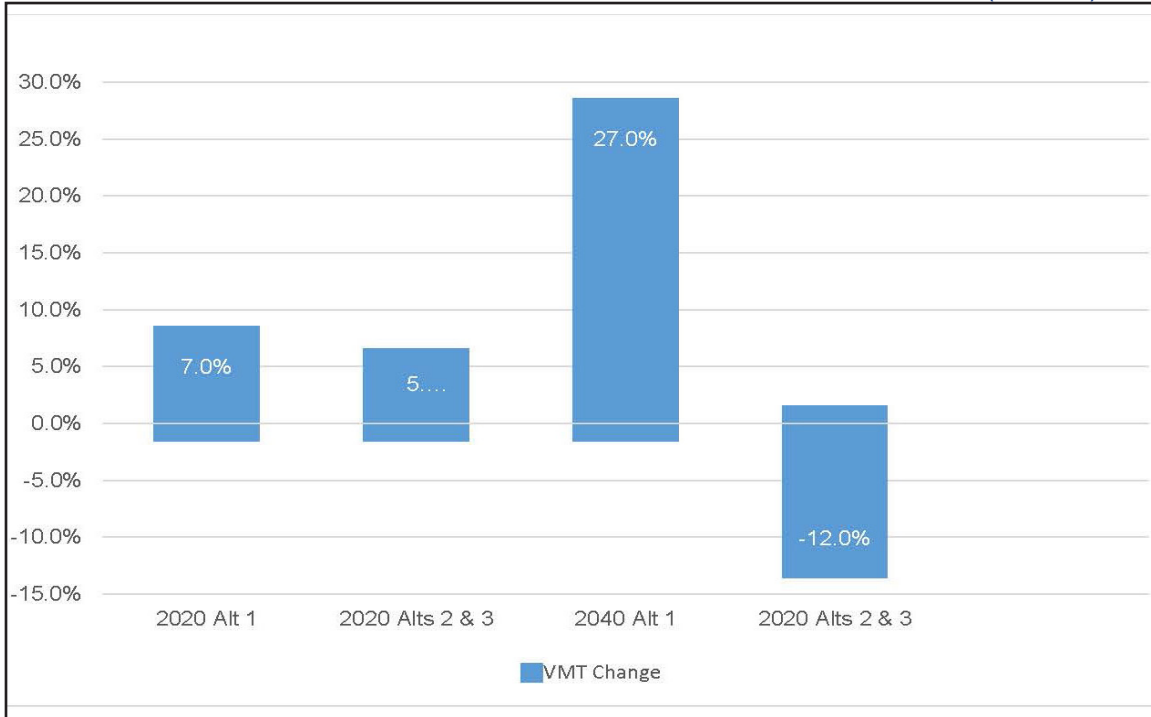


TABLE 21. VMT PER CAPITA (CSTDM)

	Population	VMT per capita - Personal Travel	Personal Travel Change from 2010	VMT per capita - Total Travel	Total Travel Change from 2010
2010	37,249,156	19.36	-	22.14	-
2020 Alt 1	41,559,731	18.37	-5%	21.41	-3%
2020 Alt 2&3	41,559,731	18.13	-6%	21.16	-4%
2040 Alt 1	50,357,006	18.41	-5%	21.58	-3%
2040 Alt 2&3	50,357,006	13.60	-30%	16.55	-25%

FIGURE 11. PERSONAL TRAVEL PER CAPITA VMT (CSTDM)



Vehicle-Hours-of-Delay (VHD)

Vehicle hours of delay (VHD) is a measure of congestion. One vehicle delayed for one hour equals one vehicle hour of delay. Many of the transportation VMT reduction strategies were intended to reduce VMT as a means to reduce GHG emissions. However, reducing vehicle hours of travel VHT and VHD can also reduce GHG emissions. VHD

also serves as a useful measure of roadway congestion.

In 2010, approximately 898,000 vehicle hours of delay were estimated across the state, with delay more than doubling for 2040 Alternative 1. Alternative 2 transportation strategies are forecast to reduce delay to well below 2010 levels. Table 22 shows VMT and VHD in Alternatives 1 and 2.

TABLE 22 – VEHICLE HOURS OF TRAVEL AND DELAY (X 1,000) (CSTDM)			
	VHT	VHD	% Congest- ed
2010	14,459	898	6.2%
2020 Alt 1	15,329	965	6.3%
2020 Alt 2&3	15,329	965	6.3%
2040 Alt 1	19,322	1,929	10.0%
2040 Alt 2&3	13,634	587	4.3%

GREENHOUSE GAS EMISSIONS

AB32 requires that the 2020 total GHG inventory be the same as the 1990 GHG inventory, then 80 percent below the 1990 GHG inventory by 2050 (the law does not require that each individual sector achieve its absolute 1990 value). Because the CTP project does not include all sectors, it is assumed that the transportation sector 2020 GHG value calculated for Alternative 1 will be the reference point for the 2050 GHG reductions.

ARB calculated GHG reductions based on CSTDM VMT outputs for Years 2020 and

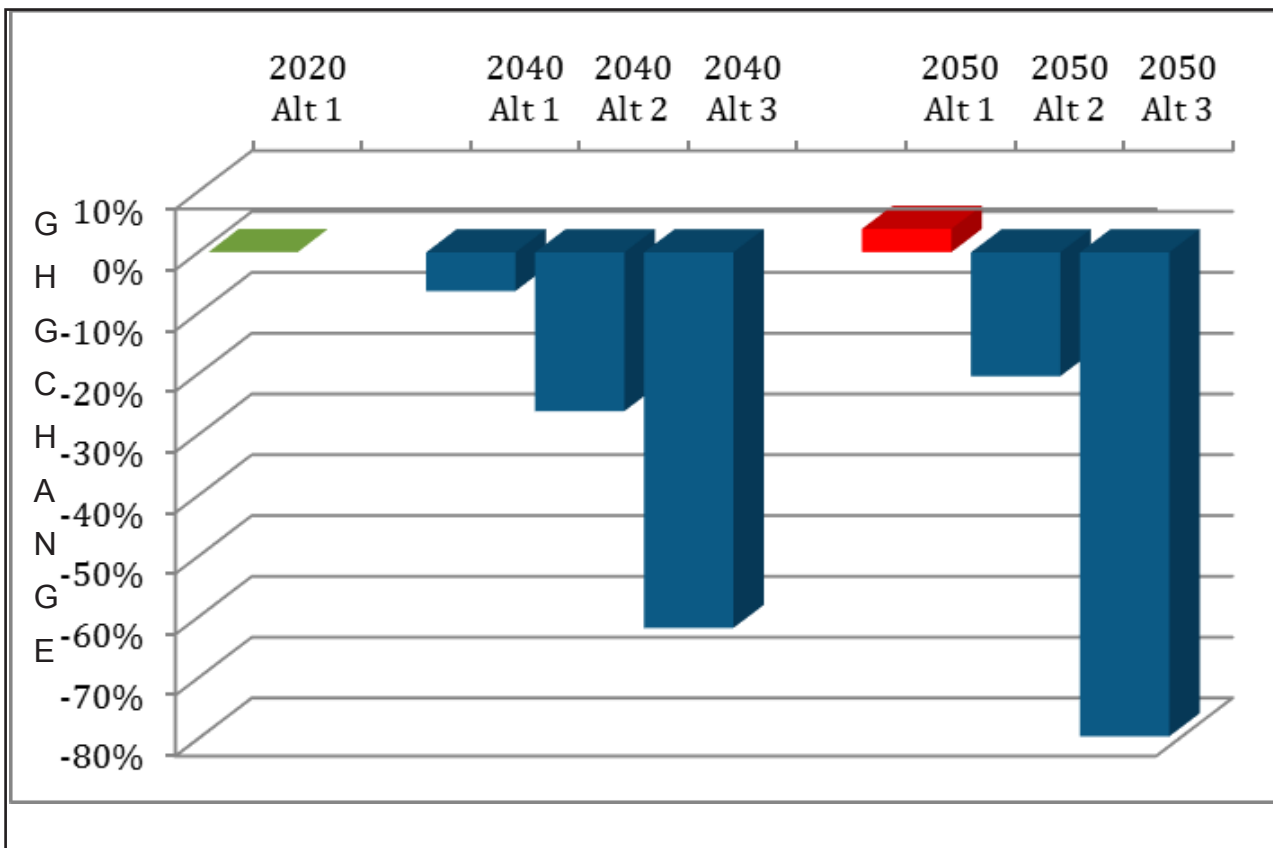
2040. EMFAC 2011 assumptions for GHG reductions were used for the draft version of this report. For the final report, new EMFAC 2015 assumptions will be used.

Preliminary GHG reductions are shown in Table 23 and Figure 12 below for Alternatives 1, 2, and 3. This table displays total GHG emissions (million metric tons, or MMT of CO₂), and relative percentage reductions below 2020 for 2040 and 2050.

ARB assumed that the transportation sector 2020 GHG value calculated for Alternative 1 was the reference point for the 2050 GHG reductions

TABLE 23. DRAFT STATEWIDE GHG EMISSIONS BY CTP ALTERNATIVE (ARB)					
Alternative 1					
	2010	2012	2020	2040	2050
GHG Emissions (MMT CO₂e / yr)					
Total	175	168	158	147	163
Target	-	-	-	-	32
GHG Relative Reduction Below Alternative* 20201 (%)					
Total	-	-	-	7%	-3%
Target	-	-	-	-	80%
Alternative 2					
GHG Emissions (MMT CO₂e / yr)					
Total	174	168	157	116	125
Target	-	-	-	-	32
GHG Relative Reduction Below Alternative 1 20201 (%)					
Total	-	-	-	27%	21%
Target	-	-	-	-	80%
Alternative 3					
GHG Emissions (MMT CO₂e / yr)					
Total	175	168	156	60	32
Target	-	-	-	-	32
GHG Relative Reduction Below Alternative 1 20201 (%)					
Total	-	-	-	62%	80%
Target	-	-	-	-	8%
<p>* AB32 requires that the 2020 total GHG inventory is the same as the 1990 GHG inventory, while the law does not require that each individual sector achieve its absolute 1990 value. Because the CTP project does not include all sectors, it is assumed that the transportation sector 2020 GHG value calculated for Alternative 1 will be the reference point for the 2050 GHG reductions</p>					

FIGURE 12. STATEWIDE GHG EMISSION CHANGES RELATIVE TO 2020 ALTERNATIVE 1 (ARB)



ECONOMIC IMPACT ANALYSIS OF CTP 2040

The economic impact analysis of the CTP 2040 focused on the pricing, mode shift and other transportation VMT reduction strategies described in Alternative 2. Pricing strategies target motorists by imposing additional costs for utilizing the roadway transportation system. The increased cost is offset by making active transportation modes a viable substitute to vehicle travel through capacity and network improvements. The changes in travel patterns resulting from the implementation of the strategies were estimated using the CSTDM. The outputs from the CSTDM analysis were used in the economic analysis.

ANALYSIS APPROACH

The analysis was completed using the Transportation Economic Development Impact System (TREDIS) predictive impact model. TREDIS is an integrated economic impact and analysis tool covering a wide range of applications including benefits, costs, finance and macroeconomic impacts of alternative projects, plans and programs. The analysis started by establishing a baseline condition, Alternative 1, comprising of strategies identified in MPO/RTPA RTPs and State Modal Plans by year 2040. The changes in travel patterns due to increased travel costs result in wider economic impacts such as increased concentrations of businesses and labor markets, and access to intermodal facilities (such as ports, airports and rail transfer stations). Businesses benefit from closer proximity to suppliers, consumers and an expanded pool of labor, improving productivity of goods and services. The analysis generate a set of economic impact outcomes consisting of jobs, wages and income, and value added (Gross State Product equivalent) for the alternative scenarios. A comparative analysis between

Alternative 1 and Alternative 2 analyzes the net economic impact from the pricing and mode shift strategies. The economic impacts of alternative 3 were not assessed because the financial impacts to travelers could not be quantified from the vehicle and fuel technology advancement identified in the Vision model.

DATA USED IN ANALYSIS

The analysis was limited to passenger and freight vehicle movement on roadways and transit vehicles (including bus and rail), and also included bicycle and pedestrian usage. CSTDM results for CTP 2040 alternatives 1 and 2 included trips, VMT, vehicle hours traveled (VHT), and vehicle hours of delay (VHD) – all generated from the CSTDM. A fee or toll was assessed to each vehicle trip in Alternative 2 to simulate the increase in auto operating costs. Additional TREDIS default values were used, such as for the value of time, freight valuation, safety and environmental impacts. See the Chapter 7 Technical Report for more details on the TREDIS application methodology.

ANALYSIS RESULTS

The net effects of implementing the pricing and mode shift strategies identified in Alternative 2 over the analysis period result in net positive economic impacts. Travel cost increases to households and business are offset by greater access to production materials, as well as markets and labor from the reduction in travel and congestion,

allowing businesses to increase productivity. The secondary benefits to the environment and public safety also offset additional pricing costs. However, the effects of positive market and labor clusters decline and diminish over time as a growing populace and demand for travel erode the benefits previously gained from the implementation of Alternative 2.

TABLE 24. NET ECONOMIC IMPACTS FROM ALTERNATIVE 1 TO ALTERNATIVE 2 (2040) (TREDIS)

	2012/15	2016/20	2021/25	2026/30	2031/35	2036/40	Net Total (2040)
GSP (\$mil)	\$(2,000)	\$16,000	\$33,000	\$23,000	\$11,000	\$(2,000)	\$79,000
Jobs	(20)	87,000	2,200	(23,000)	(26,000)	(28,000)	13,000
Wage (\$mil)	\$(1,000)	\$11,000	\$23,000	\$18,000	\$10,000	\$2,000	\$64,000

LIMITATION OF ANALYSIS

Transportation’s economic impact is only a fraction of the state’s economy, as other exogenous variables effect economic growth. TREDIS only analyzes the economic impacts of transportation strategies. Broader impacts such as land use, market allocations, and reinvestments are not reflected in this analysis. Therefore, this analysis only serves as a barometer to the economy’s response to the strategies identified in Alternative 2.

transportation strategies can be evaluated using the CSTDM. Additionally, the CSFFM was not available and therefore additional potential freight related transportation strategies were not included.

SUMMARY

This is the first CTP to analyze statewide alternatives intended to reduce VMT, hence reducing GHG emissions. At present, not all

To model and analyze the potential effectiveness of various packages of VMT and GHG emission reduction strategies, projects, and vehicle technologies, Caltrans developed three alternatives. Tables 25-27 highlight the the three alternatives and how they performed. For more in-depth information on the analysis, please refer to the Chapter 7 Technical Report in Appendix B.

A series of recommendations from this analysis are included in Chapter 8. These recommendations include such things as data collection and analytic improvements to the CSTDM and

CSFFM systems, and ways to reduce VMT and GHG emissions.

TABLE 25. ALTERNATIVE 1 RESULTS SUMMARY (CALTRANS)

Alternative 1 - Planned (Current MPO SCSs and State Modal Plans)					
	Alternative 1				2050 Target
	2010	2020	2040	2050	
Green House Gas Emissions (GHG) (MMT CO2/yr)	175	158	147	163	32
Vehicle Miles Traveled (VMT) (billions of miles)	264	282	334	-	-
Vehicle Hours of Travel (VHT) (hours x 1,000)	14,459	15,329	19,322	-	-
Vehicle Hours of Delay (VHD) (hours x 1,000)	898	965	1,929	-	-

TABLE 26. ALTERNATIVE 2 RESULTS SUMMARY (CALTRANS)

Alternative 2 - Planned + Proposed Strategies (Current MPO SCSs and State Modal Plans plus Transportation Strategies)					
	Alternative 2				2050 Target
	2010	2020	2040	2050	
Green House Gas Emissions (GHG) (MMT CO2/yr)	175	157	116	125	32
Vehicle Miles Traveled (VMT) (billions of miles)	264	276	233	-	-
Vehicle Hours of Travel (VHT) (hours x 1,000)	14,459	15,329	13,634	-	-
Vehicle Hours of Delay (VHD) (hours x 1,000)	898	965	587	-	-

TABLE 27, ALTERNATIVE 3 RESULTS SUMMARY (CALTRANS)

Alternative 2 - Planned + Proposed Strategies + Future Vehicle and Fuel Technology (Meeting the Goals Through Vehicle and Fuel Technologies)					
	Alternative 3				2050 Target
	2010	2020	2040	2050	
Green House Gas Emissions (GHG) (MMT CO ₂ /yr)	175	156	60	32	32
Vehicle Miles Traveled (VMT) (billions of miles)	264	276	233	-	-
Vehicle Hours of Travel (VHT) (hours x 1,000)	14,459	15,329	13,634	-	-
Vehicle Hours of Delay (VHD) (hours x 1,000)	898	965	587	-	-

Endnotes

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14. <http://www.dot.ca.gov/hq/traffops/sysmgtp/repports/MasterPlan.pdf>
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16. 2012, Lovejoy, Handy and Boarnet, Draft Policy Brief on the Impacts of Eco-driving Based on a Review of the Empirical Literature, Prepared for California Air Resources Board, Sacramento, CA.

“California’s transportation system is safe, sustainable, universally accessible, and globally competitive. It provides reliable and efficient mobility for people, goods, and services, while meeting the State’s greenhouse gas (GHG) emission reduction goals and preserving the unique character of California’s communities.”

The recommendations outlined in this chapter provide ways that State, regional and local government, agencies, non-governmental organizations and community based organizations can implement the California Transportation Plan 2040 (CTP 2040) vision within their respective jurisdictions, scopes and responsibilities. These entities become partners with the State in ensuring that the CTP 2040 is the overarching guide and vision for all other plans and transportation investments. The CTP 2040 will continue to evolve through an extensive public involvement process, government-to-government engagement with tribal communities, and close work with all levels of local, regional, state, and federal partners.

The recommendations reflect the work of statewide transportation leaders, and the CTP 2040 Policy Advisory Committee (PAC) and Technical Advisory Committee (TAC) members. This chapter is organized with the recommendations under broad-based themes or categories; many are provided within the context of the strategies from Chapter 6. Some of the recommendations can be implemented or adopted immediately, and others are longer term. The recommendations are presented as short-range (within the next 2 years), mid-range (within the next 3 to 5 years), and long-range opportunities (from the next 5 to 20 years). A

short-range recommendation is something that can be implemented rather quickly. A short-range recommendation may result in a long-term program, policy or other activity that lasts for years. Some categories have only short range recommendations, while others only long-range. In addition, some recommendations appear in multiple categories.

SAFETY

IMPROVE PUBLIC SAFETY AND SECURITY

Caltrans supports a proactive approach to improve and promote multimodal public safety and security. The focus on efforts to bring awareness to statewide importance of reducing fatalities and serious injuries has contributed to the reduction of such. However, there remains the need to reduce safety risks disparities with bicyclists and pedestrians, as these groups represent a significant percentage of all fatalities.

The CTP 2040 is consistent with the policies and strategies from the Caltrans five modal plans (i.e. ITSP, State Rail Plan, Freight Mobility Plan, Transit Plan, and the Aviation Plan), Complete Streets, and the Strategic Highway Safety Plan (SHSP 2014-19). The SHSP 2014-19 investments in safety improvements to the multimodal system is evident in that California has experienced a

30.4 percent reduction in fatalities and 17.5 percent reduction in severe injuries from 2005 to 2012.¹ The CTP 2040 incorporates policies and mandates from the SHSP 2014-19, 2015 California Highway Safety Plan, and MAP-21 (Sections 1201, 1202 & 1203) that continue to promote safety and security, and encourage future reductions Towards Zero Deaths (TZD) and incorporating security approaches, such as Crime Prevention through Environmental Design (CPTED).

Lastly, Caltrans supports newer technologies investment that incorporates safety improvements to the multimodal system for traffic and modal safety efforts, such as collision prevention programs, roadway infrastructure improvements, enforcement, public education, and advances in state-of-the-art safety technology, such as autonomous vehicles and interconnected multimodal systems.

Recommendations

SHORT-RANGE

- Invest in rail safety public awareness campaigns and social norming to change behavior related to impaired driving, railroad grade crossing safety improvements and safe operations for both passenger and freight rail.
- Implement aggressive public education and media/awareness campaigns to increase awareness of distracted motorists, cyclists and pedestrians.²
- Improve traffic safety and security programs through prioritizing opportunities for risk reductions, implementation, monitoring, testing, evaluating, and revising safety and security plans.¹
- Identify hazardous materials transport routes that minimizes influence to communities and populated areas to the final destination.¹
- Assess and minimize transportation security risks for hazardous materials shipment and appropriate measures to address the assessed risks.¹
- Ensure activities and operations enhance transportation security.³
- Support grants and funding opportunities for cooperative multiagency/multi-municipality data systems, data sharing and resource and data pooling.²
- Continue outreach efforts to both urban and rural counties to help them improve safety, data collection, access, and analysis by continuing to fund traffic collision database and GIS mapping systems.⁴
- Improve Positive Train Control (PTC) technology on all intercity and commuter passenger rail.
- Distribute safety data among planners to coordinate and find areas that could benefit from investments to improve the safety of the arterials, corridors, ramps, etc.

MID-RANGE

- Improve the quality, completeness, timeliness, and uniformity of safety data and the sharing among federal, state, and local agencies and stakeholders.⁴
- Fund regional EMS programs to ensure rural communities have access to the latest “state-of-the-art” rescue and extrication equipment.⁵
- Fund “corridor DUI programs” that select corridors based on data showing disproportionate numbers of DUI collisions and convening task forces to implement identified solutions.⁶
- Improve outreach, education, and implementation of Crime Prevention through Environmental Design (CPTED) approach deters crime and provides security through environmental design in transportation systems.
- Establish requirements, collaborate and support research for manufacturers of connect/autonomous vehicles, Self-Guided, Magnetic Bus Technology to meet specific safety requirements that has the potential to improve safety, costs, and efficiency in reducing passenger fatalities and traffic incidents as well as operational benefits.

SUSTAINABILITY

FOSTER LIVABLE/HEALTHY COMMUNITIES AND SOCIAL EQUITY

In order to successfully foster livable and healthy communities, there has to be coordinated planning. The CTP 2040 encourages infill development and conservation opportunities as a way to reduce urban sprawl, allow for better transit and to be consistent with SB 375. An integrated planning process should increase the public’s ability to influence and understand the implications of planning decisions through outreach and utilization of new and emerging technologies. In transportation planning, consideration of social equity and environmental justice modeling, and measurement of health impacts will be necessary to improve outcomes related to quality of life, livable communities and equity.⁷

Land use and transportation decisions greatly affect the health and safety of the community and the environment. CTP 2040 calls attention to the fact that public health can be impacted by transportation services. Land use planners, transportation planners, and others must collaborate to ensure that the health and safety of the community remains a priority. Shared data across sectors would benefit all entities. No single agency has authority over every decision or policy. The transportation system should provide an equitable level of transportation services to all segments of the population.⁸

Recommendations

SHORT-RANGE

- Collaborate with stakeholders and partners early and often in the planning process.
- Collaborate to develop transportation planning tools, policies, and incentives to improve analysis and consideration of social equity, environmental justice and public health impacts.
- Promote efficient infill housing development and redevelopment opportunities to reduce urban sprawl consistent with SB 375, the Sustainable Community Strategies, and other regional and State policy guidance.
- Implement the Smart Mobility Framework principles statewide to integrate the transportation system and encourage non-motorized forms of transportation and Complete Streets.
- Identify potential pedestrian and bicyclist improvements on state highways and work toward development of those projects.¹⁰
- Promote the Affordable Housing and Sustainable Communities Program.
- Work with tribal governments using principles of coordination, collaboration, and engagement to improve transportation for tribal communities.
- Support infill development around High Speed Rail stations.

MID TO LONG RANGE

- Partner with industries and innovators involved in technological approaches to environmental improvement.
- Follow the model of the California Health in All Policies Task Force through which more than twenty State departments and agencies came together to promote public health, equity, and environmental sustainability across multiple policy areas, including transportation, housing, and land use.
- Work with local and regional agencies to apply considerations of health, equity and sustainability to transportation decision making.

PRACTICE ENVIRONMENTAL STEWARDSHIP

Upholding environmental stewardship requires a multi-pronged approach. While meeting transportation goals and maintaining the transportation system, impacts to natural resources and working lands should be avoided to reduce costs, risks and protect and preserve the State's environment. California must develop transportation improvements that sustain and enhance the environment, and reduce GHG emission from vehicles. In all planning decisions, policy makers must consider climate change mitigation, adaptation, conserving natural resources and limiting environmental impacts. While some recommendations may appear in other sections, there are mutual benefits. For example, recommendations in other sections, such as VMT reductions and

expanded transit services and operations, have a mutual benefit of reducing GHG and criteria pollutant emissions and therefore are linked closely with environmental stewardship.

Recommendations

SHORT-RANGE

- Support wildlife connectivity and naturally functioning ecosystems through design and plans to protect habitat and natural resources.
- Expand the use of technology and tools to provide environmental impact performance measures.
- Continue to promote policies that reduce air pollution such as the 2013 Zero Emission Action Plan, which directs the State to accelerate the market for zero-emission vehicles (ZEVs) in California. This also includes a goal of 1.5 million ZEVs in California by the year 2025.¹¹
- Support technological research and development of alternative fuels and transportation modes that can further improve air quality.¹²
- Promote active transportation and public/mass transit promoting policies for the co-benefit of reducing air pollution when they replace motor vehicle trips.
- Convene State, regional and local stakeholders to establish coalitions that engage communities on the importance of environmental stewardship.

- Expand resiliency planning and climate change impact studies of sea level rise and storm events, and other climate change indicators that affect the future of communities, infrastructure, and ecosystems.
- Support electrification of passenger rail, mode shift from planes and autos to high speed rail, and investments in renewable energy sources for transportation.
- Promote and expand strategies such as the Cap-And-Trade program and High Speed Rail, and enhance environmental stewardship locally, regionally, and statewide.

MID-RANGE

- Partner with State agencies to implement recommendations from the 2014 AB32 Scoping Plan Update.

SUPPORT ECONOMIC VIBRANCY

The CTP 2040 supports an efficient and affordable transportation system that enhances mobility. Transportation costs are a significant portion of an average household income. Affordable transportation is essential to a healthy and vibrant population, enhancing physical and economic interactions, and promoting a sustainable and livable environment. The CTP 2040 looks to a future transportation system that adapts to population increases, societal preferences, and technological innovations. These factors will influence where people live and what type of transportation mode they will choose, as well as the cost of transportation services.

Recommendations

SHORT-RANGE

- Avoid projects with high health and environmental costs, such as general land uses.
- Prioritize funding toward transportation alternatives that enhance efficient and affordable mobility.
- Work with tribal governments to improve access to State highways from tribal lands.

MID TO LONG-RANGE

- Adjust the pricing of transportation modes to reflect the total cost for each mode, including health and environmental costs.
- Invest in interregional goods movement corridors.
- Improve the linkages between transportation, housing, and land use by tying policies to incentives with environmental benefit.
- Develop a tax and fee structure that facilitates an efficient and affordable transportation system consistent with long-term transportation, housing, land use, and resource management plans.

OBTAINING PERMANENT FUNDING

The CTP 2040 emphasizes the need for reliable, permanent sources of funding to ensure a sustainable system and service delivery. The State needs over \$536 billion to sustain and improve the transportation infrastructure, but transportation revenue is estimated to only total \$242 billion over the next 10 years.¹³ This shortfall is primarily due to marginal transportation revenues. As mentioned, it has been decades since motor fuel taxes have increased, let alone indexed for inflation. Moreover, the need to fund a multimodal system is more urgent than before, yet new transportation revenue sources have not been added. Policymakers must provide the transportation sector with permanent funding sources that account for inflation and population growth. One funding strategy currently being discussed in the context of the CTP 2040 goals is tolling/pricing strategies. More information about the proposal can be found here: <http://calsta.ca.gov/>

Recommendations

SHORT-RANGE

- Support efforts of a pricing strategy
- Establish and/or expand GHG Reduction Fund Programs.

LONG-RANGE

- Create a transportation State sales tax component
- Create a tax increment financing or transportation financing districts. This would be similar to a Mello-Roos tax

through which community districts would be able to finance transportation improvement projects.

- Implement a revenue structure that is solely dedicated to improving non-motorized travel methods.

ADDRESS CLIMATE ADAPTATION AND RESILIENCY OF INFRASTRUCTURES TO ENSURE RELIABLE TRANSPORTATION

GHG reductions and climate adaptation must go hand-in-hand to effectively combat the challenges of climate change. The CTP 2040 highlights adaptation and resiliency as key factors in transportation planning. Sea-level rise (SLR) is a significant risk of climate change and brings uncertainty of how SLR would affect all modes of transportation.¹⁴ Preparing transportation infrastructure for climate change impacts is a new priority as future projects are designed and the current system is maintained. The tools and methodologies for evaluating and adapting to such impacts are still in the early stages of development and will require ongoing monitoring.¹⁵

Recommendations:

SHORT-RANGE

- Incorporate climate change resiliency in long-range transportation documents to address potential climate change-related vulnerabilities.¹⁶
- Require climate change resiliency in SHOPP and STIP programs and projects.

- Coastal communities must utilize Local Coastal Programs (LCPs) alongside general plans to implement climate change adaptation where impacts of SLR are most intense.
- Avoid planning, developing, or building in places where structures will require significant protection from sea level rise, storm surges, or coastal erosion during the expected life of the structure.¹⁷
- Focus on reliable transportation routes away from SLR impacts on harbors and ports¹⁸, airports, access roads, trail tracks, and bridges.
- Track sea level rise and other climate change indicators such as interactive maps and modeling that identify transportation infrastructure that could be vulnerable to environmental and climate changes.

MID TO LONG-RANGE

- Accelerate the use of alternative fuels, new vehicle technology, pricing strategies, public transportation expansion, more bicycling and walking to contribute to GHG reduction goals.

MULTI-MODAL SYSTEM ENHANCEMENTS

ACTIVE TRANSPORTATION SYSTEM (BICYCLING AND WALKING)

California must establish a flexible and efficient transit system that will play a role in bettering the multimodal transportation system. Transit is a key component of the CTP 2040. Stakeholders in California expect a lot from transit; it can function to serve a range of policy goals. Environmental, social, and economic goals require increased transit ridership, but the cost of increasing ridership falls squarely on the shoulders of California's public transit agencies. Agencies must increase ridership cost-effectively for the State to achieve its broader policy goals. This includes commuter rail, intercity rail, ferry and various types of bus service.

Often the transit system and active transportation such as bicycling and walking go hand-in-hand. Thus, another proven practice is to implement more Complete Streets policies throughout cities in California. Complete Streets are those that enable safe access and mobility amongst motorists, bicyclist, pedestrians and transit service.

[Recommendations](#)

SHORT-RANGE

- Implement programs that encourage people to participate in active transportation modes and help educate travelers on the benefits of not using a car.¹⁹

- Offer strategic planning workshops for best transit-oriented strategies at the local level.²⁰
- Support local/regional multidisciplinary efforts to ensure safe active transportation is a priority for all jurisdictions in the State.

MID TO LONG-RANGE

- Fund and expand Active Transportation programs that promote carpooling, transit, walking and bicycling and other active modes of transportation.²¹
- Create safe and effective walking and bicycling facilities that create neighborhood connectivity and continuity.
- Leverage private sector investment to find more alternatives to automobiles.¹⁸
- Experiment and evaluate alternatives through providing pilot projects that allow for better understanding of successful and unsuccessful strategies to help improve current transit services.¹⁹
- Find ways to improve non-auto interregional and interstate travel modes.¹⁹
- Work with transit operators to help them understand real-time passenger information system, as well as offering grants that can help to offset initial costs of publishing data.¹⁹
- Division of Mass Transportation can work with local transit stakeholders throughout the state to evaluate and learn from the Bus Rapid Transit project, which can help identify best-practices.¹⁹

- Improve perception of transit services by working with other State and local agencies.¹⁹
- Report vanpool service data to attract federal funds.¹⁹
- Share successes and lessons learned to state-wide transit authorities in order to build momentum towards implementing strategies that will improve transit services.¹⁹
- Optimize traffic signal timing for transit or bicycle speeds to improve the multimodal efficiency on complete streets.²²
- Improve transit payment methods to speed up vehicle boarding, which in turn can increase the efficiency of buses arriving on-time more often.²¹
- Create circulator service which specializes in transit to link popular and frequently visited destinations within universities and downtown areas.²¹
- Improve upon scheduled transfers between regional transit services.²¹
- The State can work with tribes to identify potential pedestrian and bicyclist improvements on state highways in Indian Country and work toward development of those projects.²³

EXPAND TRANSIT SERVICES AND OPERATIONS

Perhaps the most cost-effective option to improving transit and intercity, commuter, and high speed rail service in California is to better leverage what has already been put into place. Transit operators throughout the state have experienced both successes and failures in identifying and implementing cost-effective means to increase patronage. Caltrans and University of California researchers have also researched roadway treatments such as bus-on-shoulder and bus-only lanes, and case studies of lessons learned. California's transit operators can build upon these experiences to avoid the expense of additional studies and the risks of uninformed experimentation. Access to such studies can help agencies identify and implement strategies to improve transit and achieve future ridership goals.

Transit operators have many options at their disposal that do not require trade-offs with automobiles, but some measures will require that Caltrans and local governments prioritize transit and high-occupancy vehicles over single-occupancy vehicles. These measures are likely to be a source of conflict throughout California as it moves toward a sustainable transportation future in pursuit of its social, environmental, and economic policy goals. Caltrans can support local governments and regions that chose to prioritize transit by accelerating the implementation of transit-priority measures on State-administered facilities

Recommendations

SHORT-RANGE

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

MID TO LONG-RANGE

- Identify and implement rail capital improvements targeted at integrating existing passenger rail systems and supporting planned California High Speed Rail service
- Address institutional and operational barriers to implementing an integrated rail passenger network in California.
- Expanding funding for transit service operations and capital improvements.
- Support local-regional transit seamless transfers to and from high speed rail.

IMPROVE MULTIMODAL MOBILITY AND ACCESSIBILITY FOR ALL

Californians want a transportation system that is safe, reliable, and cost effective along with a sustainable environment that takes into consideration the health of the public and the community's character. Mobility and accessibility are important factors in transporting goods and services through the state. In order to accomplish these demands, the CTP 2040 looks to improve multimodal mobility and accessibility by creating fluidity amongst transit, bicycle/pedestrian and vehicles and managing to optimize the State's existing highway system.

The cost of travel is a leading concern for many Californians. Moreover, transportation inequity becomes a concern for stakeholders when Californians with lower socioeconomic status are not able to access the same destinations as people of higher socioeconomic status, or those individuals with

no physical limitations. Thus, in keeping with the guidelines of equity, it is important that people have access to efficient, affordable, integrated housing and recreational access within California’s transportation system. Reliable and accessible transportation will meet the needs of the State’s citizenry and the visiting public that contributes significantly to State’s tourism economy

Recommendations

SHORT-RANGE

- Create modal plans and programs that synchronously improve safety and system operations while taking the community, environmental and economic goals in mind.
- Implement land use strategies that reduce impedance through the reduction of distances in consumer activities (ex: shopping, recreation, etc.).²⁴
- Create public spaces with bicycle/pedestrian and transit access in order to reduce automobile dependency.²³
- Work with tribal nations and communities to improve multimodal accessibility and mobility by integrating the tribal transportation network into the overall transportation network.
- Create new transportation demand management strategies that improve travel efficiency;
- Increase subsidies for projects or programs that provide greater access and connections for the public to desired destinations.

MID-RANGE

- Focus on transit-oriented development projects that capitalize on incorporating high-density, mixed use areas that reduces individual dependency on cars encourages the use of transit.²³
- Support infill development to slow urban sprawl and increase density which will reduce distances between consumer activities, thus encouraging more people to take advantage of transit services, bicycling and walking.²³
- Increase the efficiency and reliability of transit service trips by having signal timing to favor public transit.²⁵
- Re-design the current roadways to integrate medians, channelized islands, and roundabouts to increase automobile throughput and multimodal accessibility.²⁴
- Ensure that an interconnected, multi-modal transportation network serves all segments of the State’s population as well as the significant number of tourists that visit each year from various destinations.
- Add bicycle lanes, and change signal timing/countdown to increase safety at cross intersections.²⁴
- Look at ways to develop more rideshare programs and efficient parking management strategies that will allow more people to move with the existing infrastructure in place.²⁴

- Work with tribes to improve multimodal accessibility and mobility.

PROMOTE SUSTAINABILITY IN RURAL COMMUNITIES AND SMALL TOWNS

CTP 2040 supports sustainable and active transportation options for all California’s residents; however, rural communities and small towns have special transportation challenges due to the sparse and widely spread populations. Communities must work towards planning a balanced, interregional, and interconnected transportation system through maintaining the existing road system which faces severe weather conditions. These factors jeopardize pavement integrity as well as the travel safety. CTP 2040 recommends strategies and options to address special needs and circumstances of small rural communities.

Recommendations

SHORT-RANGE

- Expand vanpool services as an effective way to connect rural and exurban communities with employment, food and recreational outlets.²⁶
- Provide accessibility to regional jobs markets, which can allow the transport of local made goods to urbanized areas as well as build connectivity for tourists and consumers for rural community businesses.²⁷
- Create efficient and sustainable transportation solutions that embrace communities’ unique context and culture.²⁸
- Integrate planning for the aging population in rural community and agency projects and services.²⁹
- Educate rural residential developers about integrating bicycling, walking and public transit into rural projects and plans.²⁷
- Increase the frequency of transit services that are available to riders at a level that can support their daily activities.²⁷

MID-RANGE

- Increase the State Transit Assistance and obtain extra funds that can be allocated towards improving transit services.
- Integrate mixed-use housing into commercial areas within small towns allowing residents to be less reliant on cars.²⁵
- Develop rural roadways to support multi-modal accessibility for bicyclists, walking pedestrians, transit and automobiles.
- Encourage private sector companies to invest within the existing rural and small town communities.²⁸
- Link areas that have labor shortages with communities that have a surplus amount in labor.³⁰
- Increase connectivity to medical care and social services, employment and educational facilities to increase health and quality of life within the rural residential communities. Also build proper accessibility to employment and educational facilities.²⁸

- Partner with local, regional, and tribal governments on planning rural transit improvements with rural transit agencies.

SYSTEM EFFICIENCY AND TECHNOLOGY

STREAMLINE DELIVERY

The CTP 2040 guides various State agencies and departments to work together to establish programs that will help streamline delivery of infrastructure projects that are critical for achieving GHG emission reduction goals. Applying advance mitigation planning in multiple regions will help the State take the next critical steps to plan for sustainable infrastructure on an interregional basis.

[Recommendations](#)

SHORT-RANGE

- Adopt a process to quickly advance projects that will reduce GHG emissions by improving the efficiency of the environmental review process.
- Develop implementation guidance for SB 226 (expanding SB 375 CEQA streamlining provisions) with the Governor's Office of Planning and Research.
- Develop advance-mitigation-planning programs among Caltrans and other State departments that will allow simultaneous consideration of the environmental effects of several planned infrastructure projects.

COORDINATE DATA AND ANALYSIS

The CTP 2040 performance measures should be used statewide to compare like metrics across regions. The CSTDM (see Chapter 7) is a key tool for better understanding statewide travel and the cumulative effects of regional planning efforts on the transportation system.

[Recommendations](#)

SHORT-RANGE

- Coordinate data and analysis efforts across regions to ensure consistency and comparability of results.
- Expand partnerships with tribal governments to improve data collection for both traffic volumes and crash data.
- Secure funding to make available data statewide.

SYSTEMIZE TRAFFIC MANAGEMENT

The CTP 2040 shows that Traffic Management Systems (TMS) are an effective and economical way to improve the current transportation system within California through: ramp meters, real time weather/accident update message signs, and traffic incident management. With existing technologies, there is great potential to meet the State's future mobility needs. The CTP 2040 encourages investment in more TMS technology and the maintenance of current devices. The management of the SHS can move from reactive to active traffic management, finally finding a predictive method/technology that will allow engineers to relieve traffic congestion before it occurs.

Recommendations

MID-RANGE

- Develop a performance-based framework that prioritizes TMS work activities and funding.³¹
- Create a TMS infrastructure that fosters high-performance and good maintenance which will improve real-time system management.³⁰
- Develop and implement real-time corridor-wide strategies that optimize traffic flow, pedestrian safety and the reduction of GHG's while working in cooperation with jurisdictional stakeholders.³⁰

MID TO LONG-RANGE

- Implement automated toll collection services that reduce delays through collecting tolls electronically, which can increase the flow of traffic, rather than exacerbate congestion and traffic at conventional toll booths.³²
- Adopt adaptive traffic signal controls which can help with the reduction in delays and GHG emissions. Using adaptive control over traffic signals through real-time can improve the efficiency of corridors and traffic conditions through optimized algorithms.³¹

LONG RANGE

- Explore the technology of Connected Vehicles and Vehicle Platooning.

MANAGE TRANSPORTATION DEMAND

The CTP 2040 supports Transportation Demand Management (TDM) tools to develop ways pedestrians can participate in sustainable and environmentally friendly modes of travel through: ridesharing, transit, telecommuting, biking and walking.

Recommendations

SHORT-RANGE

- TDM strategies must be incorporated into general planning.³³
- Congestion management systems should incorporate TDM strategies that enhance regional mobility and accessibility to maximize transportation efficiency.³²
- Make TDM strategies that address mobility and accessibility a part of the public involvement dialogue to gain broadened community support.³²
- Implement TDM strategies that enhance travel reliability for all modes including real-time traveler information, preferential treatment for High Occupancy Vehicle / High-Occupancy Toll (HOV/HOT) lanes and transit vehicles.³²
- Implement strategies that limit automobile traffic through reducing total vehicle mileage.³²
- Inform companies of the benefits of offering alternative work arrangement strategies to employees, such as: telecommuting, flextime, and compressed work weeks.³²

MID-RANGE

- Put forth strategies that will shift travel to be more transit focused and rideshare oriented to provide better road safety benefits.³²

INVEST STRATEGICALLY

The CTP 2040 sets a strategy for Caltrans and its partners to address mobility needs on interregional corridors through investments that include system maintenance and preservation, system efficiency, operations, and multimodal capacity expansion.

The motto of “Fix It First” if applied to maintenance of the state’s highways would have a major impact on the cost of transportation in the State. The SHS has a replacement value of over \$1.2 trillion.³⁴ Protecting this investment will require continuous maintenance and rehabilitation. According to the ten-year study period (2011 to 2020), the total cost to bring the transportation facilities into a “state of good repair” was \$341.1 billion.

The State Highway Operations and Protection Program (SHOPP) provides capital funding to address this, however, funding levels are not sufficient to meet all maintenance and rehabilitation needs. If this is not addressed, the SHS will continue to deteriorate because of limited funding. Roads, highways, bridges, airports, seaports, railways, border crossings, and public transit infrastructure need adequate investment and restoration to protect the future of the State’s economy and quality of life.³⁵

Recommendations

SHORT-RANGE

- Avoid funding projects that add road capacity and increased maintenance costs.
- Use California State Transportation Demand Model (CSTDM) findings (see Chapter 7) to make sound investments in communities.
- Preservation of the existing transportation system should always be high priority when making investment decisions on maintenance and rehabilitation.³⁵
- Maintain the existing SHS and roads which would also include 46 percent of the state’s road miles in rural areas.
- Make quick and preventive treatments to avoid more costly maintenance in the future. Utilize and install new operational strategies and technologies to optimize the use of system capacity.³⁶
- Gain efficiency from better coordination of diverse services, better features, and greater ridership.³⁷

LONG-RANGE

- Target rail capital improvements that serve to integrate the network, that have system-wide benefits and that maximize the use of existing infrastructure capacity.

EXPAND FREIGHT NETWORK CAPACITY

Freight transportation supports business and the economy. The freight industry moved over \$17 trillion dollars of goods

nationally in 2012.³⁸ Congestion and insufficient infrastructure such as port access roads and rail line overpasses are leading problems for the freight industry resulting in impacts of fifteen major freight chokepoints and bottlenecks throughout California. Total shipment by weight is expected to grow by 180 percent by 2040. This growth leads to concerns about the State's ability to meet freight movement demands.

SHORT-RANGE

- Incorporate freight projects into planning documents, e.g., RTPs and Overall Work Programs (OWPs).
- Work with tribal governments to improve freight accessibility to tribal lands.
- Prioritize California Freight Management Plan (CFMP) projects to maximize financial resources.
- Invest in capitalized rail maintenance projects in shared use intercity passenger rail corridors that preserve freight capacity and maintain on-time passenger train performance.

MID-RANGE

- Create a dedicated, reliable, and long-term freight funding program.
- Maximize resource in the freight network with collaborative efforts between the public and private sectors. For example, the public may be willing to help freight industries finance dedicated truck lanes to improve vehicle movement on public roadways.

- Preserve light-density rail lines because the overall freight demand is anticipated to grow throughout California's main line network, thereby exacerbating existing issues and conflicts on tracks jointly used by freight and passenger trains.⁴⁰

MID TO LONG-RANGE

- Preserve light-density freight rail lines, identify and implement improvements in shared-use corridors allowing expansion of both freight and passenger rail operations to meet market demands, and invest in dedicated freight rail infrastructure in heavily used corridors.

MID TO LONG-RANGE

- Preserve light-density freight rail lines, identify and implement improvements in shared-use corridors allowing expansion of both freight and passenger rail operations to meet market demands, and invest in dedicated freight rail infrastructure in heavily used corridors.

LONG DISTANCE MULTIMODAL TRANSPORTATION

Multi-modal long distance transportation includes ground access, air and rail. Together, these modes create a long-distance transportation network. The multimodal transportation system continues to be a visible and important part of the State. Aside from the familiar use of meeting commercial passenger and air cargo needs, California's General Aviation airports are redefining themselves to better support community job growth and economic sustainability. In addition, High Speed Rail is making its way into the future transportation system.

[Recommendations](#)

SHORT-RANGE

- Serve as transfer hubs for multiple modes of transportation.
- Expand business and light manufacturing opportunities, with considerations of existing and planned surrounding uses.
- Capitalize on the competitive advantage of having a business-friendly airport zone.
- Sitting law enforcement, fire and medical support services in an area that accommodates aviation training and operations.

RECOMMENDATIONS FROM MODELING ANALYSIS

REDUCE VMT

SHORT-RANGE

- Create policies to incentivize employers to provide greater telecommuting options, and alternative work schedules designed to reduce work-related travel reduce drive-alone commuting to work.
- Secure additional funding to implement significant transit improvement strategies, including, but not limited to, increasing speeds, decreasing fares, increasing BRT, and improving transfer times.
- Create policies and secure funding for increasing and improving bicycling and pedestrian infrastructure, security, and education.
- Implement substantial public outreach to publicize the GHG benefit of eco-driving, car sharing and telecommuting.

MID-RANGE

- Create legislation to implement an aggressive mix of VMT reduction strategies, including, but not limited to, road pricing strategies, increasing car sharing, increasing the minimum carpool requirements, and increasing HOV lanes.
- Utilize funds from the road pricing strategies to fund improvements for driving alternatives.

- Expand High Speed Rail

REDUCE GHG EMISSIONS IN THE TRANSPORTATION SECTOR

LONG-RANGE

- Create incentives for drivers of Zero Emissions Vehicles (ZEVs), to greatly increase the percentage of these vehicles in the overall fleet in order to achieve the 2050 GHG reduction target for the transportation sector.
- Subsidize and incentivize (via legislation) an aggressive shift to alternative vehicle fuels, including, but not limited to biofuel blends, hydrogen, and electricity in order to achieve the 2050 GHG reduction target for the transportation sector.
- Subsidize and incentivize (via legislation) an aggressive advancement of vehicle technologies in order to achieve the 2050 GHG reduction target for the transportation sector.

ADVANCE MODELING AND DATA

SHORT-RANGE / ONGOING

- Secure stable funding for statewide data collection, model development, documentation, and data visualization activities to support policy making activities.
- Expand use of common input assumptions between State and MPO forecasting efforts, including socio-economic data, interregional travel forecasts, goods movement/trucking, pricing policies, and other areas where data sharing will result in better and more consistent

travel demand forecasts across jurisdictions.

- Coordinate data and analysis efforts across regions to ensure consistency and comparability of results.
- Expand partnerships between state agencies and Caltrans for model training, coordination of activities, and periodically updating modeling guidelines and requirements for RTP/SCS and CTP forecasting.
- Implement the California Commercial Vehicle Inventory Survey (Cal VIUS)
- Coordinate statewide model activities such as the CSTDM, CSFFM, EMFAC, and Vision to enhance the capabilities of all agencies.
- Deploy a statewide integrated land use-transportation modeling system.
- Conduct a new statewide household travel/activity survey with GPS and on-board vehicle diagnostics. Ideally, the statewide household travel survey should be conducted on an on-going and continuous basis. Decennial surveys have proven burdensome for Caltrans and MPOs, and key information on household changes over time are not currently collected.
- Funding for regular modal surveys (including transit on-board surveys, and pedestrian/bicycle activity surveys), and big data analysis using anonymous cell phone/GPS data to improve understanding of travel patterns.

- Conduct data collection and research on visitor travel to California. This information is largely absent from existing travel demand models.

CONCLUSION

The goals, strategies, policies and recommendations for the CTP 2040 respond to the rapidly changing demands of transportation services and the transportation system in California. The CTP 2040 is a plan for all

of California and seeks to provide a unified approach to statewide transportation planning and policy. The recommendations give the people of California a guide for how Caltrans, along with other State, regional and local agencies, and individuals contribute to transportation planning in a way that meets GHG emissions reduction targets and the meet the vision for a transportation system that is safe, sustainable and globally competitive.

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ARB	Air Resources Board
APS	Alternative Planning Strategy
ATP	Active Transportation Program
BIA	Bureau of Indian Affairs
BOE	California Board of Equalization
BRT	Bus Rapid Transit
CalSTA	California State Transportation Agency
Caltrans	California Department of Transportation
Cal VIUS	California Commercial Vehicle Inventory Survey
CARB	California Air Resources Board
CASP	California Aviation System Plan
CEQA	California Environmental Quality Act
CFMP	California Freight Mobility Plan
CHSRA	California High Speed Rail Authority
CHTS	California Household Travel Survey
CIB	California Interregional Blueprint
CO2	Carbon Dioxide
CPTED	Crime Prevention through Environmental Design
CSFFM	California Statewide Freight Forecasting Model
CSMP	Corridor System Management Plans
CSTA	Consolidated Transportation Services Agencies
CSTDM	California Statewide Travel Demand Model
CSRP	California State Rail Plan
CSS	Context Sensitive Solutions
CTC	California Transportation Commission
CTP	California Transportation Plan
CTIP	California Transportation Infrastructure Priorities
E-85	Ethanol Fuel Blends
EGPR	Governor's Environmental Goals and Policy Report

EJ	Environmental Justice
EMFAC	ARB's Emission FACTors model
EMS	Emergency Medical Services
EOP	Emergency Operations Plan
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GARVEE	Grant Anticipation Revenue Vehicles (bonds)
GHG	Greenhouse gas
GIS	Geographic Information System
GSP	Gross State Product
HDV	Heavy Duty Vehicles
HOT	High Occupancy Toll lanes
HOV	High Occupancy Vehicle
HSR	High-speed rail
HTF	Highway Trust Fund
HVTU	Heavy vehicle use tax
ICM	Integrated Corridor Management
ICS	Incident Command System
IFD	Infrastructure Financing District
IRR	Indian Reservations Roads program
IRS	Internal Revenue Service
ITHiM	Integrated Transport and Health Impact Model
ITIP	Interregional Transportation Improvement Program
ITS	Intelligent Transportation Systems
ITSP	Interregional Transportation Strategic Plan
LCCA	Life-cycle Cost Analysis
LCP	Local Coastal Programs
LDV	Light Duty Vehicles
LOS	Level of Service
MAP-21	Moving Ahead for Progress in the 21st Century

MMT	Million Metric Tons
MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organizations
MTC	Bay Area Metropolitan Transportation Commission
MTP	Metropolitan Transportation Plan
NHTS	National Household Travel Survey
OPR	Office of Planning and Research
OWP	Overall Work Programs
PAC	Policy Advisory Committee
PaveM	Pavement Management System Software
PeMS	Caltrans Performance Measurement System
PPP	Public Participation Plan
PTA	Public Transportation Account
PTC	Positive Train Control
RAMP	Regional Advance Mitigation Planning
RTA	Reservation Transportation Authority
RTIP	Regional Transportation Improvement Program
RTP	Regional Transportation Plan
RTPA	Regional Transportation Planning Agencies
RUCS	Rural-Urban Connections
SACOG	Sacramento Area Council of Governments
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SAMI	Statewide Advance Mitigation Initiative
SANDAG	San Diego Association of Governments
SCAG	Southern California Association of Governments
SCS	Sustainable Communities Strategies
SFTI	Sustainable Freight Transport Initiative
SHA	State Highway Account
SHOPP	State Highway Operations Protection Program

SHS	State Highway System
SHSP	Strategic Highway Safety Plan
SLR	Sea Level Rise
SMF	Smart Mobility Framework
SRTS	Safe Routes to School
STA	State Transit Assistance
STIP	State Transportation Improvement Program
SWAP	State Wildlife Action Plan
TAC	Technical Advisory Committee
TCRP	Traffic Congestion Relief Program
TEROs	Tribal Employment Rights Ordinances
TEUs	20-foot Equivalent Units
TDA	Transportation Development Act
TDM	Transportation Demand Management
TMS	Caltrans's Traffic Management System
TOD	Master Plan Strategy
TOD	Transit-Oriented Development
TREDIS	Transportation Economic Development
TSMO	Transportation System Management and Operations
TTP	Tribal Transportation Program
TZD	Towards Zero Deaths
USDOT	United States Department of Transportation
V2I	Vehicles connected to transportation infrastructure
V2V	"Connected" Vehicles
VHD	Vehicle-Hours-of-Delay
VHT	Vehicle Hours of Travel
VISION	ARB's Vision for Clean Air
VLf	Vehicle License Fee
VMT	Vehicle Miles Traveled
ZEV	Zero-Emission Vehicle

APPENDIX A: CALIFORNIA NATIVE AMERICAN TRIBES, TRUST LANDS AND THE STATE HIGHWAY SYSTEM

TABLE 11. CALIFORNIA TRIBES

COUNTY	TRIBE
Alpine	Washoe Tribe of Nevada and California
Alpine	Woodfords Community Tribal Council (Part of Washoe Tribe)
Amador	Buena Vista Rancheria of Me-Wuk Indians of California
Amador	Ione Band of Miwok Indians of California
Amador	Jackson Rancheria of Me-Wuk Indians of California
Butte	Berry Creek Rancheria of Tyme Maidu Indians
Butte	Enterprise Rancheria of Maidu Indians
Butte	Mechoopda Indian Tribe of Chico Rancheria
Butte	Mooretown Rancheria of Maidu Indians
Calaveras	California Valley Miwok Tribe
Colusa	Cachil Dehe Band of Wintun Indians of the Colusa Indian Community
Colusa	Cortina Rancheria of Wintun Indians
Del Norte	Coast Indian Community of Resighini Rancheria
Del Norte	Elk Valley Rancheria
Del Norte	Smith River Rancheria of California
El Dorado	Shingle Springs Band of Miwok Indians
Fresno	Big Sandy Rancheria of Mono Indians
Fresno	Cold Springs Rancheria of Mono Indians
Fresno	Table Mountain Rancheria
Glenn	Grindstone Rancheria of Wintun-Wailaki Indians
Humboldt	Bear River Band of Rohnerville Rancheria
Humboldt	Big Lagoon Rancheria
Humboldt	Blue Lake Rancheria
Humboldt	Hoopa Valley Tribe
Humboldt	Cher-Ae Heights Indian Community of the Trinidad Rancheria
Humboldt	Wiyot Tribe
Humboldt	Yurok Tribe
Imperial	Fort Yuma Quechan Indian Nation
Imperial	Torres-Martinez Desert Cahuilla Indians
Inyo	Big Pine Paiute Tribe of Owens Valley
Inyo	Bishop Paiute Tribe
Inyo	Fort Independence Community of Paiute
Inyo	Lone Pine Paiute-Shoshone Tribe
Inyo	Timbisha Shoshone Tribe

TABLE 11. CALIFORNIA TRIBES

Kern	Tejon Indian Tribe
Kings	Tachi Yokut Tribe (Santa Rosa Rancheria)
Lake	Big Valley Band of Pomo Indians of the Big Valley Rancheria
Lake	Elem Indian Colony of Pomo of the Sulphur Bank Rancheria
Lake	Habematolel Pomo of Upper Lake
Lake	Middletown Rancheria Band of Pomo Indians
Lake	Robinson Rancheria of Pomo Indians
Lake	Scotts Valley Band of Pomo Indians
Lake	Sherwood Valley Rancheria Band of Pomo Indians
Lake (and Sonoma)	Koi Nation of Northern California
Lassen	Susanville Indian Rancheria
Madera	North Fork Rancheria of Mono Indians
Madera	Picayune Rancheria of the Chuckchansi Indians
Mendocino	Cahto Tribe
Mendocino	Coyote Valley Band of Pomo Indians
Mendocino	Guidiville Band of Pomo Indians
Mendocino	Hopland Band of Pomo Indians
Mendocino	Manchester Band of Pomo Indians of the Manchester-Point Arena Rancheria
Mendocino	Pinoleville Pomo Nation
Mendocino	Potter Valley Tribe
Mendocino	Redwood Valley Rancheria of Pomo Indians
Mendocino	Round Valley Indian Tribes
Modoc	Alturas Rancheria of Pit River Indians
Modoc	Cedarville Rancheria of Northern Paiute Indians
Modoc	Fort Bidwell Indian Community of Paiute
Mono	Benton Paiute Reservation (Utu Utu Gwaitu Paiute Tribe)
Mono	Bridgeport Indian Colony
Placer	United Auburn Indian Community of the Auburn Rancheria
Plumas	Greenville Rancheria
Riverside	Agua Caliente Band of Cahuilla Indians
Riverside	Augustine Band of Cahuilla Mission Indians
Riverside	Cabazon Band of Mission Indians
Riverside	Cahuilla Band of Indians
Riverside	Morongo Band of Mission Indians

TABLE 11. CALIFORNIA TRIBES

Riverside	Pechanga Band of Luiseño Indians
Riverside	Ramona Band of Cahuilla Mission Indians
Riverside	San Manuel Band of Serrano Mission Indians
Riverside	Santa Rosa Band of Cahuilla Indians
Riverside	Soboba Band of Luiseño Indians
Riverside	Torres-Martinez Desert Cahuilla Indians
Sacramento	Wilton Rancheria
San Bernardino	Chemehuevi Indian Tribe
San Bernardino	Colorado River Indian Tribes
San Bernardino	Fort Mojave Indian Tribe
San Bernardino	San Manuel Band of Serrano Mission Indians
San Bernardino	Twenty-Nine Palms Band of Mission Indians
San Diego	Barona Band of Mission Indians
San Diego	Campo Kumeyaay Nation
San Diego	Ewiiapaayp Band of Kumeyaay Indians
San Diego	Iipay Nation of Santa Ysabel
San Diego	Inaja and Cosmit Band of Mission Indians
San Diego	Jamul Indian Village
San Diego	La Jolla Band of Luiseño Indians
San Diego	La Posta Band of Mission Indians
San Diego	Los Coyotes Band of Mission Indians
San Diego	Manzanita Band of Kumeyaay Nation
San Diego	Mesa Grande Band of Mission Indians
San Diego	Pala Band of Mission Indians
San Diego	Pauma Band of Luiseño Indians (Pauma and Yuima)
San Diego	Rincon Band of Luiseño Indians
San Diego	San Pasqual Band of Mission Indians
San Diego	Sycuan Band of Kumeyaay Nation
San Diego	Viejas Band of Kumeyaay Indians
Santa Barbara	Santa Ynez Band of Chumash Indians
Shasta	Pit River Tribe (includes XL Rancheria, Lookout Rancheria, Likely Rancheria)
Shasta	Redding Rancheria
Siskiyou	Karuk Tribe
Siskiyou	Quartz Valley Indian Reservation
Sonoma	Cloverdale Rancheria of Pomo Indians
Sonoma	Dry Creek Rancheria Band of Pomo Indians
Sonoma	Federated Indians of Graton Rancheria

TABLE 11. CALIFORNIA TRIBES

Sonoma	Kashia Band of Pomo Indians of the Stewarts Point Rancheria
Sonoma	Lytton Rancheria
Tehama	Paskenta Band of Nomlaki Indians
Tulare	Tule River Tribe
Tuolumne	Chicken Ranch Rancheria of Me-Wuk
Tuolumne	Tuolumne Band of Me-Wuk
Yolo	Yocha Dehe Wintun Nation (aka Rumsey Indian Rancheria of Wintun)

FIGURE 1. NATIVE AMERICAN TRUST LANDS AND HIGHWAYS – NORTHERN CALIFORNIA

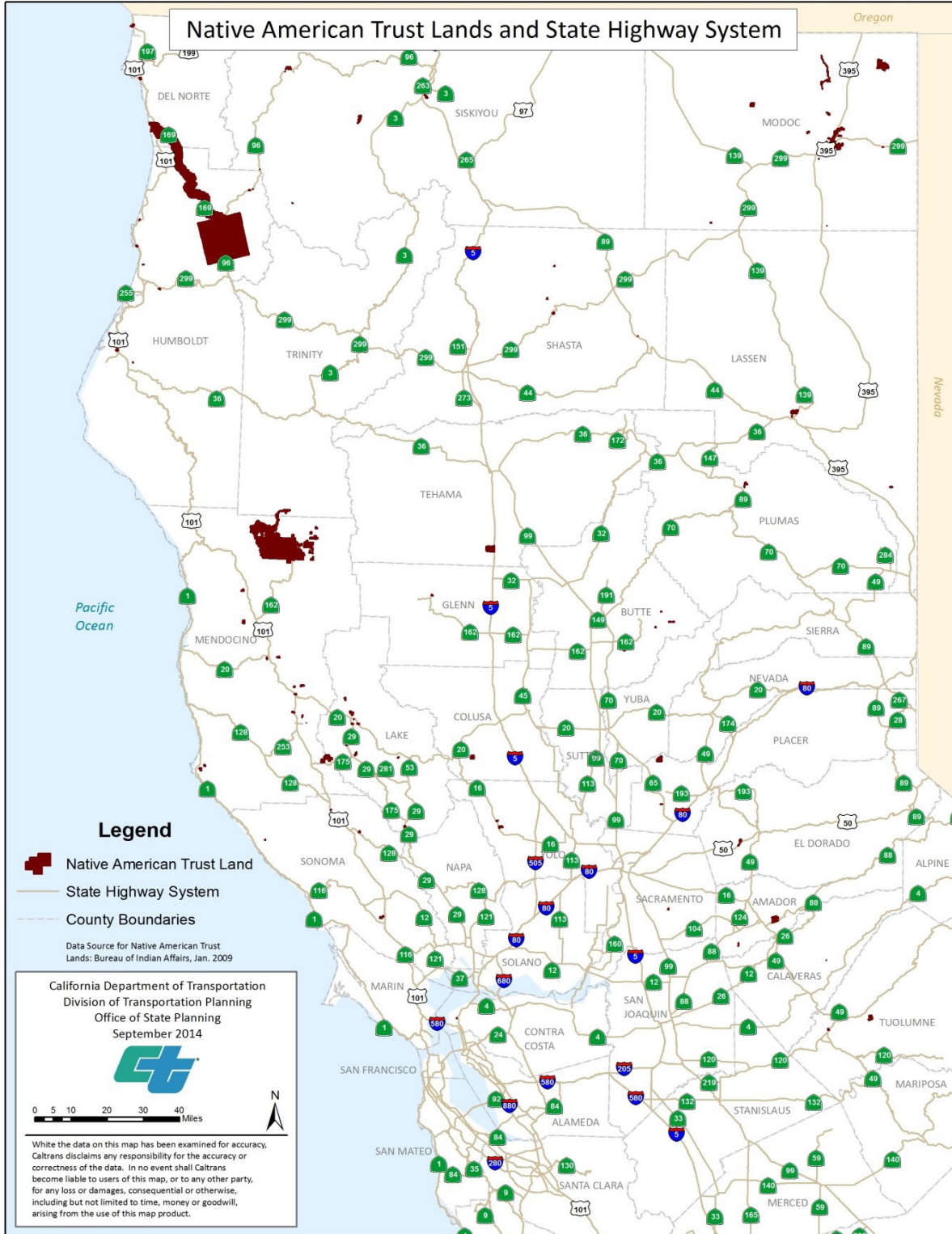


FIGURE 2. NATIVE AMERICAN TRUST LANDS AND HIGHWAYS – CENTRAL CALIFORNIA

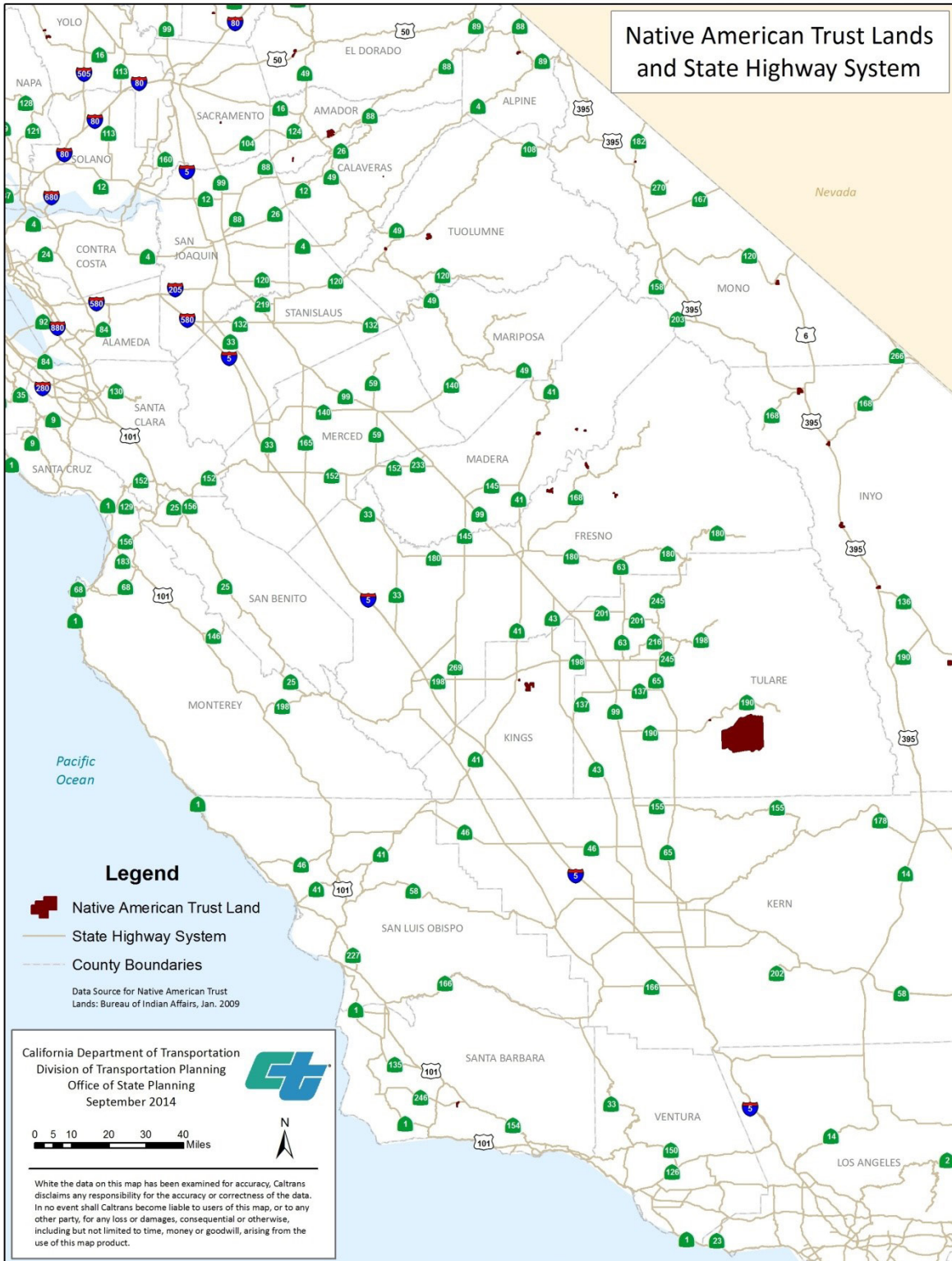
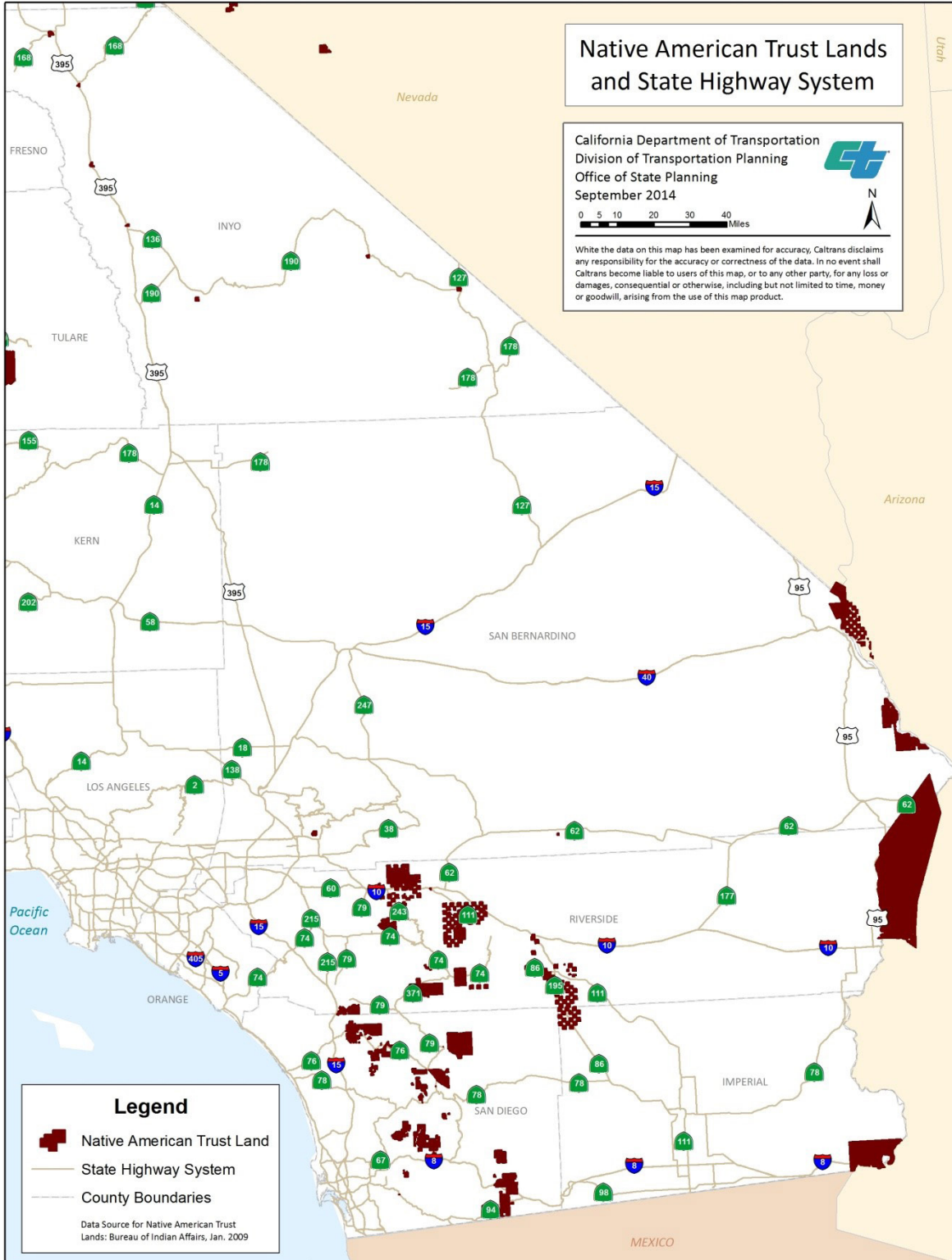


FIGURE 3. NATIVE AMERICAN TRUST LANDS AND HIGHWAYS – SOUTHERN CALIFORNIA



INTRODUCTION

This report focuses on the technical analyses conducted to evaluate VMT and GHG reduction strategies, and economic benefits contained in the CTP Alternatives. Key technical analyses were centered on the California Statewide Travel Demand Model (CSTDM), ARB's Emissions Factor (EM-FAC) and VISION Models, and the Transportation Economic Development Impact Software (TREDIS).

CALIFORNIA STATEWIDE TRAVEL DEMAND MODEL

The CSTDM was recently updated using the most current information from the 2012 California Household Travel Survey, the 2010 US Census, and assumptions from California MPO Sustainable Community Strategies (SCSs), effective Spring 2013. The CSTDM (dubbed CSTDM Version 2.0) is documented at the Caltrans website at http://www.dot.ca.gov/hq/tpp/offices/omsp/statewide_modeling/cstdm.html

The CSTDM is an integrated system of five components of typical weekday travel in California:

- Short distance personal travel
- Long distance personal travel
- Short distance truck travel
- Long distance truck travel
- Interregional Travel (from other states and Mexico)

The CSTDM also includes all mode of transportation including bicycle, walk and transit to trucks and high-speed rail (high-speed rail included only for future year forecasts). A summary of model components and modes of travel is shown in Table 1. Modes of travel are restricted to those logically associated with each model. For example, the long and short distance personal travel models do not allow for commercial truck travel. The long distance personal travel model excludes walk and bicycle trips, and high speed rail is excluded from short distance personal travel.

TABLE 1. CSTDM MODES OF TRAVEL FOR EACH MODEL COMPONENT.

Travel Modes	Models				
	Short Distance Personal	Long Distance Personal	Short Distance Truck	Long Distance Truck	External Travel
Auto Single Occupant	✓	✓			✓
Auto 2 persons	✓	✓			✓
Auto 3+ persons	✓	✓			✓
Transit (bus & urban rail)	✓				
Bicycle	✓				
Walk	✓				
Air		✓			
Intercity Rail		✓			
Trucks (3 classes x weight)			✓	✓	✓

The CSTDM was used to evaluate some of the 16 transportation strategies designed to reduce statewide VMT. Other strategies were evaluated off-model with prior research or from MPO SCS assumptions.

TRANSPORTATION STRATEGIES

Many regionally significant GHG reduction strategies pertaining to transportation were and are being identified by the MPOs RTP/SCS, as required by SB 375. For the most part these strategies address regional passenger travel. The CTP 2040, with guidance from the PAC and TAC, has taken the regional analyses further with 16 statewide transportation-related GHG reduction strategies for Alternatives 2 and 3. Transportation strategies were divided into four categories: pricing, transportation alternatives, mode

shift, and operational efficiency.

Strategies were evaluated using the CSTDM, or with off-model approaches. Off-model approaches represented either specific policies that could not be tested using CSTDM, or were evaluated from an aspirational standpoint. Policies were specific proposals that could be evaluated for potential effectiveness. For example, a road user charge, i.e., a policy to increase the cost of driving, was evaluated using the CSTDM which produced a decrease in statewide VMT. On the other hand, the transportation strategy to double the mode share of bicycling is an objective – and not based on a specific policy (or policies). Specific policies may be developed post hoc to achieve bicycling mode share objective. Put another way, a test of a policy is an input

that produces an output performance measure; an objective states the direct output performance measure without testing.

Transportation strategies were summarized by equivalent VMT reductions. Most of the strategies could be expressed directly in terms of VMT reductions; however, some strategies were expressed in other measures of effectiveness (such as fuel savings), and were subsequently converted to

equivalent VMT reduction. Expressing all strategies in terms of a single measure of effectiveness allows for direct comparison of the effectiveness and relative importance to GHG reductions.

Table 2 shows the 16 VMT reduction transportation strategies and their categories. Assumptions for each strategy are discussed below.

TABLE 2. CTP 2040 VMT REDUCTION TRANSPORTATION STRATEGIES MATRIX

Category / Strategy	Assumption	Evaluation Method: Source	Policy or Objective	VMT Reduction (estimated)
Pricing				
Road User Charge	75% increase in auto operating cost	CSTDM	Policy	-17%
Transportation Alternatives				
Telecommute/ Work at Home	2.1% increase in work at home rate	Off-Model: SACOG	Objective	-0.39%
Increased carpoolers	5% increase in carpool vehicles	Off-Model: Calculated using CSTDM data	Objective	-2.9%
Increased Car Sharing	Net 5% increase in adoption rates -- short distance travel	Off-Model: MTC, CARB Draft Policy Brief	Objective	-1.1%
Mode Shift				
Transit Service Improvements	All transit services doubled; transit speeds doubled, free transfers, reduced transfer wait times	CSTDM	Policy	-6% (includes Transit Service Improvements and HSR fare reductions)
High Speed Rail	HSR fares reduced by 50%	CSTDM	Policy	Included as part of transit service improvements
Bus Rapid Transit	Ridership change from converting Local Bus Routes to BRT	Off Model: TCRP 118, CSTDM Data	Policy	-0.07%
Expand Bike	Doubled bicycle shares	Off Model: CSTDM Data	Objective	-0.41%
Expand Pedestrian	Double walk shares	Off Model: CSTDM Data	Objective	-0.43%
Carpool Lane Occupancy Requirements	Change 2+ occupancy to 3+	CSTDM	Policy	-0.80%
Increased HOV Lanes	Added HOV lanes, Interregional connectors; Fill missing gaps (mixed flow lanes converted to HOV)	CSTDM	Policy	TBD
Operational Efficiency				
Incident/Emergency Management	Implementation of Caltrans System Management and Operations Plan	Off Model: Caltrans	Policy	-1.0% equivalent VMT savings
Caltrans' (TMS) Master Plan	Implementation of TMS Master Plan	Off Model: Caltrans	Policy	-1.2% equivalent VMT savings
ITS/TSM	Implementation of ITS/TSM strategies	Off Model: SACOG	Policy	-0.62%
Eco-driving	Reduced fuel consumption through changes in driving habits	Off Model: ARB Policy Brief	Objective	-0.23% equivalent VMT savings

The Transportation Research Board’s (TRB) National Cooperative Highway Research Program (NCHRP) report 20-24(59) was chosen as a framework for identifying alternative strategies that could be analyzed using the tools discussed later in this chapter. The CTP 2040 PAC and TAC were consulted and helped to guide the selection of specific strategies contained in Alternatives 2 and 3. During PAC and TAC involvement, additional input was gathered from all of the State’s 44 MPOs and RTPAs to help identify any gaps and overlap in regional transportation strategies.

Pricing Strategies

Three road-pricing strategies were initially evaluated: a road user charge (RUC) assessed to all vehicles; a gas or fuel tax (also applied to all vehicles); and congestion pricing (applied only on roadways during congested periods). RUC was used for the CTP analysis for applicability to the CSTDM, and for comprehensiveness (applied to all vehicles). The other two methods of road pricing could only be applied on a more limited basis. A gas tax could only be applied to carbon-based fuels such as gasoline and diesel, and congestion pricing would only be applied to the most congested highways. As such, the RUC was chosen as a comprehensive means to increase the cost of driving for all vehicles.

ROAD USER CHARGE

Road pricing was modeled in the CSTDM using an automobile operating cost variable; thus RUC and auto operating cost terms may be used interchangeably for the CTP

2040 road pricing analyses. Auto operating costs are a function of gasoline price projections with Corporate Average Fuel Economy (CAFÉ) standards forecasted for all CSTDM horizon years (through 2050). The auto operating costs were based on peer-reviewed assumptions developed for the California High-Speed Rail Authority¹. Auto operating cost assumptions were adopted into the CSTDM, and summarized in Table 3 for Years 2010, 2020 and 2040.

Changes in auto operating costs primarily impacted auto travel. On the commercial travel side, the CSTDM includes only truck travel. The statewide freight model – which could predict goods movement mode choice (such as rail versus truck) – was not available for this project. Thus commercial travel mode changes (such as shippers switching from truck to rail) could not be analyzed under this context.

TABLE 3. AUTO OPERATING COST ASSUMPTIONS

Motor Gasoline in California	--
Fuel Efficiency (mpg)	--
Gas Operating Cost (\$/mile)	--
Non Gasoline Operating Cost (\$/mile)	--
2010 Auto Operating Cost (\$/mile)	\$0.23
Motor Gasoline in California	\$3.72
Fuel Efficiency (mpg)	24.1
Gas Operating Cost (\$/mile)	\$0.15
Non Gasoline Operating Cost (\$/mile)	\$0.09
2020 Auto Operating Cost (\$/mile)	\$0.24
Motor Gasoline in California	\$4.83
Fuel Efficiency (mpg)	36.1
Gas Operating Cost (\$/mile)	\$0.13
Non Gasoline Operating Cost (\$/mile)	\$0.09
2040 Auto Operating Cost (\$/mile)	\$0.22

Industry analysts have predicted that road pricing will be among the most effective strategies in reducing vehicle miles of travel (VMT) and greenhouse gas (GHG) emissions. A forecast based on the CSTDM seems to confirm this assumption. A 2010 base-year sensitivity test was conducted that doubled auto operating costs, and additional 2040 tests were conducted to raise auto operating costs by 2, 8 and 16 cents per mile. These results are summarized in Table 4. Alternative 2 includes the 16 cent increase in auto operating costs – a 73% increase in the cost for auto travel compared to Alternative 1.

TABLE 4. AUTO OPERATING COST ASSUMPTIONS

SCENARIO	CHANGE IN AUTO OPERATING COST	CHANGE IN VMT
Year 2010 Double Auto Operating Costs	+100%	-22.5%
2040 – 16 cent Increase	+73%	-17.3%
2040 – 8 cent Increase	+36%	-10.6%
2040 – 2 cent Increase	+9%	-2.8%

Transportation Alternatives

Transportation alternatives include telecommuting, increasing the number of carpool vehicles, and increasing carsharing adoption rates. ARB and CAPCOA have documented VMT and GHG reductions associated with implementation of these strategies.

TELECOMMUTING

Telecommuting is the practice of working from home by employees who would otherwise travel to a workplace. Telecommuting

usually requires the ability to communicate with coworkers electronically, either by telephone, email, text message or video-conference. Alternatively, telecommuters may work from a “telecommuting center,” also called a “telecenter,” that provides desk space, Internet access, and other basic support services but is located closer to home than the established workplace.² CTP 2040 assumes an aggressive implementation of the telecommuting strategy.

The impact of increased telecommuting as an alternative to commuting was analyzed by SACOG as part of their Metropolitan Transportation Plan (MTP).³ SACOG used an off-model approach to forecast reduced VMT resulting from increased work at home shares – above and beyond that assumed in SACOG’s SCS. SACOG noted the adjustment for increased work at home shares did not count flexible or compressed work schedules (considered part of a TDM adjustment). SACOG determined that working at home resulted in an average daily decrease of between 5 and 7 VMT per worker. SACOG then calculated a range of GHG reductions of 0.13 to 0.39 percent, assuming variable increased rates of telecommuting. For the purposes of CTP 2040, the GHG reductions assumed by SACOG for telecommuting were converted to VMT for purposes of comparability with other transportation strategies. An implicit assumption of a one-to-one GHG to VMT reduction was assumed. The more aggressive SACOG travel reduction assumptions was applied on a statewide basis for CTP 2040 Alternatives 2 and 3. See Table 5.

TABLE 5. VMT REDUCTIONS ASSOCIATED WITH INCREASED TELECOMMUTING	
% Change Work at Home	+2.1%
Daily VMT reduced per worker	7.0
Change in VMT	-0.39%

Source: SACOG; Assumes a 1:1 relationship between GHG reductions and VMT reductions.

CARPOOLING

Carpooling, or ridesharing strategies promote carpooling or vanpooling as a method of increasing vehicle occupancies to reduce VMT. A relatively new concept known as “peer-to-peer ridesharing” has recently gained popularity. Peer-to-peer ridesharing allows drivers and riders traveling to the same place at the same time to connect efficiently via the Internet or mobile devices to share rides and share travel costs.

A more traditional form of ridesharing is casual carpooling, in which riders queue at designed pickup points in the early morning and late afternoon, as if at a taxi stand, and drivers heading to the desired destination give them a ride.⁴ Casual carpooling has been popular in the San Francisco Bay Area for decades for travelers using the West-bound San Francisco-Oakland Bay Bridge during the AM peak period (tolled direction).

The CTP 2040 assumes an aggressive implementation to increase carpooling participation by 5 percent statewide. The carpooling transportation strategy has been assessed as an off-model aspirational objective; that is, specific policies are not directly assumed. Rather, the VMT effects of the in-

creased carpool participation are assessed. Policies would need to be implemented at some future point in order to realize the objective of the carpool transportation strategy.

The following summarizes the methodology for calculating the VMT effects of increased carpooling participation rates. Increased carpooling has been assumed to come from solo occupant vehicles; that is, 5 percent of solo-occupant drivers have been assumed to switch from the drive along mode to carpool mode. The change in person-trips is shown in Table 6. Five percent of solo-occupant person trips were assumed to transfer to carpools, but total auto-based person-trips did not change. Non-auto travel modes were assumed to be unaffected by the increased carpooling assumption. Transportation modes unaffected by the carpooling transportation strategy included bicycle, walk, transit, truck, commercial airplane, conventional rail, and high-speed rail. To increase carpooling by 5 percent, solo occupant travelers were reduced by 7.0 percent for short distance personal travel, and by 12 percent for long distance personal travel.

The auto-based person-trips were converted to vehicle trips, assuming 2.0 persons per two person carpool vehicle and 3.75 persons per three-plus person vehicle. These calculations resulted in a statewide reduction of personal vehicle travel of 2.7 percent. See Table 7.

Multiplying average trip lengths for each mode of travel by the number of trips under the increased carpooling strategy yielded the change in vehicle miles of travel. The total change in VMT was -2.9 percent.

TABLE 6. CHANGE IN PERSON-TRIPS BY MODE WITH 5% INCREASE IN CARPOOLERS

	SOV	HOV2	HOV3+	Total
Short Distance Personal Travel				
Daily Person Trips	64,213,062	52,898,520	37,426,353	154,537,935
+5% Carpoolers	59,696,818	55,543,446	39,297,671	154,537,935
	-7.0%	5.0%	5.0%	
	SOV	HOV2	HOV3+	Total
Long Distance Personal Travel				
Daily Person Trips	88,106	108,180	105,193	301,479
+5% Carpoolers	77,437	113,589	110,453	301,479
	-12.1%	5.0%	5.0%	
		Other Modes	Total All Modes	
Daily Person Trips		40,297,025	195,136,439	
+5% Carpoolers		40,297,025	195,136,439	

TABLE 7. CHANGE IN VEHICLE TRIPS BY MODE WITH 5% INCREASE IN CARPOOLERS

	SOV	HOV2	HOV3+	Total
Short Distance Personal Travel				
Daily Vehicle Trips	64,213,062	26,449,260	9,980,361	100,642,683
+5% Carpoolers	59,696,818	27,771,723	10,479,379	97,947,920
	-7.0%	5.0%	5.0%	-2.7%
	SOV	HOV2	HOV3+	Total
Long Distance Personal Travel				
Daily Vehicle Trips	88,106	54,090	28,051	170,247
+5% Carpoolers	77,437	56,795	29,454	163,686
	-12.1%	5.0%	5.0%	-3.9%
		Other Modes	Total All Modes	
Daily Vehicle Trips		14,038,168	100,812,930	
+5% Carpoolers		14,038,168	98,111,606	
Total Change in Vehicle Trips			-2.7%	

CARSHARING

Carsharing allows people to rent cars by the hour for as little as 30 minutes up to a full week. Carsharing services have been available in the California since 2001, and in that time the number of subscribers and available vehicles has grown.⁵

CTP 2040 assumes an aggressive implementation to increase the use of carsharing. This transportation strategy was assessed using an off-model approach with assumptions developed for the MTC Region and applied statewide.

At the individual household level, carsharing could increase or decrease VMT. Carsharing may increase VMT for households that do not own automobiles, but other households with cars may choose to forego auto ownership (or own fewer vehicles) in favor of carsharing. An ARB Policy Brief examined two studies that found, “[R]eductions in VMT among vehicle-owners (or previous owners) who joined carsharing outweighed increases in VMT among non-owners who had joined at the time of the study. As a result, carsharing appears to have reduced VMT overall by about a quarter to a third among those who have participated.”⁶

MTC analyzed carsharing as part of their 2013 Regional Transportation Plan.⁷ MTC’s analysis assumed carsharing would increase region-wide due to new policies, such as the introduction of peer-to-peer carshare exchanges (which allows an individual to rent out his/her private vehicle when not in use), and one-way carsharing (in which vehicles are picked up in one location and returned to

another). MTC assumed a net five percent increase in carsharing region-wide. MTC’s analysis specifically noted higher rates of car sharing in urbanized areas, but that car sharing would also be expanded to suburban locations. See Table 8.

TABLE 8. INCREASED CAR SHARING ASSUMPTIONS, PLAN BAY AREA

EIR ALTERNATIVE	URBAN AREAS	SUBURBAN AREAS	ALL AREAS
No Project (2020 and 2035)	10%	0%	
Car Share Alternatives (2035)	15%	5%	
Net change in Car Share Adoption Rates	5%	5%	5%

Source: Metropolitan Transportation Commission and Association of Bay Area Governments

MTC cited research showing that carsharing reduced per-mile fuel consumption by 29 percent. ARB’s research referenced another study that found nearly 35% in fuel consumption savings. For CTP 2040, the lower 29 percent VMT reduction figure was used, and a one-to-one rate of fuel consumed to VMT savings applied. The 29 percent VMT reduction was applied to 5 percent of short-distance person travel, yielding an overall total VMT reduction statewide of 1.1 percent.

Mode Shift

Mode shift strategies include various improvements to facilitate, transit, bicycling, walking, and carpooling. The strategies include aggressive improvements to public transportation in California. Twenty percent

of local bus routes were converted to Bus Rapid Transit, and 2040 High-Speed Rail fares are assumed to be reduced to fifty percent. Additionally, improvements for bicycling, walking and carpooling modes are also analyzed.

TRANSIT SERVICE IMPROVEMENTS

Many different transit service-related improvements can be used to increase transit ridership. For CTP 2040, an aggressive set of transit improvements was assumed for this draft strategy. Note that high-speed rail is not considered under this strategy. Non-high speed rail transit service levels were assumed to double over 2040 baseline conditions, transit speeds for all services except high-speed rail were assumed to have been doubled, transit fares for all services excluding high-speed rail were assumed to be free, and widespread timed transfers were also included.

For the Year 2040 high-speed rail system, fares were assumed be reduced by 50 percent below those assumed in the 2013 State Rail Plan. No other changes to high-speed rail were assumed.

The intention of the transit improvement strategy was to identify the maximum VMT reductions from transportation strategies. Thus, the aggressive transit improvement strategy was devised. In particular, the transit strategy was also designed to help offset the road user charge by making transit a more viable option.

The transit service improvements combined with reduced high speed rail fares resulted

in a statewide VMT reduction of 6.0 percent.

REDUCED HIGH-SPEED RAIL FARES STRATEGY

The high speed rail (HSR) system in CTP 2040 is the same as assumed in the 2013 California State Rail Plan with service operating between the Los Angeles Region, San Joaquin Valley and San Francisco Bay Area. HSR service levels and speeds are not changed from Alternative 1, but Alternatives 2 and 3 HSR fares are assumed to be reduced by 50 percent.

BUS RAPID TRANSIT

This strategy assumed that 20 percent of local bus services were converted to Bus Rapid Transit (BRT). *TCRP Report 118: Bus Rapid Transit Practitioner's Guide*⁸ was used as a reference guide for documenting ridership changes for BRT improvements to local bus systems. Specific sets of improvements were not considered, as BRT systems vary from operator to operator and route to route. A combination of local bus to BRT improvements were assumed to meet the assumption of this strategy. The combination of improvements was determined in the TCRP report to be a requirement of high-quality BRT services required to substantially improve transit ridership for Alternatives 2 and 3. BRT improvements can include:

- Exclusive rights-of-way, including busways, exclusive lanes, and bypass/queue jumping lanes to reduce vehicle running time;

- Limited-stop service, including express service and skip-stopping;
- Intelligent transportation technology, such as signal priority, automatic vehicle location systems, system security, and customer information;
- Advanced technology vehicles and new, specially designed vehicles with doors on each side;
- Design of stations;
- Off-board, fare-payment smart cards or proof-of-payment systems;
- “Branding” the system;
- Vehicle guidance systems (mechanical, electronic, or optical); and
- Other strategies that enhance customer satisfaction.

The following calculations were used to determine VMT reductions associated with converting local bus services to BRT. The first assumption was to estimate the percentage of total transit ridership on local buses. Given a 2040 forecast of approximately 6.5 million total transit trips in Alternative 1, an estimate of 3.0 million local bus trips – slightly less than 50 percent of total transit ridership.

Given the prior assumption that 20 percent of all local bus trips would be converted to BRT, 600,000 daily local bus trips would be affected. With a conversion to high quality BRT services, the 600,000 daily transit trips would be expected to double. This increase in ridership is in line with guidance from

TCRP Report 118 for high BRT investments of multiple components.

Of these new transit riders, 25 percent were assumed to have been car drivers for Alternative 1, but switch to BRT under Alternatives 2 and 3. An average BRT trip length of 5.0 miles was also assumed. The latter two assumptions were made for simplification purposes and are not based on actual data. These assumptions may be varied to produce different VMT savings. However, using these estimates, this strategy produces a modest statewide VMT reduction of 0.07 percent. See Table 9.

TABLE 9. VMT CHANGES DUE TO BRT IMPROVEMENTS (INCLUDES ASSUMPTIONS)

1. Total Local bus trips (separate from existing BRT, express routes and rail)	3,000,000
2. Estimate % change in conversion of local bus to BRT	20%
= number of new local bus trips	600,000
3. Estimate % change of new BRT trips that were auto mode	25%
= reduced number of vehicle trips	150,000
4. Average trip length (miles)	5.0
= Calculated VMT savings	750,000
= Estimated VMT savings (as % of total daily 2040 VMT)	0.07%

EXPANSION OF BICYCLE USE

Strategies that facilitate increased bicycle use fall into two categories: 1) infrastructure projects that improve bicycle accessibility, safety, and convenience, either while traveling or at the end of the trip, and 2) programs that promote bicycling directly or indirectly through education, community events, advertising, and other activities.⁹ CTP 2040 assumes an aggressive implementation of the expansion of bicycle strategies.

Expanded bicycle use was considered in two ways. The CTP 2040 team considered trying to add up all the bicycle investments contained in regional transportation plans and assessing the impact to increased bicycle use. However, this proved to be too daunting a task, so a simplified aspiration objective of doubling the bicycle mode share over Alternative 1 was assumed. As with the other aspirational objectives, a desired outcome is stated (doubled bicycle mode shares). Specific policies would need to be enacted to achieve this outcome.

Table 10 describes the assumptions used for calculating VMT savings due to the increased bicycling mode share. Average bicycle trip length comes from the 2012 California Household Travel Survey.

TABLE 10. VMT CHANGES DUE TO INCREASED 2040 BICYCLE MODE SHARE (INCLUDES ASSUMPTIONS)

Change in mode share - bike	100%
New bike trips	2,499,528
Average Bike Trip Length (miles)	3.03
% of new bike trips that were formerly auto	50%
Reduced Auto trips - bike	1,249,764
Reduced Auto VMT - bike	3,786,785
% Reduction Auto VMT - bike	0.41%

EXPANSION OF PEDESTRIAN ACTIVITIES

The expansion of pedestrian strategies should enhance the walking environment. This can be accomplished directly with improvements to the pedestrian infrastructure, such as sidewalks pathways, and crossings. Other street improvements include street trees and lighting for enhanced pedestrian

comfort and security, which may encourage walking. Traffic calming techniques that reduce vehicle speeds and/or volume also enhance comfort and security for pedestrians, again potentially encouraging walking.¹⁰

CTP 2040 assumes an aggressive implementation of the expansion of pedestrian strategies. In line with the bicycle strategy assumption, a doubling of pedestrian mode shares has been assumed. Table 11 summarizes the calculations used to arrive at VMT savings associated with this transportation strategy.

The pedestrian strategy was developed as an aspirational objective. As with the other aspirational objectives, a desired outcome is stated (doubled walk mode shares). Specific policies would need to be enacted to achieve this outcome.

TABLE 11. VMT CHANGES DUE TO INCREASED 2040 PEDESTRIAN MODE SHARE (INCLUDES ASSUMPTIONS)

Change in mode share - walk	100%
New walk trips	14,511,263
Average Walk Trip Length (miles)	0.55
% of new walk trips that were formerly auto	50%
Reduced Auto trips - walk	7,255,632
Reduced Auto VMT - walk	3,990,597
% Reduction Auto VMT - walk	0.43%

CARPPOOL LANE REQUIREMENTS

Carpool lane occupancies were increased from 2+ persons to 3+ persons for all carpool lanes statewide. Carpool lanes with 3+ occupancy rates were not modified, thus a uniform 3+ carpool occupancy was as-

sessed.

This strategy was evaluated using the CSTDM and yielded a modest reduction of VMT by 0.8 percent statewide. The higher standard had the effect of improving aggregate carpool lane performance; however, increased carpool lane occupancy requirements also included forcing some 2-person carpools to solo driving (or to using mixed-flow traffic lanes). This result was seen most clearly for long-distance travel vehicle-hours of delay where drive alone and shared ride 2 person vehicles showed increased delay, while 3+-person carpools had reduced delays.

HIGH OCCUPANCY VEHICLE LANE EXPANSION

The high-occupancy vehicle (HOV) lane system is a strategy used to maximize the people-carrying capacity of California freeways. HOV lanes, often referred to as carpool lanes, are managed lanes that limit access to vehicles with higher occupancy (currently these lanes vary between two or more, and three or more people). The emphasis of this strategy will be connecting HOV gaps within and between metropolitan areas. This strategy has not yet been evaluated, but will be tested using the CSTDM. The complete list of new HOV lanes is still under development. Based on consultation with the CTP TAC and PAC, no new freeway lanes will be added; mixed flow traffic lanes will be converted to HOV in all cases.

Operational Efficiency

Strategies for operational efficiency included improved response times to incidents and emergency management, Caltrans TMS

Master Plan, intelligent transportation system elements, and eco-driving. Each of the operation efficiency strategies were evaluated off-model.

INCIDENT AND EMERGENCY MANAGEMENT

Incident management programs identify, analyze, and correct minor and major traffic incidents to help mitigate traffic backups as well as increase public safety. Incident management programs generally include three primary functions: 1) traffic surveillance – detecting and verifying traffic incidents, 2) clearance – coordinating the dispatch of emergency response teams to the site of the incident, and 3) traveler information – notifying motorists of the incident through changeable message signs to provide time to select a route that avoids the incident.¹¹ Incident and emergency management is one component of Caltrans' Transportation System Management and Operation (TSMO) program. The CTP 2040 assumes the implementation of all components of TSMO.

CALTRANS' TRANSPORTATION MANAGEMENT (TMS) SYSTEM MASTER PLAN

Caltrans' Transportation Management System Master Plan focuses on three core processes that help regain lost productivity in congestion. The three core processes include traffic control and management systems, incident management systems, and advance traveler information systems. All three processes rely on real-time, advance detection systems. These TMS processes and their associated detection systems represent a nucleus for the Department's traffic operations strategies, form a critical part of the overall system management strategy,

and are the focus of this report.¹² The TMS Master Plan is one component of Caltrans' Transportation System Management and Operation (TSMO) program. The CTP 2040 assumes the implementation of all components of TSMO.

INTELLIGENT TRANSPORTATION SYSTEM (ITS) ELEMENTS

Intelligent transportation systems (ITS) encompass a broad range of information communications and control technologies that improve the safety, efficiency, and performance of the surface transportation system. ITS technologies provide the traveling public with accurate, real-time information, allowing them to make more informed and efficient travel decisions.¹³ The CTP 2040 assumes an aggressive deployment of ITS.

ECO-DRIVING

For an ARB Policy Brief, Eco-driving has been defined as, *"a style of driving that saves energy, improving fuel economy and reducing tailpipe emissions per mile traveled. Eco-driving tactics include accelerating slowly, cruising at more moderate speeds, avoiding sudden braking, and idling less, as well as selecting routes that allow more of this sort of driving."*¹⁴

The ARB referenced studies of fuel savings that found, on average, 2.3 percent fuel savings for drivers using eco-driving tactics. For the purpose of analysis for the CTP, eco-driving is analyzed as an off-model aspirational objective of a 10 percent adoption rate. Applying to the 10 percent eco-driving adoption rate to the 2.3 percent fuel savings yields a net fuel savings of 0.23 percent. An

additional assumption of a 1:1 relationship between fuel savings and equivalent VMT reduction was made.

EMFAC¹⁵

The Emissions Factor (EMFAC) model is used to assess emissions from on-road passenger vehicles. The latest version of the model, EMFAC2011, was released in September 2011. The EMFAC2011 release is needed to support the ARB regulatory and air quality planning efforts and to meet the FHWA transportation planning requirements. EMFAC2011 includes the latest data on California's car and truck fleets and travel activity. The model also reflects the emission benefits of ARB's recent rulemakings, including on-road diesel fleet rules, Pavley Clean Car Standards, and the Low-Carbon Fuel Standard.¹⁶ CSTDM and CSFFM outputs are then input to EMFAC2011 to calculate future transportation-related emissions for California. The EMFAC model addresses the emissions quantification of the vehicle activity from both CSTDM and CSFFM, as required by SB 391.

ARB VISION¹⁷

The ARB Vision model is used for air quality and climate emissions planning. Vision evaluates strategies to meet California's multiple air quality and climate change goals well into the future (to the year 2050). The model's exploration of the technology and energy transformation needed to meet goals provides a foundation for future integrated air quality and climate change program development. Vision addresses future changes in vehicle technology, vehicle efficiency,

alternative fuels, and activity changes, and evaluates their impacts on emissions above and beyond on-road diesel fleet rules, Advanced Clean Car Standards, and the Low-Carbon Fuel Standard required by SB 391.

ARB Staff prepared a memo summarizing preliminary GHG emissions for CTP Alternatives 1, 2, and 3 using EMFAC and Vision model outputs. That memo is included in its entirety starting on page 153.

Transportation Systems Planning
Air Quality Planning and Science Division
California Air Resources Board
January 28, 2015

To: California Department of Transportation
CTP 2040 Staff

Subject: Preliminary ARB Vision CTP results for Alternatives 1, 2, and 3

Summary

Preliminary results for CTP 2040 Alternatives 1, 2, and 3 have been completed. The baseline, Alternative 1, achieved a 7% reduction in GHG emissions by 2040, but shows a slight increase of 3% in 2050 over the 2020 base year. Alternative 2 reduced GHG emissions, with 27% and 21% reductions in 2040 and 2050 respectively below the Alternative 1 2020 base year, but still did not achieve an 80% reduction by 2050 (the target is 32 MMT CO_{2e} for this analysis). Finally, Alternative 3 achieved an 80% reduction in 2050 achieving the GHG goal. Detailed analysis, input assumptions, and results are given below.

Background

For reference, Figure 1 below is a pie graph of the 2012 official Air Resources Board (ARB) greenhouse gas (GHG) emission inventory for all sectors. Total GHG emissions in 2012 were estimated to be 459 MMT CO_{2e} of which transportation accounted for 37% (167 MMT CO_{2e}) and industrial emissions, which include refineries and oil and gas extraction, accounted for 19% (89 MMT CO_{2e}) of the inventory. Figure 2 further breaks down the transportation section emissions, while Figure 3 expands the industrial section emissions. Figure 2 illustrates that on-road emissions from light-duty vehicles (LDV) and heavy-duty vehicles (HDV) account for 92% (154 MMT CO_{2e}) of the transportation sector emissions with LDV contributing the greatest portion (71% or 118 MMT CO_{2e}). From Figure 3, refineries and oil and gas extraction contribute ~50% of the industrial sector emissions (46 MMT CO_{2e}). Adding the three sectors together, transportation, refineries, and oil and gas extraction, gives a wheel-to-wheel (WTW) perspective of the transportation sector total emissions occurring in California, which account for nearly half of all the GHG emission (214 MMT CO_{2e}) in the 2012 emission inventory.

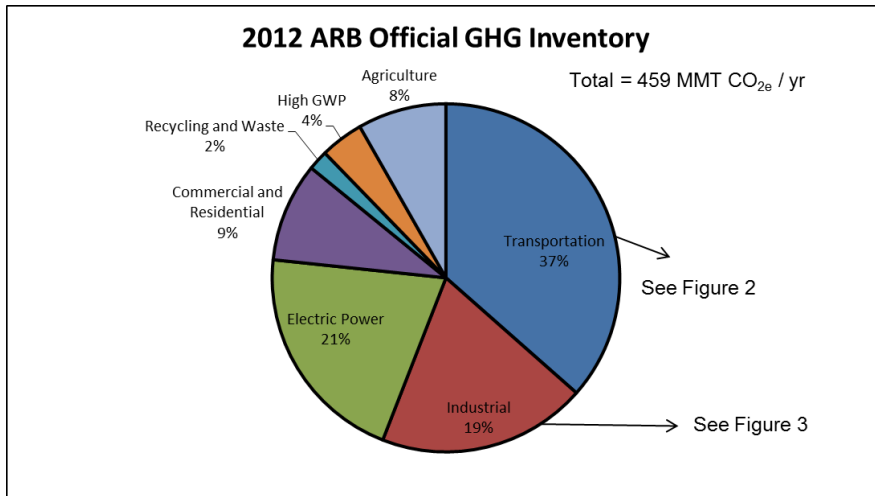


Figure 1: 2012 ARB Official GHG Inventory

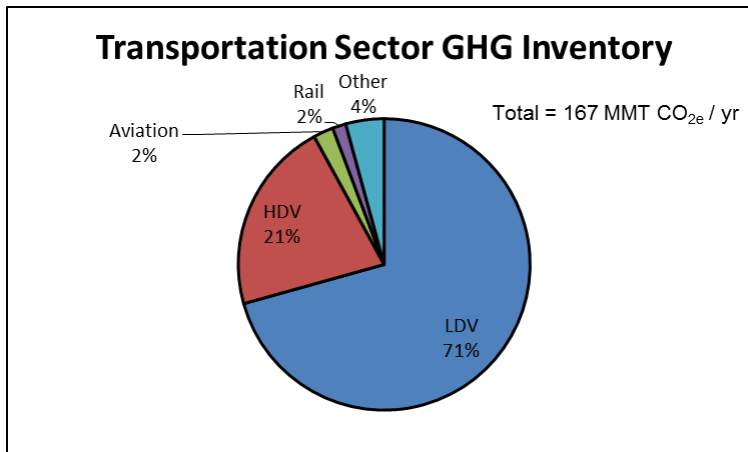


Figure 2: Transportation Sector GHG Inventory

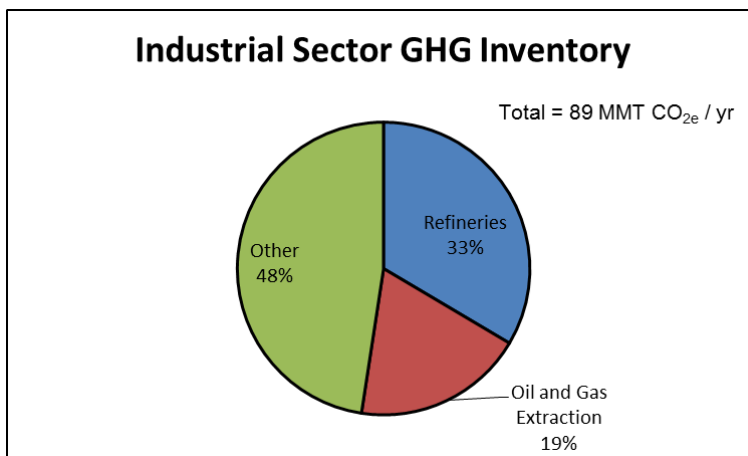


Figure 3: Industrial Sector GHG Inventory

Methodology

Scenarios were run for Caltrans Alternatives 1, 2, and 3 to determine total GHG emissions and fuel demand from 2010 to 2050. The sectors highlighted in this analysis, which were most relevant for CTP, were LDV, HDV, high speed rail (HSR), aviation (intrastate), and rail (passenger and freight). The ARB Vision 2.0 model was used for the analysis and other transportation sectors (ocean going vessels, harbor craft, cargo handling equipment, and off-road vehicles) lumped together under “other transportation” emissions. Vision 2.0 incorporates the latest data from ARB’s EMFAC 2014 as well as the newest baseline policy assumptions for other sectors.

LDV and HDV activity data was supplied to ARB from the Caltrans CSTDM model, which gave VMT by speed bin for three select years (2010, 2020, and 2040). Table 1 below displays total VMT in billions of miles for Alternative 1 in 2010, 2020 and 2040 and the 2040 VMT for the other two Alternatives. Also shown in the table is the percent reduction in VMT between Alternatives 1 and 2 (3 is the same VMT as 2). Note that VMT was reduced by 30% in 2040 for Alternative 2 and Alternative 3. ARB extrapolated VMT annually for years between 2010 and 2040. Beyond 2040, VMT growth rates from EMFAC 2014 were applied to the 2040 data point.

Table 1: Total VMT from CSTDM for Alternatives 1, 2 and 3 in billions of miles per year

	2010	2020	2040
Alternative 1			
<i>LDV</i>	189.7	208	251
<i>HDV</i>	74	73.5	83
Total	264	282	334
Alternatives 2 and 3			
<i>LDV</i>	-	-	161.9
<i>HDV</i>	-	-	71.3
Total	-	-	233
% Reduction			30%

Inputs for HSR came from the HSR Authority High Speed Rail plan, which gives LDV VMT offsets and intrastate aviation trip reductions. HSR authority assumes that HSR will be entirely powered by renewable electricity so there are no GHG emissions associated with HSR and HSR only affects VMT and aircraft trips. For conventional passenger rail, inputs were matched to Vision 2.0 and the Caltrans rail plan for Alternative 1. Ridership was assumed to double for Alternative 2. It was assumed that there were no aircraft fuel efficiency improvements for Alternatives 1 and 2, but HSR aircraft trip reductions were included for both alternatives. Finally, all other assumptions, including the off-road sectors, came from the ARB Vision 2.0 baseline scenario (projections of existing policies and sector growth estimates).

In order to achieve the 2050 GHG target, additional assumptions were made for Alternative 3 in ARB Vision 2.0 for the following sectors. For LDVs, the assumptions are that fuel efficiency increases such that new vehicle fuel efficiency is four times higher by 2050 from today's levels and an assumption of ~20 million LDV ZEVs on the road in 2050. For HDVs, the assumptions are that fuel efficiency is more than 50% higher by 2030 for new vehicles and ZEVs (BEV, FCV) will represent 12% of total sales by 2030. For freight rail and aviation, the assumptions are that fuel efficiency increases by 2.0% per year starting in 2015. Assumptions for HSR and conventional passenger rail remained the same as in Alternative 2.

For transportation fuels, this analysis assumes 7 billion gallons gasoline equivalent ("BGGE") bio-fuels are available, including drop-in renewable fuel, by 2050 (~1 BGGE in Alternative 1). Also assumed is a 75% renewable electricity and hydrogen supply mix by 2050 as compared to 33% for both in Alternative 1 (for years 2020 – 2050).

Alternatives 1 and 2 Results

Preliminary results are shown in Tables 2 and 3 below for Alternatives 1 and 2, respectively. The table displays total fuel demand (quadrillion BTUs or "quads" and billion gallons gasoline equivalent or "BGGE"), GHG emissions (MMT CO_{2e} / yr), and relative percent reduction below Alternative 1 2020 for 2040 and 2050.

Table 2: Alternative 1 Results

Alternative 1					
	2010	2012	2020	2040	2050
Fuel Demand (Quads)					
<i>Gasoline (CaRFG)¹</i>	1.31	1.25	1.10	0.76	0.83
<i>Diesel (ULSD)²</i>	0.61	0.61	0.69	0.87	0.98
<i>Jet Fuel</i>	0.47	0.46	0.51	0.68	0.77
<i>Electric Power</i>	0.000	0.001	0.008	0.026	0.033
<i>Hydrogen</i>	0.000	0.000	0.001	0.007	0.009
Fuel Demand (BGGE)					
<i>Gas (CaRFG)¹</i>	11.7	11.1	9.8	6.8	7.4
<i>Diesel (ULSD)²</i>	5.5	5.5	6.2	7.8	8.8
<i>Jet Fuel</i>	4.2	4.1	4.6	6.1	6.9
<i>Electric Power</i>	0.00	0.01	0.07	0.23	0.30
<i>Hydrogen</i>	0.00	0.00	0.01	0.07	0.08
GHG Emissions (MMT CO_{2e} / yr)					
<i>LDV + Bus</i>	114	108	94	66	73
<i>HDV</i>	50	49	50	60	64
<i>Rail</i>	2	3	3	5	6
<i>Aviation</i>	4	4	5	6	7
<i>Other Transportation</i>	4	4	6	10	14
Total	175	168	158	147	163
Target	-	-	-	-	32
GHG Relative Reduction Below Alternative 1 2020³ (%)					
<i>LDV + Bus</i>	-	-	-	30%	23%
<i>HDV</i>	-	-	-	-19%	-27%
<i>Rail</i>	-	-	-	-53%	-91%
<i>Aviation</i>	-	-	-	-26%	-40%
<i>Other Transportation</i>	-	-	-	-70%	-129%
Total	-	-	-	7%	-3%
Target	-	-	-	-	80%

¹California Reformulated Gasoline (CaRFG) includes 10% ethanol blended by volume

²Diesel includes 5% biodiesel by volume

³AB32 requires that the 2020 total GHG inventory is the same as the 1990 GHG inventory, while the law does not require that each individual sector achieve its absolute 1990 value. Because the CTP project does not include all sectors, it is assumed that the transportation sector 2020 GHG value calculated for Alternative 1 will be the reference point for the 2050 GHG reductions.

21% in 2050. LDV emissions were reduced by 54% in 2040 and 49% in 2050, while HDV increased by 3% and 2%.

Figure 4 below displays the aggregate fuel demand by sector for Alternative 1 from 2010 to 2050 in BGGE. There is a reduction in total gasoline demand, but an increase in demand for the other fuels, such that the total demand in 2050 is higher than the demand in 2010.

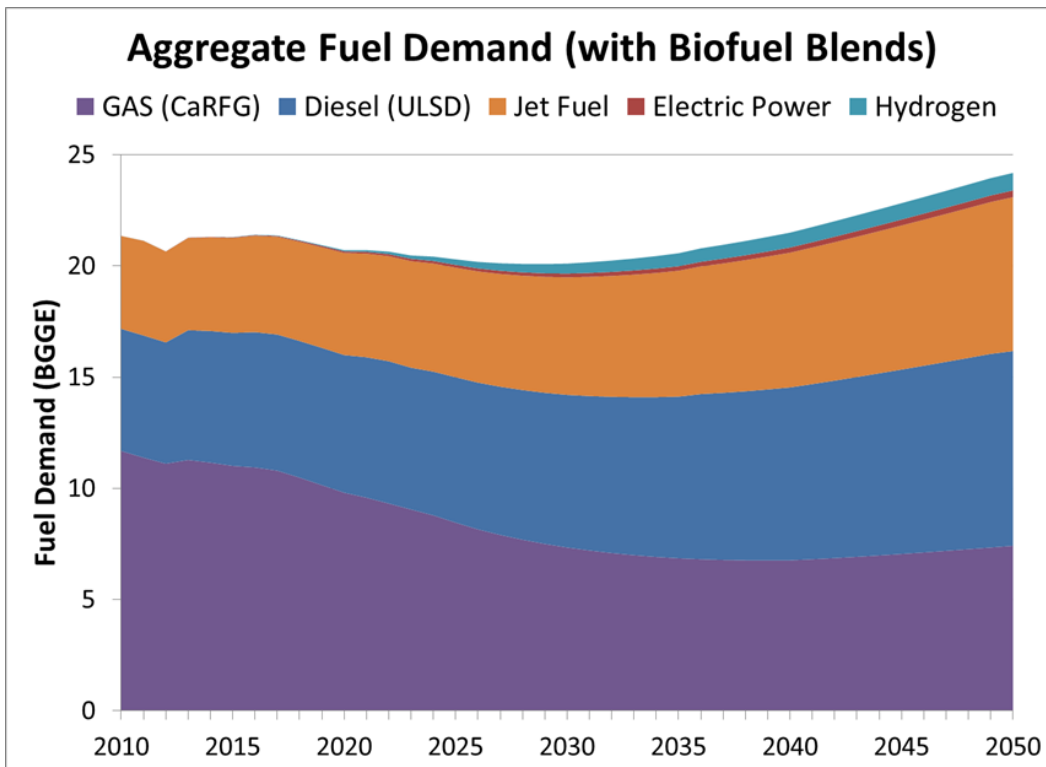


Figure 4: Aggregate Fuel Demand by sector for Alternative 1

Figures 5 and 6 below illustrate total WTW GHG emissions by sector for Alternative 1 (Figure 5) and Alternative 2 (Figure 6). For Alternative 1, there are significant reductions in LDV GHG emissions as a result of existing policies, but these are somewhat offset by the increase in GHG emission for the other sectors. Overall, there is a slight decrease in GHG emissions for this alternative from 2010. For Alternative 2, there are substantial reductions in LDV GHG emissions, which lead to greater total GHG reductions. As a reference, each figure contains red “X’s”, which represent the 2020 and 2050 targets. The 2020 target is based on Alternative 1 (see footnotes on Table 2 or 3) and the 2050 target is 80% of that value. Neither scenario meets or exceeds the target of 32 MMT CO_{2e} in 2050. Furthermore, the more aggressive Alternative 2 would still need to reduce GHG emissions by more than 50% to reach the expected goal.

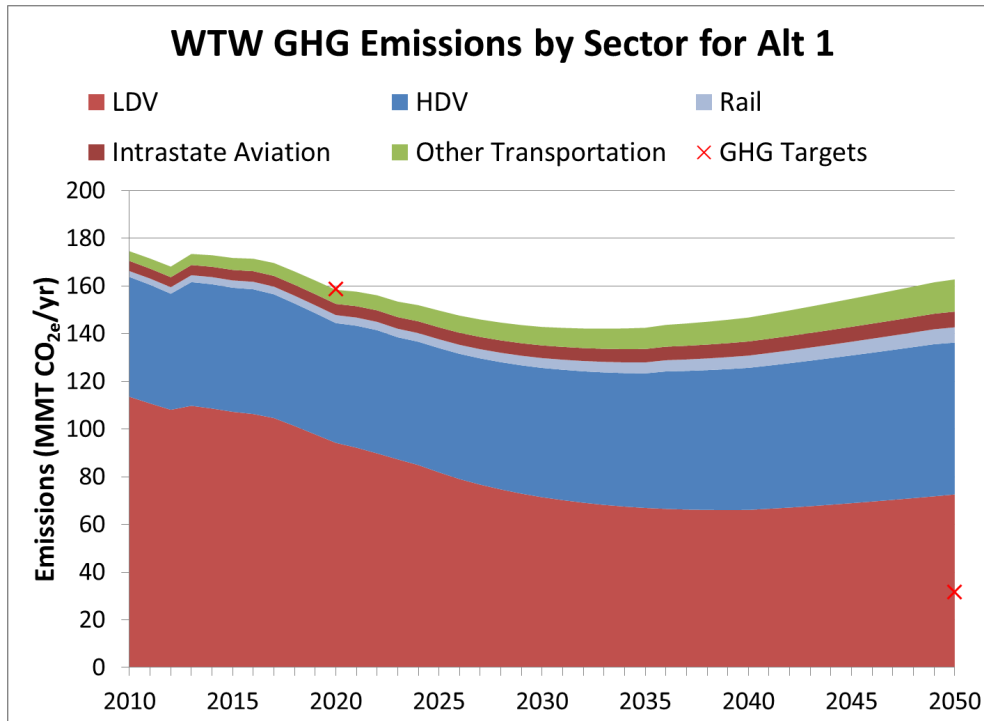


Figure 5: WTW GHG Emissions by Sector for Alternative 1

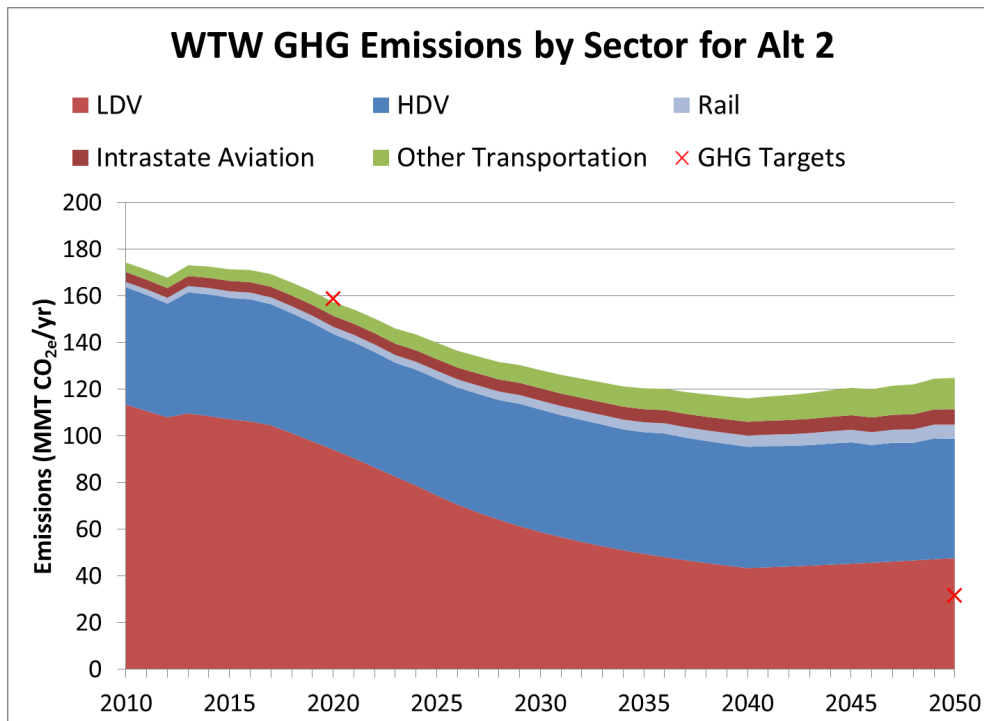


Figure 6: WTW GHG Emissions by Sector for Alternative 2

Alternative 3 Results

Preliminary results are shown in Table 4 below for Alternative 3. The table displays total fuel demand (quadrillion BTUs or “quads” and billions gallons gasoline equivalent or “BGGE”), GHG emissions (MMT CO_{2e} / yr), and relative percent reduction below 2020 for 2040 and 2050.

Table 4: Alternative 3 Results

Alternative 3					
	2010	2012	2020	2040	2050
Fuel Demand (Quads)					
<i>Gasoline (CaRFG)¹</i>	1.31	1.25	1.10	0.30	0.17
<i>Diesel (ULSD)²</i>	0.61	0.61	0.68	0.67	0.67
<i>Jet Fuel</i>	0.47	0.46	0.44	0.38	0.35
<i>Electric Power</i>	0.000	0.001	0.011	0.060	0.097
<i>Hydrogen</i>	0.000	0.000	0.001	0.032	0.052
Fuel Demand (BGGE)					
<i>Gasoline (CaRFG)¹</i>	11.7	11.1	9.8	2.6	1.5
<i>Diesel (ULSD)²</i>	5.5	5.4	6.0	6.0	6.0
<i>Jet Fuel</i>	4.2	4.1	3.9	3.4	3.1
<i>Electric Power</i>	0.00	0.01	0.10	0.54	0.88
<i>Hydrogen</i>	0.00	0.00	0.01	0.28	0.46
GHG Emissions (MMT CO_{2e} / yr)					
<i>LDV + Bus</i>	114	108	94	23	11
<i>HDV</i>	50	49	49	26	12
<i>Rail</i>	2	3	3	3	3
<i>Aviation</i>	4	4	4	2	2
<i>Other Transportation</i>	4	4	6	5	4
Total	175	168	156	60	32
Target	-	-	-	-	32
GHG Relative Reduction Below Alternative 1 2020³ (%)					
<i>LDV + Bus</i>	-	-	-	75%	88%
<i>HDV</i>	-	-	-	47%	76%
<i>Rail</i>	-	-	-	13%	22%
<i>Aviation</i>	-	-	-	52%	62%
<i>Other Transportation</i>	-	-	-	12%	28%
Total	-	-	-	62%	80%
Target	-	-	-	-	80%

¹California Reformulated Gasoline (CaRFG) includes 10% ethanol blended by volume

²Diesel includes 5% biodiesel by volume

³AB32 requires that the 2020 total GHG inventory is the same as the 1990 GHG inventory, while the law does not require that each individual sector achieve its absolute 1990 value. Because the CTP project does not include all sectors, it is assumed that the transportation sector 2020 GHG value calculated for Alternative 1 will be the reference point for the 2050 GHG reductions.

For Alternative 3, LDV GHG emissions are reduced by 75% in 2040 and 88% in 2050, while HDV emissions decrease by 47% and 76%. For all transportation sectors, there is a 62% reduction in GHG emissions by 2040 and 80% reduction by 2050.

Figure 7 below displays the aggregate fuel demand by sector for Alternative 3 from 2010 to 2050. There is a large reduction in total demand due to the decrease in gasoline demand and the decrease in demand for the other sectors, such that the total demand in 2050 is 24% lower than the base value in 2010.

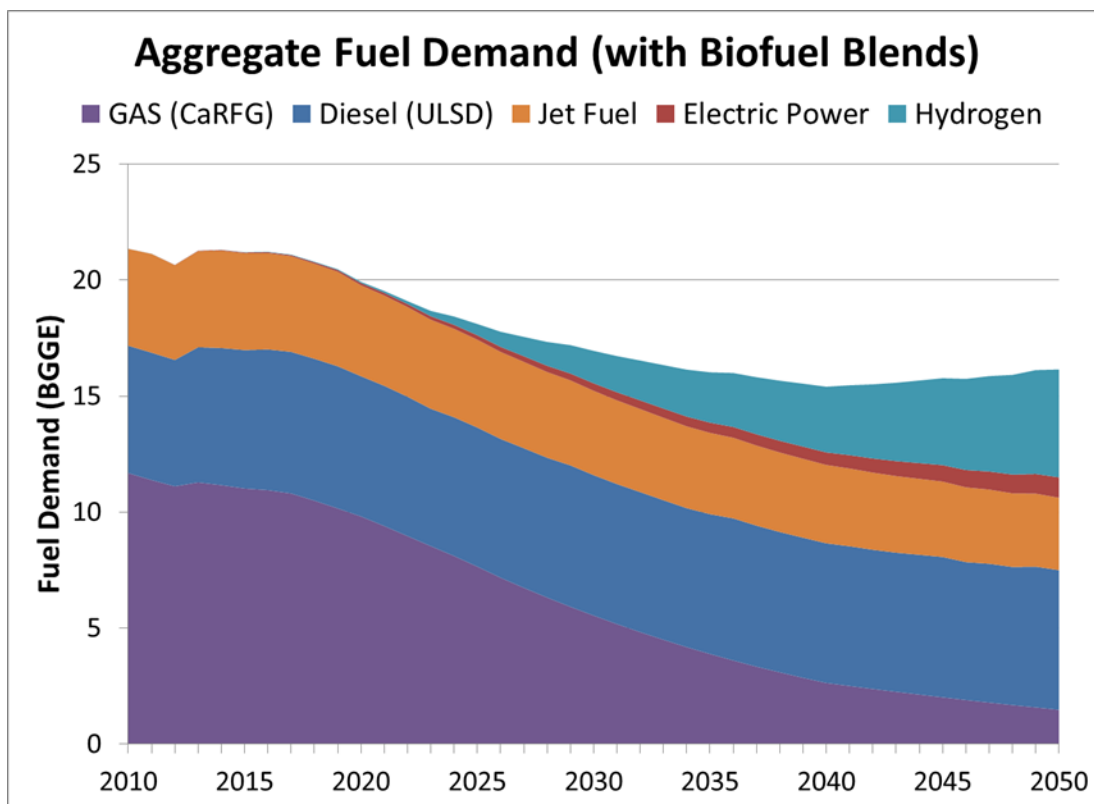


Figure 7: Aggregate Fuel Demand by sector for Alternative 3

Figure 8 below illustrates the total WTW GHG emissions by sector for Alternative 3. There are significant reductions in LDV GHG emissions as well as reductions in the other transportation sectors such that this Alternative meets the target of 32 MMT CO_{2e}. As a reference, the figure contains red “X’s”, which represent the 2020 and 2050 targets (see explanation above).

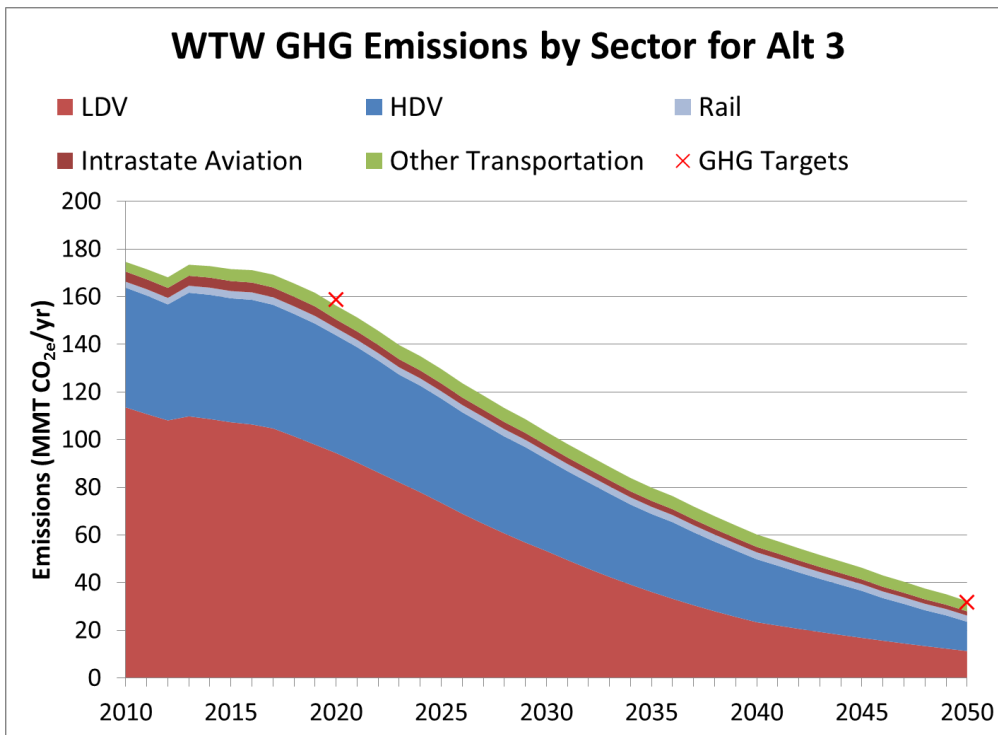


Figure 8: WTW GHG Emissions by Sector for Alternative 3

Conclusions

The 2050 GHG target for CTP2040 is 80% below the 2020 data point for Alternative 1, or a target of approximately 32 MMT CO_{2e} for the entire transportation sector, to meet its “equal share” of the GHG emissions target. Neither Alternative 1 nor 2 attained this target for the entire transportation sector. In Alternative 2, the LDV mode nearly attained its “equal share” target but because the other modes did not reach their “equal share” the alternative did not reach the 2050 target. In Alternative 3, the LDV mode attained more than its equal share and the other sectors reduced emissions significantly such that the 2050 target was obtained. It’s important to note that the official full statewide GHG Inventory 2050 target equals 86 MMT CO_{2e} for all sectors, with many of those sectors likely unable to reach their equal share, such that the transportation sector may have to reduce beyond their equal share.

Comment on Methodology

CSTDM has not been fully validated against official state records for gasoline, diesel, and jet fuel consumption in the 2010 base year demand. As a result, CSTDM Alternative 1 VMT for HDVs is approximately double what ARB estimates in EMFAC 2014 statewide. Alternative 1 LDV VMT is approximately 20% lower than EMFAC 2014. For the next draft, as an improvement to CSTDM, the base year should be validated against these records.

TREDIS

TREDIS is the Transportation Economic Development Impact System developed by Economic Development Research Group, Inc. TREDIS is an integrated economic analysis system for transportation planning and project assessment and is designed to analyze the macroeconomic impacts of long-range plans like CTP 2040. TREDIS

assesses costs, benefits, and economic impacts across a range of economic responses and societal perspectives of passenger and freight travel across all modes. TREDIS will assess the economic impacts from the CSTDM as it relates to passenger and freight travel information. TREDIS addresses the economic forecasts from the vehicle activity of the CSTDM required by SB 391 for CTP 2040

Endnotes

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