California TRANSPORTATION PLAN 2040

Integrating California's Transportation Future

Caltrans

June 2016

CalSTA
CALIFORNIA STATE TRANSPORTATION AGENCY

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Dear Fellow Californians:

For generations people have come to California to live and work in one of the most vibrant and diverse places on Earth. Our transportation system supports our quality of life by providing residents access to opportunities and delivering goods to market. However, the livability and economy of California face new challenges in the era of climate change -- and the transportation system must do its part to reduce these threats to our environment and health. Per the requirements of Senate Bill 391 (2009), this is the first California Transportation Plan published that provides a pathway for the transportation sector to help meet our state's climate goals. Fortunately, climate goals can be achieved while providing Californians with what they most seek from the transportation system—quality mobility choices to reliably get them to their destinations.

With approved Sustainable Communities Strategies, our regional partners are already leading the way towards transportation and land use patterns that will provide cost-effective transportation solutions and also improve livability in our communities. The plans value efficient land use by locating more housing closer to job centers, and they recognize consumer demand by proposing to invest in multiple modes. This CTP 2040 is an expression of how the State will reinforce these regional efforts and take conforming action for the interregional transportation system.

By 2040, California will have completed an integrated rail system linking every major region in the State, with seamless one-ticket transfers to local transit. Responding to the desires of millennials and aging baby-boomers alike, we will further invest in complete, safe pedestrian and bicycle networks. Through the CTP 2040, we reiterate a "fix-it first" approach that will improve operations and lower maintenance costs for our highways, roads, and bridges. We will continue to support the deployment of zero-emission vehicles and other technology innovations.

Achieving the goals and strategies of the CTP 2040 will take significant effort and deep partnerships with regional, local and tribal governments. However, the plan and associated modeling demonstrates California can achieve a low carbon transportation system that meets State policy objectives of livable communities, economic growth and emission reductions.

Thank you to everyone who participated in the development of the CTP 2040.

Sincerely,

Brian P. Kelly

BRIAN P. KELLY
Secretary

CTP2040
CALIFORNIA TRANSPORTATION PLAN

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WELCOME to the

CALIFORNIA TRANSPORTATION PLAN 2040

PREFACE

WHY A CALIFORNIA TRANSPORTATION PLAN (CTP)?

California's transportation system is at a crossroads. Never before has it been asked to deliver so much for so many. California policy today requires the state's transportation system to deliver mobility, safety, economic, accessibility, and environmental objectives. The system has long been called on to deliver on mobility and safety objectives. Today's environmental objectives, in the era of climate change, are more challenging than they have been in the past. While the transportation system must continue to meet demand for reliable travel, it must do so while achieving quantifiable reductions in greenhouse gas (GHG) emissions. This challenge is particularly daunting while Californians continue to drive more vehicle miles each year than residents of any other state, and while public transit ridership has been relatively stagnant over the last 30 years. The State is committed to working with its regional and local partners to deliver a transportation system capable of meeting all of today's transportation objectives. Fortunately, the path to doing so can be achieved while providing Californians with what they seek most—mobility choice.

Congestion in California–a longstanding problem in a state that adds nearly 5 million people each decade–has people seeking other ways to get around. They are calling for greater choice and their timing could not be better. Just as they are demanding mobility options, the state of California has begun the most aggressive frontal assault on GHG emissions seen anywhere in the country, and maybe anywhere in the world.

Californians continue to display their want to drive their cars, piling up some 330 billion miles driven in 2013, by far the most in the nation.[1] At the same time, they abhor congestion, delay, and traffic. They want mobility choices. Household surveys conducted by the California Department of Transportation (Caltrans) reflect a considerable increase in Californians diversifying their mode of travel. More are walking, biking, or using public transit.

Are they seeking alternatives to driving because they have grown tired of sitting in California's paralyzing congestion? For more than 30 years, California's major urban regions—Los Angeles, the Bay Area, San Diego, and increasingly the Inland Empire and the Central Valley—have occupied the list of the nation's most congested places. While local, state, and federal governments have poured billions of dollars into improving our roads and freeways to accommodate growth, congestion remains as vexing a problem in California today as it was decades ago. It is time to pursue new strategies to combat this problem.

Data tell us that we must look at solving congestion in a more holistic way. Simply adding more lanes and roads will not be enough. It must be coupled with new approaches that look less at specific projects and more at improving corridors; that look less at analyzing how many cars we can squeeze through a segment of highway and instead look at how we can reliably move people to their destinations. Highway and road investment alone will neither solve our congestion problems nor provide the mobility options Californians want.

1 Caltrans, "2013 California Public Road Data," Highway Performance Monitoring System, 2014. http://www.dot.ca.gov/hq/tsip/hpms/hpmslibrary/prd/2013prd/2013PublicRoadData.pdf

Starting with the passage of Assembly Bill (AB) 32, The California Global Warming Solutions Act of 2006, California has mandated a reduction in the emissions most responsible for climate change. Nearly 40 percent of GHG emissions in California come from the transportation sector. In 2008, the Legislature passed and Governor Schwarzenegger signed into law Senate Bill (SB) 375, legislation that required regions throughout California to improve their long-term Regional Transportation Plans (RTPs) to reflect more efficient land use, improved transportation, and reduced GHG emissions. In short, the bill sought more sustainable growth for California, and the regions are delivering.

Their plans represent a shift in long-term planning away from simply a list of transportation projects and toward a strategy for sustainable growth. Their plans value efficient land use by proposing to locate more housing closer to job centers; they recognize consumer demand by proposing to invest in numerous modes of transportation—roads, public transit, walking, and biking facilities. They value taxpayer investments by proposing to spend more on taking care of our existing assets before building more. Regions have adopted growth plans, and will soon begin revising them, to deliver the more sustainable transportation system now required by California law. How does the state help achieve the same objective?

That question is what this plan attempts to answer. It will lay out the role for the State in partnering with regions to deliver a transportation system right for California today and tomorrow. It describes those objectives transportation policy must strive to achieve over the next couple of decades and makes recommendations for how they will be achieved. In recent years, the Brown Administration, working with the legislature, has taken steps toward diversifying our transportation system, providing the mobility choices increasingly sought by Californians, investing in areas consistent with RTPs, and striving to get state transportation assets in a state of good repair.

These investments are seen in the creation of the State's first Active Transportation Program (ATP), concentrating more investment on improving bicycle and pedestrian facilities throughout the state; the commitment to improving passenger rail service in California, including the development of the nation's first true high-speed rail (HSR) system that will reduce rail travel time between Southern California and the Bay Area from eleven hours to less than three; the investment of Cap-and-Trade funds to improve communities and enhance public transit; and of course, the Administration also continues its push to invest in "fix-it-first" strategies to improve highways, neighborhood streets, bridges and overpasses, and the state's trade corridors. Through operational improvements and strategic expansion, this plan will describe the state's continued march to provide a diverse transportation system to meet California's needs.

CALTRANS' ROLE

Caltrans primary role is to develop a long-range transportation plan that serves all Californians through an open and collaborative planning process by supporting early and continuous communication and identifying shared interests with affected government entities, agencies, transportation partners, other stakeholders and operators, community-based organizations, and the public. This collaborative and inclusive effort provides Californians an opportunity to step back and look at the big picture to consider the future transportation system on a statewide basis. The statewide planning process provides a framework to understand and shape the role of transportation in the context of broader economic, environmental, and quality of life goals.

INTEGRATING WITH OTHER PLANS AND PROGRAMS

The CTP is a core document that helps tie together several internal and external inter-related plans and programs to help define and plan transportation in California. The CTP 2040 exists within the larger context of long-range transportation planning that considers other relevant local, regional, and statewide plans and programs that may impact the transportation system.

Other Modal Plans

The CTP also identifies a sustainable transportation system by pulling together the State's long-range modal plans to envision the future system:

- Interregional Transportation Strategic Plan (ITSP)
- California Freight Mobility Plan (CFMP)
- California State Rail Plan (CSRP)
- California High-Speed Rail Business Plan
- Statewide Transit Strategic Plan
- California Aviation System Plan (CASP)
- Bicycle and Pedestrian Plan (coming in 2017)

Other State Programs

The CTP 2040 will integrate findings and recommendations from key documents from various statewide programs. The following table lists several of these statewide programs:

Agency/Program	Specific Program/Policy/Project
California Air Resources Board	• Sustainable Communities (Key SB 375-Related Documents) • AB 32 Scoping Plan • California Sustainable Freight Action Plan • Air Quality and Transportation Planning
California Climate Change Portal	• Energy & Transportation and Climate Change Adaptation
California Department of Transportation	• California Essential Habitat Connectivity Project • Caltrans Climate Change Program • Complete Streets • Public Participation Plan for the CTP and FSTIP • Regional Blueprints Program • Regional Advance Mitigation Planning (RAMP) • Smart Mobility Framework
California Energy Commission	• California Energy Policy • Alternative and Renewable Fuel and Vehicle Technology Program
California Natural Resources Agency	• Safeguarding California
California Transportation Commission	• 2011 Statewide Transportation System Needs Assessment
Governor's Office of Planning and Research	• Environmental Goals and Policy Report

Guiding Transportation Policy

The CTP 2040 planning process represents an important step toward integrating statewide long-range modal plans, key programs, and analysis tools that build on RTPs, Sustainable Communities Strategies (SCSs), and rural land use visions. The CTP 2040 integrates these plans and programs to provide a statewide transportation system capable of meeting mobility, safety, sustainability, and economic objectives in the fight against climate change. The resulting CTP will serve as a guiding document of information for the development of future modal plans, programs, and major investment decisions on the transportation system.

ADDRESSING CLIMATE CHANGE

Climate change is a key issue for California, and the CTP 2040 is a benchmark document to address this challenge. In an effort to combat the effects of climate change, Governor Brown issued Executive Order (EO) B-30-15 establishing a California GHG reduction target of 40 percent below 1990 levels by 2030, which is a mid-term goal that is consistent with California's existing long-term commitment to reduce emissions 80 percent under 1990 levels by 2050. In addition, the Governor is committed to reduce by one-half current petroleum use in cars and trucks; increase from one-third to one-half the electricity derived from renewable sources; double the efficiency savings of existing buildings and make heating fuels cleaner; reduce the release of methane, black carbon and other short-lived climate pollutants; and manage farm and rangelands, forests and wetlands to store more carbon. The vision of CTP 2040 supports these climate goals and renewable energy goals.

IN THIS DOCUMENT

The CTP 2040 outlines goals and recommendations to achieve a vision for a safe, sustainable, universally accessible, and globally competitive transportation system that provides reliable and efficient mobility for people, goods, and services, and information, while meeting the State's GHG emission reduction goals and preserving the unique character of California's communities.

The CTP recommendations provide a framework and guiding principles for transportation decision makers at all levels of government and the private sector. This emphasizes the importance of "partnership" to develop and implement future transportation policies, programs, and major statewide investments on transportation, the economy, and the environment that supports a sustainable California.

PROCESS FOR DEVELOPING THE PLAN

Caltrans' Public Participation Plan (PPP) supports the department's mission to involve the public in transportation decision-making and responds to federal laws and regulations that emphasizes public engagement. The PPP helps guide the public engagement process for the CTP to ensure future transportation planning reflects community values and interests.

Planning California's transportation system requires extensive coordination between Caltrans and a host of transportation partners, stakeholders, community-based organizations, advocacy groups, and the public. In an effort to understand public needs and concerns, Caltrans provided numerous outreach activities and opportunities for input and comment throughout the development of the CTP 2040, as shown in **Figure 1**. For example, Caltrans formed a policy advisory committee (PAC) and technical advisory committee (TAC) with members representing various California agencies and organizations to provide guidance and direction during the CTP 2040 planning process. Caltrans employed a wide range of outreach techniques during the CTP 2040 public participation process including statewide public workshops, focus groups, and tribal listening sessions; public and tribal webinars; public review and comment periods; website postings, electronic mailings, and social networking; and connecting with trusted community leaders representing underserved and disadvantaged populations. Furthermore, media outreach and printed materials played a valuable role in the public engagement process with news releases, public service announcements, flyers, handbills, fact sheets, timelines, and brochures. In addition to these tools, Caltrans provided on an as-needed-basis, non-English language assistance, printed materials in alternative formats to those with sensory disabilities, and disability assistance at workshops.

The results of early and continuous public participation revealed that Californians are aware of transportation trends and 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.

Figure 1

CTP 2040 OUTREACH TIMELINE

2013

OUTREACH
Communication & Public Participation

- WEBPORTAL
- FOCUS GROUPS
- TRIBAL MEETINGS

CONSULTATION

- POLICY & TECHNICAL COMMITTEES
- REGIONAL AGENCIES
- TRIBAL GOVERNMENTS

PRODUCTS
CTP Development

- CTP 2040 FACT SHEET
- CTP 2040 SPANISH FACT SHEET

2014

OUTREACH
Communication & Public Participation

- WEBPORTAL
- WORKSHOPS
  Fresno, Los Angeles, Oakland, Redding, Sacramento, San Diego

CONSULTATION

- POLICY & TECHNICAL COMMITTEES
- REGIONAL AGENCIES
- TRIBAL GOVERNMENTS

PRODUCTS
CTP Development

- CTP 2040 - ADMINISTRATIVE DRAFT
- CTP 2040 BROCHURE
- CTP 2040 TRIBAL FACT SHEET
- SCOPE DOCUMENT & TIMELINE

2015

OUTREACH
Communication & Public Participation

- WEBPORTAL
- CTP 2040 DRAFT #2
  45 Day Comment Period

CONSULTATION

- POLICY & TECHNICAL COMMITTEES
- REGIONAL AGENCIES
- TRIBAL GOVERNMENTS

PRODUCTS
CTP Development

- CTP 2040 - DRAFT
- CTP 2040 - FINAL PLAN
- AGENCY APPROVAL

POLICY ADVISORY COMMITTEE AND TECHNICAL ADVISORY COMMITTEE

Development of the CTP 2040 included an open and collaborative planning process directed by a PAC and TAC comprised of transportation planning professionals representing various government agencies, tribal governments, and advocacy organizations. The committees provided guidance, recommendations, and necessary approvals throughout the CTP 2040 planning process. **Table 1** lists the agencies and organizations represented by the advisory committee members.

SENATE BILL 391 CONSULTATION AGENCIES

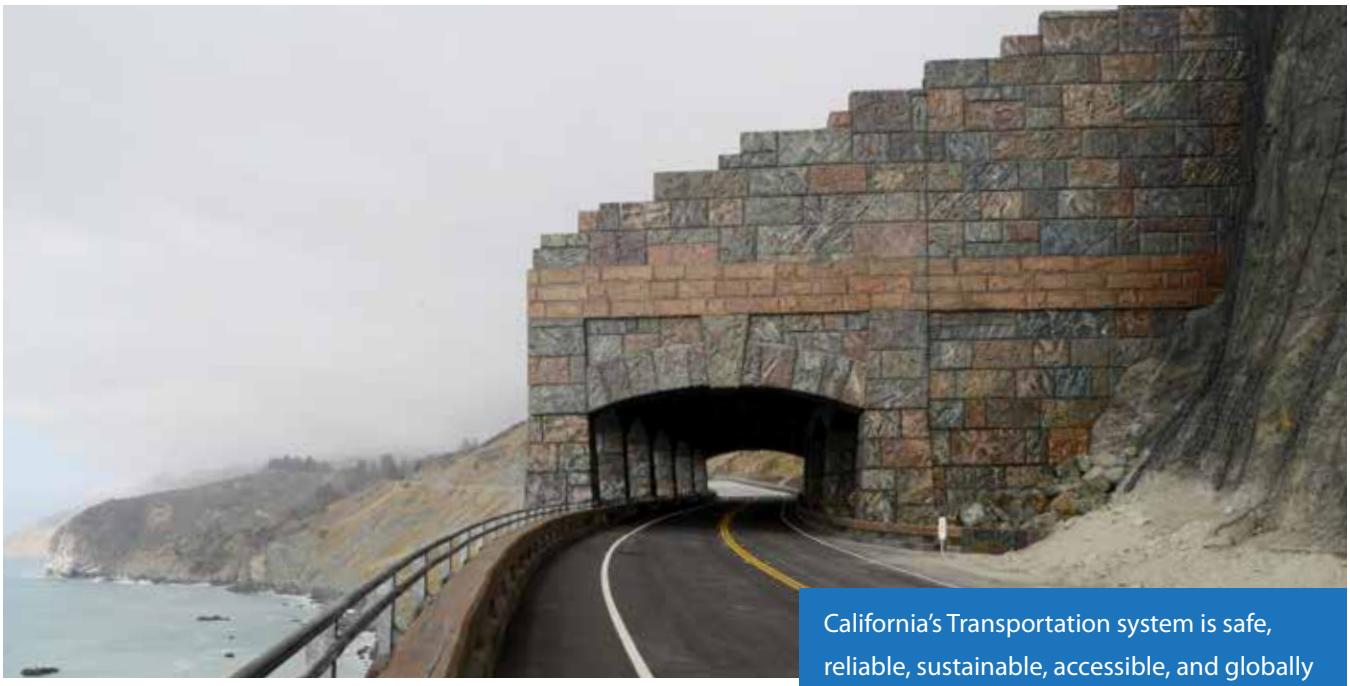
SB 391 identifies specific agencies that should be consulted in the development of the CTP. While some of these groups served on the PAC or TAC, others were asked to review the Plan during development and to provide feedback. The agencies consulted in compliance with SB 391 are as follows:

- California Transportation Commission (CTC)
- Strategic Growth Council (SGC)
- California Air Resources Board (ARB)
- State Energy Resources Conservation and Development Commission (California Energy Commission)
- Air quality management districts
- Public transit operators
- Regional Transportation Planning Agencies (RTPAs)

Table 1
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 Association of Councils 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	California State Senate Staff
California Transportation Commission (staff)	Shasta Regional Transportation Agency
California Walks	Southern California Association of Governments
California Department of Housing and Community Development	Strategic Growth Council
California Department of Rehabilitation	State Independent Living Council
California Department of Water Resources	Tehama County Transportation Commission
El Dorado County Transportation Commission	The Nature Conservancy
US Federal Highway Administration	Trinidad Rancheria
Glenn County Planning and Public Works Agency	US Environmental Protection Agency
Governor's Office of Planning and Research	California State Assembly Staff

TECHNICAL 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 Association of Councils of Governments	Native American Advisory Committee



California's Transportation system is safe, reliable, sustainable, accessible, and globally competitive, meeting California's needs today and into the future

EXECUTIVE SUMMARY

BACKGROUND, CONTEXT, AND HISTORY

The California Transportation Plan (CTP 2040) takes a comprehensive approach to provide for the State's future mobility needs in a manner that is economically, equitably, and environmentally responsible, and supports the overall vision of a low carbon and sustainable transportation system that enhances the quality of life. The CTP 2040 addresses the existing status and expected needs of the State's transportation system to optimize the movement of people, goods, services, and information to meet the State's future multimodal mobility needs for the people who live, work, and visit California. The CTP 2040 is a statewide long-range policy plan that presents a vision for California's future transportation system. The CTP 2040 defines goals, policies, and strategies to achieve a vision and recommended performance measures for assessing their effectiveness. It provides a strong, common framework to help guide transportation decisions and investments that support a statewide, sustainable, and integrated multimodal transportation system.

Federal and State laws require California to prepare a statewide plan that provides direction for planning, developing, operating, and maintaining California's transportation system. Producing the CTP 2040 is an ongoing process that requires updating every five years with a minimum 20-year planning horizon. California's transportation community covering all levels of government, the private sector, community-based organizations, and the public have shared ideas that create the current update, which focuses on a 2040 planning horizon and reflects todays changing transportation environment. Numerous strategic planning concepts were integrated throughout the development of the CTP 2040 including previous long-range transportation plans and many related efforts including findings and recommendations from the California Department of Transportation (Caltrans) statewide long-range modal plans and programs, Regional Transportation Plans (RTPs), Sustainable Communities Strategies (SCSs), and rural transportation land use visions.

PUBLIC ENGAGEMENT AND INPUT

To strengthen the CTP 2040 development process, a comprehensive outreach program was designed and implemented to encourage engagement and gather input collaboratively from a wide-range of transportation partners, key transportation stakeholder groups, tribal governments, community based organizations representing particular transportation interests, and the public throughout the creation of the CTP 2040. Meaningful and consistent outreach is a vital and required component in the development of the CTP 2040, which can influence long-range transportation planning policy, and ultimately, the investments made in California's transportation system. To achieve this goal, an extensive outreach effort was conducted to coincide with the development of the CTP 2040 to reach a diverse audience with a wide range of transportation experiences. Outreach methods used during the CTP 2040 public participation process included: two opportunities for written public comments, an informative user-friendly and interactive website, electronic mail, news releases, public service announcements for TV and radio, printed materials, surveys, social networking, and webinars. General statewide public focus groups were used to gather opinions and ideas to help formulate the CTP 2040. A key in-person series of public workshops were developed to offer attendees throughout the state the opportunity to engage State, regional, and local transportation staff about the plan under development. Caltrans districts were provided public outreach "toolboxes" to help guide outreach efforts with regional and local agencies, and the public on the development of CTP 2040. In addition, two committees–the policy advisory committee (PAC) and the technical advisory committee (TAC) made up of a diverse group of representatives with expertise and interest in transportation–served in an advisory capacity throughout the development of the CTP 2040. These outreach opportunities provided valuable perspectives to State officials and allowed a transparent and flexible approach for attendees, allowing for a successful public engagement process towards a collaboratively developed CTP 2040.

The CTP 2040 public engagement process revealed that Californians are mindful of the current trends, challenges, and emerging issues facing the State, such as the economy and job growth, climate change, population and housing growth, freight mobility, public health, and transportation funding. Californians are equally supportive of a fully integrated, sustainable, and multimodal transportation system that considers improving multimodal mobility and accessibility, preserving the transportation system, supporting the economy, increasing safety and security, enhancing livability and healthy communities, and protecting the environment and natural resources.

TRANSPORTATION TRENDS AND OPPORTUNITIES

California is at a crossroads. California's growing population and diverse economy are placing increased demands on the transportation system. Yet, the fundamental structure and principles of public financing, development, and multimodal movement have remained essentially stagnant for many years. The coming decades will be a period of dramatic change for everyone in California. Mounting challenges include global influences from climate change, fluctuating fuel costs and fuel-based tax revenue, and new technological advances; and from statewide trends such as safety and security concerns, aging infrastructure, traffic congestion, freight movement and port connectivity, intermodal connectivity, funding short falls, shifting land use and travel patterns, and human and environmental health.

On a global scale there is the State's challenge of combating climate change, which is a serious worldwide environmental threat. Potential climate change impacts include sea-level rise (SLR) that poses widespread and continuing threats to the State's transportation infrastructure, economy, and environment; extreme heat increases the risk of wildfires, drought, and public health problems. These effects can have a direct or indirect impact on California's infrastructure, resulting in increased costs in maintenance and repair, disruption of economic activity, interruption of critical transportation lifelines, and ultimately, the reduction in the quality of life for all Californians.

On a statewide level, there is the challenge of California's aging infrastructure that is in need of repair, adaption, or improvement to accommodate existing and future travel demand and needs. However, funding shortfalls have led to a backlog of system maintenance and rehabilitation projects. Existing transportation funding relies on tax revenues, bond initiatives, and general funds. Yet, the need to manage, operate, and optimize the infrastructure is outpacing the State's ability to generate sufficient revenue.

Confronting these and other challenges is already a concern. Addressing future challenges only adds to the complexity and will require smart planning, new and innovative approaches, and strong commitment from all levels of government, the private sector, and the general public. As California continues to grow and prosper, new trends and opportunities will emerge that require planning, innovation, and sustainable investments toward operating, managing, maintaining, and financing the State's transportation system. Without a transportation vision

suited to the challenge, the State runs the risk of jeopardizing California's economic health and quality of life. The CTP 2040 plays a fundamental role in the State vision for its future and looks at evolving trends, opportunities, and emerging issues anticipated over the next 25 years. As we move into the future, we will experience significant change that will place increasing demands on the State's transportation system associated with population growth, shifting demographic patterns, economic efficiency, housing and land use development, environmental effects of climate change and greenhouse gas (GHG) emissions, public health concerns, funding deficiencies, fuel and energy consumption, and sustainability in tribal, rural, and small town communities.

The world is changing and California must evolve to help manage these changes for current and future generations. The State must reinvent its thinking and work towards a vision and a common set of goals, policies, and strategies to develop unique solutions to emerging transportation issues. With strong political leadership, close collaboration between transportation partners and stakeholders, broad public support, and commitments to funding California can shift the State from where it is today to where it needs to be tomorrow.

HOW TO MOVE CALIFORNIA FORWARD

With the recent passage of State legislation and Governor's executive orders, California launched an innovative and proactive approach to addressing climate change and GHG emissions. The CTP 2040 analyzes approaches for the State to achieve maximum feasible emission reductions in order to attain a statewide reduction of GHG emissions to 1990 levels by 2020, and 80 percent below 1990 levels by 2050. The CTP 2040 is the outline to help make these targets achievable.

The CTP 2040 documents the methods, tools, techniques, and approaches used to model and analyze the potential effectiveness of State polices, programs, and major investments in transportation, the economy, and the environment on a statewide scale to reduce GHG emissions and minimize the expected impacts of climate change.

Three scenarios were evaluated to illustrate how each path contributes to meeting California's GHG reductions targets. Starting with a 2010 base year, the CTP 2040 provides an in-depth analysis of future travel behavior and the expected vehicle miles traveled (VMT) and GHG emission levels for future years 2020, 2040, and 2050. The GHG reduction strategies include fifteen transportation strategies divided into four categories: mode shift, transportation alternatives, pricing, and operational efficiency.

The evaluations of these statewide alternatives show the forecasted GHG reduction, system performance, and economic benefits of the three scenarios. Each scenario involves different levels of commitment and challenge measured in VMT, Vehicle Hours of Delay (VHD), and GHG emissions in achieving the specified GHG reduction targets. The outputs of the three scenarios analysis were further analyzed in the development of an economic impact analysis. The final results of these combined efforts assesses the economic impact, benefits, and costs of transportation polices and plans in terms of GHG emissions, jobs, gross state product (GSP), income, mode split, VMT, VHD, trips, and freight flows. The modeled scenarios are not prescribed recommendations; rather, they provide key information in developing the recommendations made within the CTP 2040.

A NOTE ON MODELING

Modeling of the transportation scenarios was a theoretical exercise designed to test one specific path to reach GHG reduction targets set by AB 32 and Governor Executive Orders. There are limitations to the models and all conclusions and findings should be read with this caveat. These are not specific policy recommendations. For specific recommendations, please refer to Chapter 4.

GOALS, RECOMMENDATIONS, AND NEXT STEPS

The CTP 2040 goals and recommendations evolved through an open and collaborative planning process from our transportation partners, stakeholders, advocacy groups, and the public. They integrate a wide-range of local, regional, State and federal transportation plans and programs, and strategic guidance from our transportation partners, stakeholders, advocacy groups, and the public with the purpose of guiding future transportation decisions and investments in the twenty-first century. The recommendations are forwarded to achieve the six goals of the plan:

- 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
- Practice Environmental Stewardship

The following implementation highlights illustrate the vision and direction the CTP 2040 suggests to improve the California transportation system over the next 25 years:

- **Improve transit** by completing the entire California High-Speed Rail Authority (Authority) Business Plan Phase 1 High-Speed Rail System by 2029, and making it the backbone of an integrated statewide transit system linking all transit operators with one-stop ticketing and well-coordinated transfers.
- **Reduce long-run repair and maintenance costs** by using "fix-it first," smart asset management, and life-cycle costing, to maintain our transportation infrastructure in good condition–this should include developing a comprehensive assessment of climate-related vulnerabilities, and actions to ensure system resiliency and adaptation to extreme events.
- **Improve highways and roads** by using management systems and technologies to maximize system efficiency through integrated multimodal corridor management (intelligent transportation system [ITS], high-occupancy toll [HOT] lanes, and bus rapid transit [BRT] lanes, which are managed in coordination with active transportation and rail lines) and through new technologies and services including autonomous and connected vehicles, smart parking, vehicle-to-vehicle (V2V) communications, infrastructure-to-vehicle (V2I) communication, and vehicle sharing and ride-sharing services.

- **Improve freight efficiency and the economy** by completing the California Sustainable Freight Action Plan outlined in Executive Order (EO) B-32-15; and through creation of dedicated federal and State freight funding programs to invest in California's primary trade corridor including multimodal last mile connections to major freight facilities including ports and hubs.
- **Improve communities** through the region-led Sustainable Communities Strategies (SCSs), which will be updated as the State moves toward 2030 and 2050 greenhouse gas (GHG) reduction targets–the State can continue to partner with regions through the investment of Greenhouse Gas Reduction Funds (GGRF) and other measures such as better use of highway corridors for recreation and to reconnect communities.
- **Reduce transportation-system deaths and injuries** through multi-agency coordination that implements the Toward Zero Deaths (TZD) vision, and public engagement to reduce distracted driving, impaired driving, and unsafe work-zone driving.
- **Expand the use and safety of bike and pedestrian facilities** by utilizing the Active Transportation Program (ATP) to support a broad range of investments that go beyond individual projects to encourage corridor-wide and city-wide strategies, and also through improved State and local implementation of Complete Streets strategies that will increase active transportation for short trips, first/last mile transit trips, and school trips.
- **Make our vehicles and transportation fuels cleaner** through incentives and regulations to increase zero-emission vehicles (ZEVs) and other methods outlined in the California Air Resources Board's (ARB's) Assembly Bill (AB) 32 Scoping Plan.
- **Improve public health and achieve climate and other environmental goals** through the strategies above and also through implementation of robust advanced mitigation to streamline transportation projects and maximize the biological benefit.
- **Secure permanent, stable, and sufficient transportation revenue** from transportation users to achieve the state of good repair, freight efficiency, and other investments outlined in this plan.

The work begins now to achieve the goals and recommendations outlined in the CTP 2040. The CTP 2040 was accomplished through an aggressive collaborative process that is continually evolving in the direction of meeting the mobility needs of all Californians. The state of California will continue in this spirit as the implementation activities are pursued, while at the same time retaining the flexibility to accommodate changing transportation conditions and priorities that may require the addition, deletion, and modification of recommendations. Achieving the vision of the CTP 2040 will take considerable effort; however, the plan and associated modeling demonstrates California can achieve a low carbon transportation system that meets State policy goals for livable communities, economic growth, and GHG reduction.

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CHAPTER 1

VISION AND FRAMEWORK FOR CALIFORNIA'S TRANSPORTATION SYSTEM

California Transportation Plan 2040 (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 multimodal, and includes many different interconnected modes that transport both people and commodities. 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 4:

- 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
- 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:

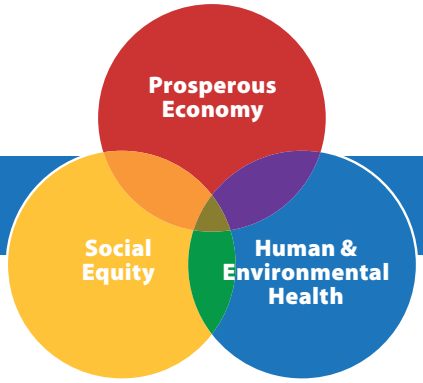
- Purpose of the Plan
- Building and Preserving California's Legacy
- Process for Developing the Plan
- Planning Framework

PURPOSE OF THE PLAN

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, as shown in **Figure 2**, 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, including achievement of the State's greenhouse gas (GHG) reduction goals. 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 improvements required to meet California's mobility needs. Furthermore, the CTP 2040 is based on the needs expressed by the full breadth of California's cultural diversity–from rural geographical areas to the State's most populous urban centers.

Figure 2

CTP2040 Policy Framework



THE VISION
SUSTAINABILITY

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.

THE 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

THE POLICIES

Goal 1	Goal 2	Goal 3	Goal 4	Goal 5	Goal 6
POLICY 1: Manage and Operate an Efficient Integrated System	POLICY 1: Apply Sustainable Preventative Maintenance and Rehabilitation Strategies	POLICY 1: Support Transportation Choices to Enhance Economic Activity	POLICY 1: Reduce Fatalities, Serious Injuries, and Collisions	POLICY 1: Expand Engagement in Multimodal Transportation Planning and Decision Making	POLICY 1: Integrate Environmental Considerations in All Stages of Planning and Implementation
POLICY 2: Invest Strategically to Optimize System Performance	POLICY 2: Evaluate Multimodal Life Cycle Costs in Project Decision Making	POLICY 2: Enhance Freight Mobility, Reliability, and Global Competitiveness	POLICY 2: Provide for System Security, Emergency Preparedness, Response, and Recovery	POLICY 2: Integrate Multimodal Transportation and Land Use Development	POLICY 2: Conserve and Enhance Natural, Agricultural, and Cultural Resources
POLICY 3: Provide Viable and Equitable Multimodal Choices Including Active Transportation	POLICY 3: Adapt the Transportation System to Reduce Impacts from Climate Change	POLICY 3: Seek Sustainable and Flexible Funding to Maintain and Improve the System		POLICY 3: Integrate Health and Social Equity in Transportation Planning and Decision Making	POLICY 3: Reduce Greenhouse Gas Emissions and Other Air Pollutants
					POLICY 4: Transform to a Clean and Energy Efficient Transportation System

The CTP 2040 represents a new generation of the statewide transportation plan that was last updated in April 2006 with the release of the CTP 2025. This latest plan reflects the evolution of stakeholder expectations to move California's transportation system from a focus on transportation as an end in itself, to transportation as a means for improving quality of life, economic opportunity, and the environment. The CTP 2025 was approved in 2006 and updated in 2007 as the CTP 2030, to comply with federal requirements that govern the development of statewide transportation plans. These requirements were established by the federal surface transportation program Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) that was adopted in 2005.

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.

Key State legislation and administration direction are 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. In addition, the bill 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 standard of 80 percent below 1990 levels by 2050.
- **AB 32 (Núñez, 2006)** - California's landmark *Global Warming Solution Act of 2006* requires reducing the State's GHG emissions to 1990 levels by 2020, and continued reductions beyond 2020.
- **Senate Bill (SB) 375 (Steinberg, 2008)** - Requires Metropolitan Planning Organizations (MPOs) to include Sustainable Communities Strategies (SCSs) in their Regional Transportation Plans (RTPs) for the purposes of reducing 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 reduction target provided by the California Air Resources Board (ARB). If the combined measures in a 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 the California Department of Transportation (Caltrans) to update the CTP every five years while showing how the State will achieve the statewide GHG 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 statewide, 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-16-12 (2012)** - Reaffirms EO S-3-05, and calls for continued reduction of GHG emissions in the transportation sector 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.
- **EO B-30-15 (2015)** - Establishes a California GHG target of 40 percent below 1990 levels by 2030 - the most aggressive benchmark enacted by any government in North America to reduce dangerous carbon emissions over the next decade and a half. The bill also requires a life-cycle accounting, including climate change considerations, in infrastructure investments made by the State. Governor Brown separately called for up to a 50 percent reduction in petroleum use by 2030.
- **EO B-32-15 (2015)** – Requires that the Secretary of the California State Transportation Agency (CalSTA), the Secretary of the California Environmental Protection Agency (CalEPA), and the Secretary of the California Natural Resources Agency (CNRA) lead other relevant State departments including ARB, Caltrans, the California Energy Commission (CEC), and the Governor's Office of Business and Economic Development (GO-Biz) to develop an integrated action plan by July 2016 that establishes clear targets to improve freight efficiency, transition to zero-emission technologies, and increase competitiveness of California's freight system.

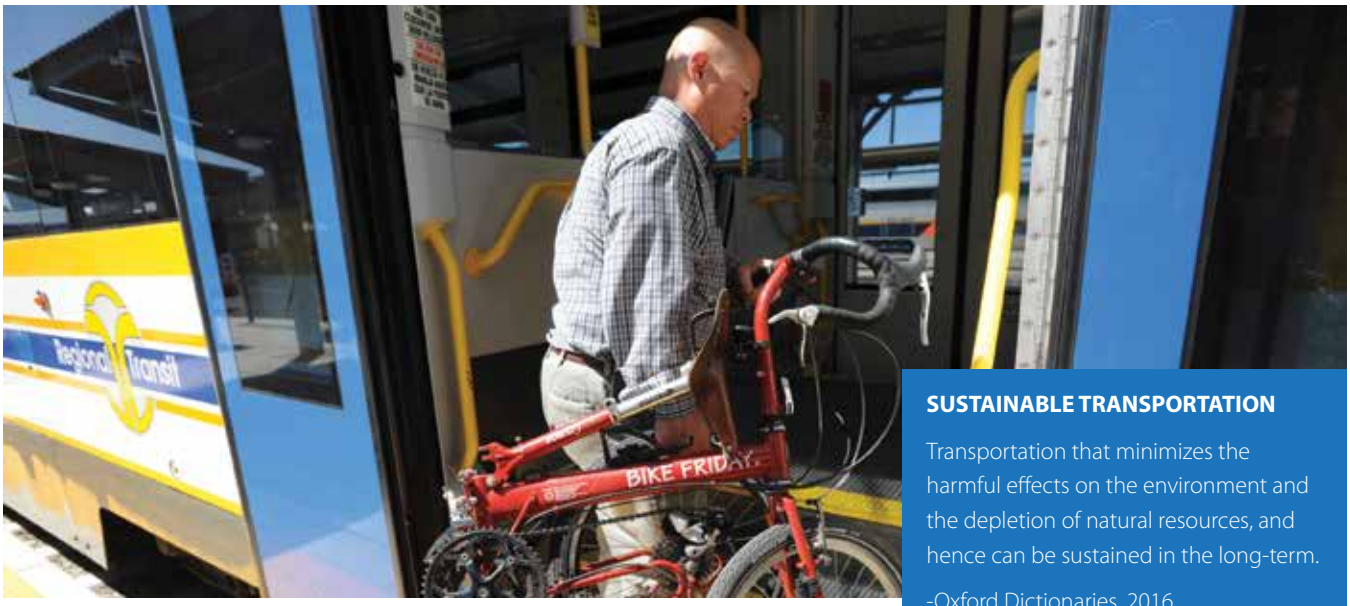
At its core, the CTP 2040 exemplifies the federal planning process (cooperative, continuing, and comprehensive)[2] and the State planning priorities established by AB 857 (economy, equity, and environment) as it strives to move California toward a more sustainable transportation system. Sustainability means that transportation decisions will support the environmental, social, public health, and economic 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 goal of stabilizing climate as well as meeting the requirements of the Federal Clean Air Act, but will require a fundamental, holistic transformation of the transportation system. This calls for significant innovation and adjusts how we develop and expand communities, how people travel, how freight is moved, and which fuels are used. The CTP 2040 relies on these main approaches to reduce future GHG emissions for the movement of people and freight:

- Promote best practices in regional and local land use that support a diverse transportation system
- Increase a shift to more sustainable transportation modes (mode shift) to reduce per capita vehicle miles traveled (VMT)
- Efficiently manage, operate and maintain the transportation system (including construction practices)
- Reduce the number of petroleum powered vehicles from California roads, and replace with zero- to near-zero equipment and modes of travel throughout the State
- Improve technology for all transportation sector activities

By establishing the goals and policies framework, the CTP 2040 provides a guide for implementing sustainable approaches throughout the transportation sector while building and preserving California's legacy. To help achieve this, this framework is built upon the philosophy of the Three P's (3P)–People, Planet, and Prosperity.

2 US DOT, "The Transportation Planning Process: Key Issues: A Briefing Book for Transportation Decision makers, Officials, and Staff," 2007, http://www.planning.dot.gov/documents/briefingbook/bbook.htm.



SUSTAINABLE TRANSPORTATION

Transportation that minimizes the harmful effects on the environment and the depletion of natural resources, and hence can be sustained in the long-term.

-Oxford Dictionaries, 2016

BUILDING AND PRESERVING CALIFORNIA'S LEGACY

Preserving and enhancing life in California falls on being sustainable. The vision of sustainability in the CTP 2040 revolves around the concept of 3P. This concept describes a spectrum of values that help plan for the future. It signals that California uses an approach to public decision-making that produces social, cultural, economic, and environmental benefits. 3P conveys that Californians, our economic prosperity, and our relationship to the planet are tied together in a mutually supportive and interdependent way. Social and environmental goals cannot be achieved without economic prosperity—and achieving prosperity is highly related to social well-being and environmental quality.

PEOPLE

Transportation systems profoundly affect public health, with impacts and benefits to communities on public safety, physical activity, the environment, and access to vital goods and services. When properly planned and designed, transportation systems can have a positive effect on public health.[3] 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 walking, biking, and taking public transit easier and safer. 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. MPOs increasingly incorporate public health enhancements toward transportation infrastructure as well as safe accommodation of all modes. All levels of government have stepped up efforts to encourage responsible driving habits that will make transportation safer for all users.

Limited access to transportation can affect health, particularly among vulnerable populations, such as the poor, the elderly, children, the disabled, and various ethnic communities. A safe and accessible transportation system allows members of vulnerable populations to more easily travel to supermarkets for fresher foods, to integrate daily walking as a form of exercise to meet physical activity needs,[4] and to better access health care facilities, education, jobs, recreation, and other needs. All of these activities are linked to improved health. Transportation solutions at the community level are needed to serve these basic, daily requirements.[5]

Inactivity is a significant factor in obesity, contributing to numerous chronic diseases. Creating opportunities for people to incorporate safe 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 SCSs, reducing GHG emissions, and making regions more enjoyable to live, work, and play.

3 Federal Highway Administration, "Health in Transportation," http://www.fhwa.dot.gov/planning/health_in_transportation/

4 MacDonald, J. et al., "The effect of Light Rail Transit on Body Mass Index and Physical Activity," 2010, http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2919301/pdf/nihms-217446.pdf.

5 Center for Third World Organizing, et al., "Roadblocks to Health," 2002, http://transformca.org/resource/roadblocks-health.

The transportation sector is a major source of air pollution due to emissions and small particulates in the exhaust from fossil fuel combustion engines on most trucks, cars, trains, planes, and ships.[6] These emissions are linked to increased incidence of several chronic respiratory and cardiovascular diseases. Federal and State regulations have substantially improved air quality,[7] but additional 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. In addition, the growing body of evidence regarding near-roadway health effects requires close coordination between transportation and land use planning to reduce potential emission-related impacts to sensitive receptors near high-volume roadways.

According to the Public Policy Institute of California, nearly 80 percent of commuters in California are still traveling to work in single occupancy vehicles (SOVs). This choice leads to greater congestion, greater emissions, and greater VMT. Public transit must be challenged to improve the ease and connectivity of services, so that transit is a more viable option for Californians. This will be particularly important as we develop high-speed rail (HSR) in a manner that seeks seamless operations with existing service providers.

PLANET

Climate change is one of the most significant threats of our time. Studies show that carbon dioxide (CO2) and other GHG emissions contribute to climate change, and at nearly half of the total, the transportation sector is the leading source of GHG emissions in the State.[8]

California's infrastructure is already stressed and will face additional burdens from climate risks. The frequency of extreme weather events–such as heat waves, sustained droughts, and torrential rains are expected to increase over the next century, potentially causing flooding, landslides, wildfires, pavement damage, bridge damage, transit vehicle stress, and rail buckling. Even if global GHG emissions were to cease today, some of these effects would be still unavoidable.[9] California must aggressively address threats to its transportation infrastructure to decrease these risks and significant damages.

California has already taken actions that make the State a national and global leader in reducing GHG emissions. Meeting our 2030 and 2050 climate emissions and petroleum reduction goals will require a significant transformation of the transportation sector. California is investing in bicycle and pedestrian infrastructure and transit projects as a first choice for sustainable mobility. California is also developing a market for clean low-carbon fuels, and is working with the federal government to ensure more efficient vehicles are entering the fleet. Finally, zero-emission vehicles (ZEVs) are growing in popularity with more than 160,000 ZEVs sold to date. Governor Brown has set a target of 1.5 million ZEVs on California's roads by 2025 which is a ten-fold increase in the next ten years.

California's population will face significant impacts from global emissions that have already occurred. Therefore, we must also implement adaptation strategies to mitigate these impacts on California.[10] Sea-level rise (SLR) is one of the most widely documented risks of climate change that will affect all modes of transportation. Sea levels are expected to rise up to almost one foot by 2030, two feet by 2050, and over five feet by 2100.[11] If SLR increases to the highest projected levels, almost half a million Californians will be at risk from a 100-year flood event.[12] These risks require that we use the best available science to estimate SLR impacts and utilize a variety of adaptation strategies, including managed retreat and other nature-based approaches, to avoid vulnerabilities and build a resilient transportation system. To achieve adaptation strategies, SLR impacts must be addressed at all project planning stages, not just at final project delivery.[13]

6 United State Environmental Protection Agency, "Sources of Greenhouse Gas Emissions. In Transportation Sector Emissions," http://www.epa.gov/climatechange/ghgemissions/sources/transportation.html.

7 Raynault, E. et al., "How Does Transportation Affect Public Health?," Public Roads 76, no. 6, 2013, http://www.fhwa.dot.gov/publications/publicroads/13mayjun/05.cfm.

8 California Air Resources Board, "AB 32 Scoping Plan," 2015, http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm.

9 California Natural Resources Agency, "2009 California Climate Adaptation Strategy: A Report to the Governor of the State of California in Response to Executive Order S-13-2008," 2009, http://resources.ca.gov/docs/climate/Statewide_Adaptation_Strategy.pdf.

10 Caltrans, "Caltrans Activities to Address Climate Change - Reducing GHG Emissions and Adapting to Impacts," 2013, http://www.dot.ca.gov/hq/tpp/offices/orip/climate_change/projects_and_studies.shtml.

11 Committee on Sea Level Rise in California, Oregon, and Washington, et al., "Sea Level Rise in California, Oregon, and Washington: Past, Present, and Future," 2012, http://ssi.ucsd.edu/scc/images/NRC%20SL%20rise%20W%20coast%20USA%2012.pdf.

12 Heberger, M., et al., "The Impacts of Sea-Level Rise on the California Coast," 2009, http://www.energy.ca.gov/2009publications/CEC-500-2009-024/CEC-500-2009-024-F.PDF.

13 Coastal and Ocean Working Group of the California Climate Action Team, "State of California Sea-Level Rise Guidance Document," 2013, http://www.opc.ca.gov/2013/04/update-to-the-sea-level-rise-guidance-document/.

Given the expected range of climate change impacts, public agencies throughout California, including Caltrans, are assessing the risks posed by SLR. Planning agencies need to address climate change-related vulnerabilities and incorporate climate change resiliency into their long-range transportation documents. This is encouraged to reduce the likelihood, magnitude, duration, and cost of disruptions associated with extreme weather and other effects of changing climatic conditions to the transportation system.[14]

Climate change will significantly increase the challenge for transportation managers who will need to ensure that reliable transportation routes are available. To 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, efficient land use, 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. How these considerations are incorporated into the transportation planning process is emerging as an area of concern.[15] One useful guide is to target investments that produce successful "co-benefits" simultaneously across economic, environmental, and social measures within a strategy, thereby improving the overall benefit-to-cost ratio.[16]

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, which is discussed in more detail in **Appendix 6**.

California has already made a strong stance to face climate change through aggressive GHG reduction legislation such as AB 32, SB 375, and SB 391. This triggered a multitude of transportation commitments to decrease GHG emissions, which leads to the development of the CTP 2040, a guide to transportation decision-making in this era of climate change. The sole objective is to strengthen regions through partnerships, planning, efficiency of resources, and support in new technologies for cleaner energy. An example would be the Active Transportation Program (ATP), which funds non-motorized transportation projects and plans. In addition, a multitude of Cap-and-Trade Programs required to demonstrate GHG emission reductions are being implemented.

PROSPERITY

California's economy continues to grow since 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 2014, the State was the eighth-largest economy in the world with a gross domestic product of $2.3 trillion.[17] California's positive economic outlook is sustained by creating an attractive business climate, continuing to build confidence in the economy, and investment in a clean energy and transportation system. Transportation helps stimulate the economy by providing Californians with access to jobs, education, health care, goods and services, and social experiences and recreational activities.

Goods and services reach international, national, tribal, regional, and local markets through the transportation system. California businesses export approximately $162 billion worth of goods to over 225 foreign countries.[18] With the recent positive economic outlook, businesses have begun to reinvest in the economy by increasing jobs and wages (see **Figure 3** and **Table 2**). Future advancements in transportation technology will continue to foster industrial growth and economic opportunities for all 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 at a reasonable cost. Households depend on an integrated, accessible, and dependable transportation network to provide them access to education, healthcare, jobs, and recreational activities. A sustainable, reliable, and cost-effective transportation system helps make California more competitive for business growth and job creation. The CTP 2040 recommendations encourage policymakers to support an efficient and effective transportation network that meets the needs of businesses and households.

14 Smart Growth America & State Smart Transportation Initiative, "The Innovative DOT: A handbook of policy and practice," 2015, http://www.ssti.us/wp/wp-content/uploads/2014/01/The-Innovative-DOT-1.8.15.pdf.

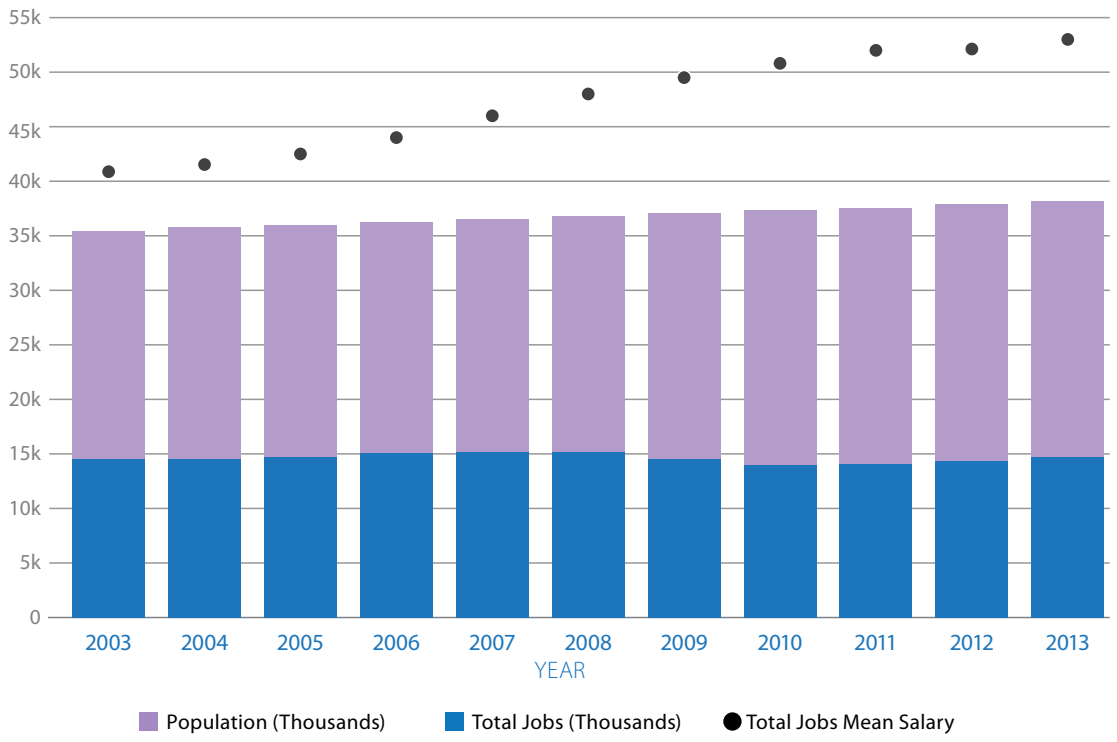
15 Smart Cambridge Systematics, "Climate Change and Transportation," http://www.camsys.com/kb_hotissue_climate.htm.

16 United Nations Centre for Regional Development, "Win Win Solutions to Climate Change and Transport," 2009, http://www.uncrd.or.jp/content/documents/4Win-Win-Solutions-EST_2009.pdf.

17 International Monetary Fund, World Economic Outlook Database, April 2015. California Gross Domestic Product: Bureau of Economic Analysis, advance estimate as of June 10, 2015.

18 International Trade Administration, "Trade Stats Express. U.S. Dept. of Commerce," 2012, http://tse.export.gov/TSE/TSEHome.aspx.

Figure 3
CALIFORNIA'S EMPLOYMENT STATISTICS



Source: Bureau of Labor Statistics

Table 2
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	1,005	$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

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, as one of many agencies responsible for the State's transportation system, guides the statewide vision, and serves regional and interregional needs through oversight and funding for Joint Powers Authorities, which administer the three State-supported intercity rail routes in California (including the Amtrak Thruway Bus Service), and as the owner-operator of the state highway system (SHS). 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
- Six Caltrans modal plans
- Regional Transportation Plans and Sustainable Communities Strategies
- California High-Speed Rail Business Plan
- Tribal transportation and safety plans
- California Transportation Infrastructure Priorities: Vision and Interim Recommendations
- Climate Change Scoping Plan
- California Sustainable Freight Action Plan
- California's Climate Future: The Governor's Environmental Goals and Policies Report (draft)

For more information on the statewide plans and initiatives, please visit the Reference section of the CTP 2040 website: www.californiatransportationplan2040.org.

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 (2005)
- Smart Mobility Framework (2010)
- Complete Streets Implementation Action Plan 2.0 (2014)
- California Essential Habitat Connectivity Study (2010)
- Regional Advance Mitigation Planning and Statewide Advance Mitigation Initiative (2008)
- Climate Action Program (2006)
- California Strategic Highway Safety Plan (2015)
- Main Street, California: A Guide for Improving Community and Transportation Vitality (2013)

CALIFORNIA INTERREGIONAL BLUEPRINT

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 integrated Caltrans' five modal plans and multiple planning initiatives that complement RTPs and future land use. Through the CIB process, 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' SIX LONG-RANGE MODAL PLANS

The CTP 2040 incorporates the research and findings of Caltrans' six modal plans listed and described in **Table 3**.

Table 3
CURRENT LONG-RANGE TRANSPORTATION PLANS

INTERREGIONAL PLAN Next Update: 2020	**2015 INTERREGIONAL TRANSPORTATION STRATEGIC PLAN (ITSP)** The first complete update to the 1998 ITSP addresses significant statute and policy issues that have occurred since then. The goals and objectives from the 1998 ITSP have been completely re-assessed, along with the Focus Routes. The ITSP is consistent with the CTP 2040 and the Mission, Vision, and Goals of the Department. The 2015 ITSP occurred simultaneously with the Interregional Transportation Improvement Program update.
FREIGHT PLAN Next Update: 2019	**2014 CALIFORNIA FREIGHT MOBILITY PLAN (CFMP)** The primary purpose of the plan is to identify freight routes and transportation facilities that are critical to California's economy. The CFMP consists of a vision, goals and a three-tiered freight project list with Tier I investments considered the highest priority for investment.
RAIL PLAN Next Update: 2018	**2013 CALIFORNIA STATE RAIL PLAN (CSRP)** This plan complies with State and federal law and provides a long-term plan for freight and passenger rail, including establishing a vision and plan for an integrated passenger rail network including high-speed, intercity and regional.
AVIATION PLAN Next Update: 2016	**2011 CALIFORNIA AVIATION SYSTEM PLAN POLICY ELEMENT** This plan includes updated programs and directives to better support aviation sustainability in California.
TRANSIT PLAN Next Update: 2018	**STATEWIDE TRANSIT STRATEGIC PLAN** This plan helps the State and partners gain a better understanding of present and future roles and responsibilities to support public transportation.
BICYCLE AND PEDESTRIAN PLAN Next Update: 2017	**CALIFORNIA STATEWIDE BICYCLE AND PEDESTRIAN PLAN (CSBPP)** The CSBPP will plan for safe and integrated bicycle and pedestrian projects for enhanced connectivity with all modes of transportation.

REGIONAL TRANSPORTATION PLANS AND SUSTAINABLE COMMUNITIES STRATEGIES

MPOs and Regional Transportation Planning Agencies (RTPAs) are the entities that receive local/regional, state, and 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. They are essential partners with local entities in achieving AB 32 goals. Unlike the CTP which is not project based, these RTPs include a financially constrained project list, must be accompanied with an Environmental Impact Report (EIR), and must be consistent with air quality conformity requirements as appropriate. RTPAs and MPOs address transportation from a regional perspective, while the CTP addresses the connectivity and/or travel between regions and applies a statewide perspective for the transportation system.

MPOs around the State have been at work adopting new SCSs included in RTPs that shift investments toward a broader suite of improvements providing greater mobility choices for travelers. This shift reflects the regions' collective efforts to provide a regional transportation system capable of meeting mobility, safety, and sustainability objectives through integrated investment and more efficient use of land.

RTPs adopted by the four largest MPO's share the following characteristics:

- Expansion of transit capacity, frequency, and connectivity;
- Higher proportion of funding for walking and biking projects;
- More investment in "managed lanes" on the state highway system;
- Greater focus on more efficient land use and denser development near transit;
- Support for streamlined CEQA review of eligible projects; and
- Greater coordination between government and stakeholders.

Regions are acting to meet mobility, safety, and sustainability objectives in an integrated way pursuant to the State's climate change and GHG emission reduction laws and policies (i.e., AB 32, Statutes of 2006 and SB 375, Statutes of 2008) that required the regions to consider these issues in the adoption of their transportation and land use plans. **Table 4** shows the GHG reduction target and the ARB's determination for each MPO in California. However, regions are primarily concerned with travel that is local and regional. The state is the governmental entity that must address interregional travel. A key challenge, then, for state policymakers today is to adopt policies for interregional travel and commerce that integrate well with regional strategies.

Table 4
STATUS OF SUSTAINABLE COMMUNITIES STRATEGIES IN CALIFORNIA REGIONAL TRANSPORTATION PLANS

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	-5%	-9%	-10%	-11%
Kern Council of Governments	Adopted June 2014	-5%	-14.1%	-10%	-16.6%
Kings County Association of Governments	Adopted July 2014	-5%	-5%	-10%	-12%
Madera County Transportation Commission	Adopted July 2014; Working with ARB on Alternative Planning Scenario	-5%	-	-10%	-
Merced County Association of Governments	Adopted September 2014; Working with ARB on Alternative Planning Scenario	-5%	-	-10%	-
Metropolitan Transportation Commission	Adopted December 2013	-7%	-10.4%	-15%	-16.2%
Association of Monterey Bay Area Governments	Adopted June 2014	0%	-3.5%	-5%	-5.9%
Sacramento Area Council of Governments	Adopted April 2012	-7%	-7.6%	-16%	-15.58%
San Diego Association of Governments	Adopted October 2015	-7%	-15%	-13%	-21%
San Joaquin Council of Governments	Adopted June 2014	-5%	-24.4%	-10%	-23.7%
San Luis Obispo Council of Governments	Adopted April 2015	-8%	-9.43%	-8	-10.91%
Santa Barbara County Association of Governments	Adopted August 2013	0%	-10%	0%	-15.4%
Shasta Regional Transportation Agency	Adopted June 2015	0%	-4.9%	0%	-0.5%
Southern California Association of Governments	Adopted June 2013	-8%	-9%	-13%	-16%
Stanislaus Council of Governments	Adopted June 2014	-5%	-19.1%	-10%	-15.1%
Tahoe Regional Planning Agency/Tahoe Metropolitan Planning Organization	Adopted 2012	-7%	-12%	-5%	-7%
Tulare County Association of Governments	Adopted June 2014	-5%	-17.3%	-10%	-19.6%

HIGH-SPEED RAIL BUSINESS PLAN

The California High-Speed Rail Authority (Authority) is responsible for planning, designing, building, and operating the first HSR system in the nation. The project's aim is to provide a fast, clean alternative to driving and flying along one of the most popular interregional routes in the country. The HSR project is currently under construction in the San Joaquin Valley and will connect the major regions of the State. It 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 Authority 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 improve connectivity and seamlessness in rail travel in California and meet the State's 21st century transportation needs.[19]

SUBJECT TO CHANGE

19 California High-Speed Rail Authority, "Business Plan 2015: Connecting California," 2014, http://www.hsr.ca.gov/docs/about/business_plans/BPlan_2014_Business_Plan_Final.pdf.

TRIBAL TRANSPORTATION AND SAFETY PLANS

Native American tribal governments engage in transportation safety planning for all users in 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 (FY) 2012-13, nine California tribes received a Moving Ahead for Progress in the 21st Century (MAP-21) Tribal Transportation Program (TTP) Safety Funds to write tribal transportation safety plans for their respective communities.

CALIFORNIA TRANSPORTATION INFRASTRUCTURE PRIORITIES: VISION AND INTERIM RECOMMENDATIONS

CalSTA was created in 2013 to develop and coordinate the policies and programs of the State's transportation entities to achieve the State's mobility, safety and air quality objectives from its transportation system. Including Caltrans, CalSTA consists of departments, boards, and offices, each with a unique role to ensure the safety and mobility of California's traveling public. CalSTA developed the California Transportation Infrastructure Priorities (CTIP) workgroup in April 2013 to identify the transportation system needed to achieve California's long-range goals of GHG reductions and increased mobility. This workgroup examined the 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 consensus of the CTIP workgroup and a focus on transportation system objectives of mobility, safety, and sustainability.

Since 2014, two important CTIP recommendations were enacted into law that could transform the way transportation projects are funded in California, expand opportunities to improve congested corridors in the State, and return to the long-held principle that transportation improvements should be funded primarily by those who use the system. The two bills are:

- **SB 1077 (DeSaulnier)**: This bill authorized a pilot project so Caltrans can test the viability of a road charge—a potential replacement of the gas tax that charges highway users based on the number of miles they drive instead of the amount of gasoline they purchase.
- **AB 194 (Frazier)**: This bill provides a streamlined approval process for the use of toll or express lanes that should be used to fund highway improvements, better manage congestion, pay for long-term maintenance and rehabilitation costs, and fund transit services in tolled corridor.

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, 2014

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 and update that plan every five years. Published 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 near-term (2020), mid-term (2030), and long-term (2050) climate goals. It also identifies opportunities to leverage existing and new funds to further drive GHG emission reductions and evaluate how to align long-term reduction strategies with State policy priorities.

SUSTAINABLE FREIGHT ACTION PLAN

On July 17, 2015, Governor Brown issued EO B-32-15 which directs the Secretary of the CalSTA, the Secretary of the CalEPA, and the Secretary of the CNRA to lead other relevant State departments including the ARB, the Caltrans, the CEC, and the GO-Biz to improve freight efficiency, transition to zero-emission technologies, and increase competitiveness of California's freight system. The purpose of the Sustainable Freight Action Plan is to identify and prioritize actions that move California toward a sustainable freight transport system characterized by zero or near-zero-emissions. The California Sustainable Freight Action Plan 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.

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 in the context of changing climate and a population growing to 50 million by mid-century. The EGPR provides a vision of the State's future and a broad overview of the State's programs and policies to achieve that vision. Together, these plans, legislation and guidance all feed into the CTP 2040. Ultimately, the CTP aims to guide California's vast transportation network into a modern, multimodal and efficient system.

The CTP 2040 builds on these statewide initiatives and their broad spectrum of policies and recommendations to best guide California in future transportation decisions. To further examine the needs of California, the next chapter portrays the current transportation system and developing trends

2015
2015
2015

CHINA SHIPPING
CHINA SHIPPING
CHINA SHIPPING
CHINA SHIPPING
ON TIME
YANG MING

CHAPTER 2

THE TRANSPORTATION SYSTEM

Transportation exists to serve society. The actions and recommendations in this plan are intended to support the vision for a diverse, sustainable low carbon transportation system that will allow people to thrive over the next 25 years and beyond. To this end, California's transportation system is large and complex. This history lingers with us today, even as we seek to transition to a more sustainable, efficient, and healthy transportation system. VMT remain high, SOV commuters remain too numerous, and the State's shift to using public transit has been too sluggish. 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. All people from the public to the federal government share ownership and operating responsibility for the various parts of the transportation system.

Over the past 60 years, growth in automobile ownership, development of the highway system, and the rise of suburban neighborhoods has dominated the landscape in much of California and the United States. This development pattern has created a dispersed network of cities and towns, which can be difficult to serve efficiently with transportation and other necessary public services. The challenge is to stitch together this patchwork development to create greater access to destinations and allow goods to flow to market. In the same way that past policies have shaped today's built environment, actions taken today and over the next few decades will establish the foundation for a more sustainable future.

Tables 5–8 and **Figures 4–7** present an overview of the transportation system. Chapter 2 provides more detail about the system's various components and concludes with transportation opportunities. This chapter includes the following sections:

- Statewide
- Tribal
- Regional
- Local
- Opportunities

STATEWIDE

The state transportation system (STS) serves not only Californians, but also the entire country. This system is essential to our mobility and economic vibrancy. The movement of people and freight throughout the State is unmatched anywhere in the country, and as we move into the future, we will continue to depend on the STS.

How should California care for assets valued at $1.2 trillion? By implementing a "fix-it first" approach, California can maintain and preserve an efficient highway system. In 2014, the CTIP workgroup found that the State ranks 48th in the nation in terms of highway condition. Potholes and other imperfections in the roadway come with real costs, estimated by one study at more than $700 per household each year. In addition, currently 1 in 4 culverts necessary

Figure 4
California Roads

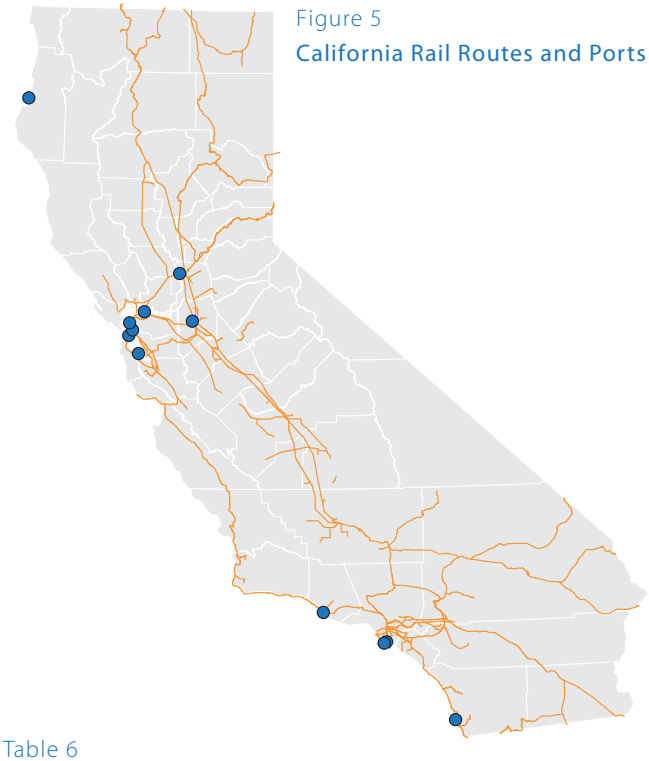


Figure 5
California Rail Routes and Ports

Table 5
California Highway and Road Centerline Miles (2012) and Bridges

HIGHWAY AND ROAD CENTERLINE MILES (2012)[20]		
State highway system (SHS)	15,104 centerline miles or 51,326 lane miles	
County roads	65,335	miles
City roads	76,098	miles
Federally owned roads	15,022	miles
Other jurisdictions	3,432	miles
Total Highway and Roadway Distance	**174,991**	**miles**
BRIDGES[21]		
State owned bridges and other structures (ferry boats, tunnels, tubes, large-crossing & small crossing bridges)	13,133	

Table 6
California Rail Route Mileage and Ports

FREIGHT AND PASSENGER RAIL ROUTE MILEAGE[22]		
Passenger: state corridors	887	miles*
Passenger: interstate AMTRAK corridors	1,663	miles*
Freight: class 1 railroads	5,418	miles*
Freight: regional and short line railroads	1,317	miles*
Freight: switching and terminal railroads	275	miles
PORTS[23]		
California seaports (Both inland and coastal)	12	
International Ports of Entry (POE)	6	

* **Route miles** are estimated by adding each agency or railroad company's reported operating route miles. The class 1 railroad miles includes trackage railroad rights. (source: CFMP 2014)

20 Caltrans, "Executive Fact Booklet," 2015, http://dot.ca.gov/hq/tsip/data_library/EFB/2015_EFB.pdf.

21 Caltrans, "The Mile Marker: A Caltrans Performance Report," 2014, http://www.dot.ca.gov/ctjournal/MileMarker/2014-1/index.html.

22 Caltrans, "2013 California State Rail Plan," 2013, http://californiaStaterailplan.dot.ca.gov/docs/Final_Copy_2013_CSRP.pdf.

23 San Diego Association of Government, "San Diego Forward: The Region Plan Draft. In Appendix U.14: Borders," 2015, http://www.sdforward.com/pdfs/DraftAppendixU14-Borders.pdf.

to manage storm water runoff are in need of repair, and more than 30 percent of the technical equipment (e.g., ramp meters, vehicle detectors, and video camera) used to operate the highway system are not in good working condition.[24] In order to address this, the 2015 Five-Year Infrastructure Plan calls for effective project planning measures, such as pavement and infrastructure management to better focus resources and refine the assessment of maintenance needs, while developing a queue of projects to be completed if additional resources become available. This combination of measures will help both existing and future transportation revenues go further and be used on the State's highest priorities.[25]

Figure 6
California Airports

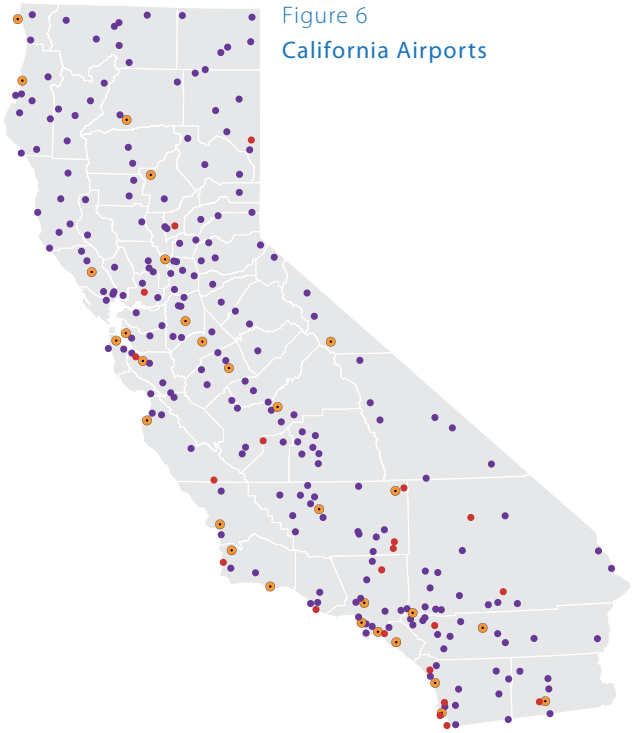


Figure 7
California Transit

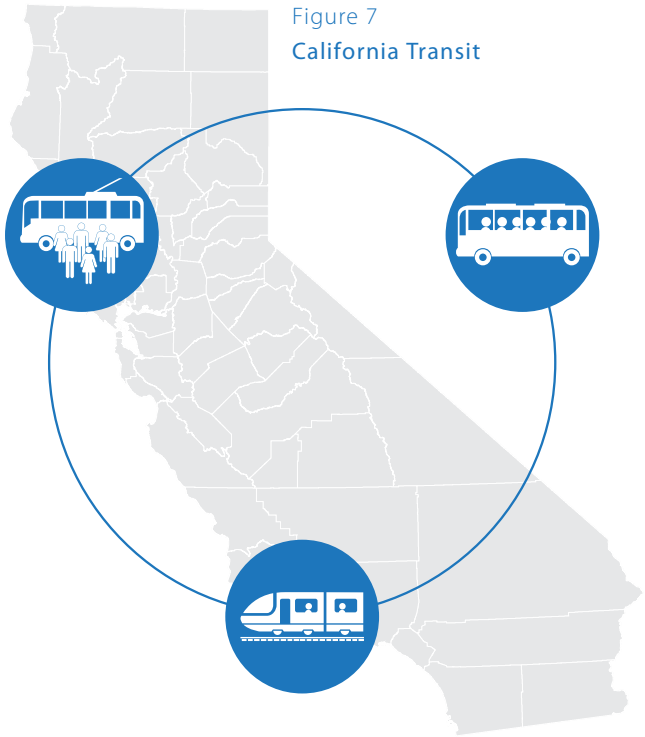


Table 7
California Airports (2013)

AIR[26]	
Commercial service airports	28
General aviation airports	215
Special-use airports	68
Hospital heliports	160
Heliports (fire, police, commuter, private)	505

Table 8
California Transit

TRANSIT[27]	
Transit Vehicles Available for Maximum Service	21,866
Unlinked Transit Passenger Trips	1.4 billion^
Number of Trains in Operation (Average Weekday)	444
Transit Passenger Stations	707
Multimodal Transit Passenger Stations	389

^ **Unlinked Passenger Trips** is the number of times passengers board public transportation vehicles. Passengers are counted each time they board vehicles no matter how many vehicles they use to travel from their origin to their destination and regardless of whether they pay a fare, use a pass or transfer, ride for free, or pay in some other way. Also called boardings.

24 CalSTA, "California Infrastructure Priorities Working Group, California Transportation Infrastructure Priorities: Vision and Interim Recommendations," 2014, http://www.calsta.ca.gov/res/docs/pdfs/2013/CTIP%20Vision%20and%20Interim%20Recommendations.pdf

25 California Department of Finance, "California's Five-Year Infrastructure Plan 2015, 8," 2014, http://www.ebudget.ca.gov/2014-Infrastructure-Plan.pdf

26 Caltrans, "Executive Fact Booklet," 2015, http://dot.ca.gov/hq/tsip/data_library/EFB/2015_EFB.pdf.

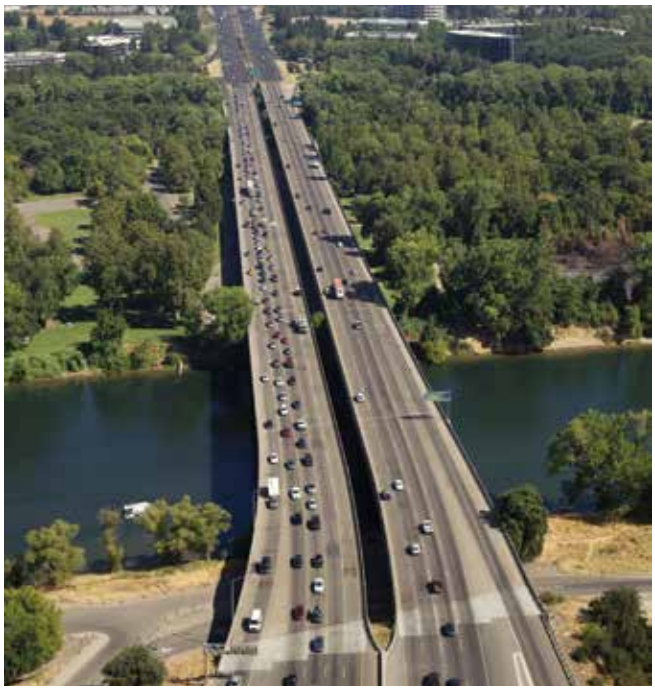
27 Federal Transit Administration, "National Transit Database. In Table 19: Transit Operating Statistics: Service Supplied and Consumed," 2013, http://www.ntdprogram.gov/ntdprogram/pubs/dt/2013/excel/DataTables.htm.

STATE HIGHWAY SYSTEM

The California SHS is expansive and complex including 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.[26] 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. This system has a value of more than $1.2 trillion.[27]

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. Most of the lane-miles were constructed in the period from post-World War II through the 1970s. Highways have been, and will continue to be, vital for the State's economy and the movement of its people and goods.

California is dedicated to maintaining and efficiently operating our existing highway system, but at the current time, the condition of highway pavement is among the worst in the nation. Additional funding will be required to bring our pavement; bridges and culverts to a state of good repair over the next decade. Fix-it first goes beyond maintaining bridges and pavement; it also means the system has good operations management, such as ramp metering lights, mode separation, congestion pricing, and other intelligent transportation systems (ITS) technologies that can greatly increase existing highway capacity without adding lanes to California's SHS. While there is good and important work being done to ensure more vehicles in California are zero-emission, there is no reasonable expectation that the State will see fewer vehicles making demands on its highway system in the coming decades than it has today. The Department of Motor Vehicles (DMV) projections show an 8 percent increase in registered vehicles on our roadways in just over the next 5 years. Our policy approach is three-fold: invest in fixing our assets to ensure they can reliably handle the demand of a growing populace; reduce demand on the system by providing viable, clean, and efficient travel options Californians are demanding; and utilize pricing and corridor targeting for smart expansion strategies that can implement a multimodal approach to corridor improvements.



Highway and road investment alone will neither solve our congestion problems nor provide the mobility options Californians want. Such a strategy is not enough. It must be coupled with new approaches that look less at specific projects and more at improving corridors; and that look less at analyzing how many cars we can squeeze through a segment of highway, and instead look at how we can reliably move people and goods to their destinations through various modes.

That said, Californians do continue to drive. And they drive a lot. Therefore, as we move forward toward meeting emission reductions, we cannot ignore the condition and operations of our highways, roads, and bridges. They require investment today, and they will do so in the future.

We simply must be smarter in how we invest in roadway expansion. We should look less at lists of projects and more at how to improve mobility in targeted corridors. Utilizing pricing in an expanded way to develop targeted capacity improvements will enable the State and regions to consider and pay for life-cycle costs and fund more mobility options within these targeted corridors. This approach has been used on State Route 91 in Riverside County, the I-405 in Orange County, the I-215 in Riverside County, and is under discussion for Highway 101 in Silicon Valley.

26 Leiter, B., et al., "2011 Statewide Transportation System Needs Assessment," 2011, http://www.catc.ca.gov/reports/2011Reports/2011_Needs_Assessment_updated.pdf.

27 California Department of Finance, "California's Five-Year Infrastructure Plan 2015, 8," 2014, http://www.ebudget.ca.gov/2014-Infrastructure-Plan.pdf.

SUSTAINABLE FREIGHT AND PORTS

California has the most extensive, complex, and interconnected freight system in the nation. The immense volume of goods traveling through California demands an efficient network of ports, roadways, railways, pipelines, and airports—for both domestic and global shipping. Rail lines and cargo ships are predominately used to move goods over great distances; aviation is used for high-value lighter goods; and trucks are the favored mode for receiving and shipping goods for 78 percent of California communities[28]—to intermodal facilities, distribution centers, manufacturing facilities, and other destinations.

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 to, through, and within California,[29] creating 800,000 freight jobs.[30] In addition, the future volume of goods transported is anticipated to grow, as **Table 9** shows.

Freight movement presents many current and future challenges to the natural environment and local communities. Efficient movement of freight minimizes impacts and supports the State's economy. Many efforts are at work to improve system efficiency including development of the national Primary Freight Network by federal and State policymakers and, in December 2014, Caltrans published the California Freight Mobility Plan (CFMP), which guides freight movement planning activities and capital investments. The collaborative effort to develop the CFMP included establishment of the California Freight Advisory Committee (CFAC), an important foundation for an ongoing partnership with the freight industry and a diverse group of public and private stakeholders.

Recognizing the importance of freight to California's economy and the opportunities to improve efficiency and environmental performance of the system, in July 2015, Governor Brown issued EO B-32-15, directing departments in his administration to develop a Sustainable Freight Action Plan by July 2016. Caltrans and the CFAC are working together with the ARB, the CEC, and the GO-Biz to develop the California Sustainable Freight Action Plan. The focus of this plan will be on greater efficiency, transition to zero- and near-zero-emission technologies, and increased competitiveness. By improving advocacy and pooling resources, this new partnership is driven to improve freight movement, improve communities along California's trade corridors, and increase the State's freight industry's global competitiveness.

Table 9
FREIGHT FORECAST AND TRENDS [31]

- Total shipments by tonnage (into, out of, and within CA) are projected to grow approximately 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 forecasted 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

SEAPORTS

California is home to some of the busiest ports in the world. This system of seaports (ports) extends along the California coast from Humboldt in the north, to San Diego in the south, including two inland ports (Stockton and West Sacramento). These ports are the linchpin of international trade, acting as gateways to global markets for goods departing to and arriving from overseas locations, creating hundreds of thousands of jobs, and generating over $40 billion in annual economic activity. This dynamic flow of goods includes California's vast agricultural products, machinery, petroleum products, electronics, apparel, furniture, vehicles, and wastepaper, among many other commodities. The combined ports of Los Angeles and Long Beach (also known as the San Pedro Bay Ports) ranks at the top of the national list for the number of 20-foot equivalent unit (TEU) containers shipped annually.[32]

California's major ports and industry partners are committed to reducing associated environmental impacts. They have successfully implemented and continue to seek new strategies to reduce emissions, including clean air programs, shore side power options, ship speed reduction, and other environmental initiatives.

28 Caltrans, "Fast Freight Facts: Commercial Vehicles (Trucks). In The Predominant Freight Mode, 1," http://www.dot.ca.gov/hq/tpp/offices/ogm/fact_sheets/Fast_Freight_Facts_Trucks_bk_040612.pdf.

29 Avol, E., "Assessing the Public Health Impacts of an Existing & Expanding Freight System, "2013, http://policyinstitute.ucdavis.edu/files/general/pdf/2013-04-18_Avol-UCS-Freight-Forum-Apr2013fnl.pdf.

30 United States Department of Labor, "May 2014 State Occupational Employment and Wage Estimates California. In Transportation and Material Moving Occupations," 2014, http://www.bls.gov/oes/current/oes_ca.htm#53-0000.

31 Caltrans, "California Freight Mobility Plan. In Freight System Assets, Condition, Performance, and Forecast." 2014, http://www.dot.ca.gov/hq/tpp/offices/ogm/CFMP/Dec2014/CFMP_010815.pdf.

32 American Association of Port Authorities, "Port Industry Statistics," 2015, http://www.aapa-ports.org/Industry/content.cfm?ItemNumber=900.

FREIGHT RAIL

California is a key state in the largely privately-owned national freight rail system. The freight rail network supports the operations of industries throughout the State and links California with domestic and interregional markets at seaports and border ports of entry (POE) that are gateways to international trade. Trucks and trains move freight through intermodal connections to and from inland destinations.

In 2014, the largest railroads in California (Class I) had operating revenues of $47.2 billion (BNSF Railway $23.2 billion and Union Pacific $24.0 billion), which rival entire budgets for many other states' departments of transportation.[33] Freight railroad issues include: the need for streamlined environmental processes, maintaining and protecting key freight rail corridors, interest in projects with both public and private benefits, and freight diversion to rail. Railroads are also seeking effective cleaner locomotives. Addressing these issues would allow the California consumer and resident to gain the positive environmental and economic benefits of freight rail. The State generally participates in freight rail projects through its role of administering federal funds and through a variety of public-private partnerships.

INTERNATIONAL PORTS OF ENTRY [34]

Another crucial component of the system is the movement of goods and people at the six international land ports of entry currently exist along the 130-mile border connecting Baja California, Mexico, and California through San Diego and Imperial counties. In 2014, more than 47.5 million individuals and 19 million vehicles crossed the border northbound into California through three of the POEs. Otay Mesa is the third busiest commercial (truck) crossing by trade value on the U.S.-Mexico border and, for passengers, San Ysidro is one of the busiest land POEs in the world. A cross-border passenger connection to the Tijuana International Airport is under construction (in 2015), and a seventh POE is planned at Otay Mesa East. This new POE will help reduce freight and passenger traffic congestion at other border sites, as well as provide additional capacity for future growth in trade.

Caltrans staff continue to coordinate binational efforts with Mexico to streamline freight entry and reduce idling, with the added benefit of mitigating adverse health impacts and protecting the environment. In 2013, Presidents from both countries announced formation of the High Level Economic Dialogue to advance strategic economic and commercial priorities central to mutual economic growth, job creation, and global competitiveness.

Together, freight and ports of entry play a vital role in the transportation system and the economy. As both of these continue to increase, the CTP 2040 provides guidance on how best to foster this growth sustainably.

33 http://www.bnsf.com/about-bnsf/financial-information/performance-summary/pdf/performance_update_4Q_2014.pdf
http://www.up.com/cs/groups/public/@uprr/@investor/documents/investordocuments/pdf_up_4q_earnings.pdf

34 San Diego Association of Government, "San Diego Forward: The Region Plan Draft. In Appendix U.14: Borders," 2015, http://www.sdforward.com/pdfs/DraftAppendixU14-Borders.pdf.

HIGH-SPEED RAIL

California has a history of being a leader of transportation innovation. HSR will be the newest addition to the transportation system. Now under construction, by 2029, Phase 1 of HSR will serve as California's backbone transportation system connecting the mega-regions of the State. In addition, construction of the XpressWest interstate HSR line will extend from Southern California to Las Vegas, Nevada and provide connectivity to California's HSR system, as well as reduce GHG emissions, congestion, and stimulate California's economy. When in operation, ridership on the system will significantly reduce GHG through savings from reduced automobile and air travel. California's HSR system will be powered by 100 percent renewable energy. Additionally HSR will spur infill development of housing and businesses near station areas, providing further environmental benefits. Accelerating progress on HSR would hasten a mode shift in long distance travel and provide the backbone for a new transportation paradigm in California that relies less on automobile travel.

During design and construction, the Authority seeks to minimize and mitigate all GHG emissions, integrate life-cycle performance in its materials, and address resilience and adaptation principles. All of the Authority's design-build procurement and contract documents have incorporated requirements for the contractor to deliver and document how they minimize GHG emissions, use the cleanest available construction equipment, recycle all concrete and steel, conserve on-site water use, and select recycled and environmentally preferred products.

To address direct GHG emission from construction, a tree-planting program is being developed in collaboration with the California Department of Forestry and Fire Protection (CAL FIRE) to include both reforestation of burnt land and urban forestry to provide co-benefits to disadvantaged communities. A voluntary emissions reductions agreement (VERA) with the San Joaquin Air Pollution Control District provides funds to the Air District's criteria pollutant offset programs in time with construction.

To plan for climate change adaptation, the Authority has completed climate vulnerability assessments and is integrating life-cycle cost adaptation measures into design, as well as into operations and maintenance as project delivery progresses.

The Authority is further investing nearly $1 billion in local connectivity projects throughout the State to improve transit, modernize the statewide rail network, and build near-term transit ridership and reduce emissions. In addition, the Authority is funding the 24 station cities to plan for compact, walkable, and resource-efficient infill development and district-level green infrastructure. If the State can encourage vibrant and intensive station area development and regional planning (e.g. SCSs) that channels the increased development into infill rather than sprawl, substantially greater VMT and GHG savings could result.

Figure 8

SUBJECT TO CHANGE

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.

INTERREGIONAL RAIL

Another form of transportation is California's passenger rail system. Recently, rail has experienced a renewed interest and increasing ridership. This system includes intercity and commuter rail and will include the California HSR. The three existing intercity rail routes include the Capitol Corridor, San Joaquin, and Pacific Surfliner routes, which serve all of California via connection to the Amtrak Thruway Bus Service.

Modernizing, integrating, and expanding California's rail and transit systems are essential to serving California's future mobility needs in a clean and efficient manner. While existing transit and intercity rail investments have provided a good foundation of service, it is often far too difficult or even impossible to reach one's intended destination using transit and rail in a manner that is competitive with the private automobile. Services are not planned and operated in a manner that makes connections convenient, and many gaps exist in the public transportation network, leading to many journeys that have no attractive public transportation alternative.

CalSTA and Caltrans are addressing this issue through a trailblazing effort to develop an integrated rail and public transportation network through the development of the 2018 California State Rail Plan (CSRP). Transit agencies, rail operators, planning organizations, and stakeholder organizations from across the State are developing a draft network vision that will be developed for public comment and feedback in early 2017. Our goal is to develop the vision and framework for a state-of-the-art, integrated transit and rail network that allows Californians and our visitors to move quickly, cleanly, and conveniently throughout the State, providing an attractive alternative for future travel needs on California's transportation system. The 2013 CSRP created a blueprint for how to improve integration of commuter and intercity rail with public transit and other transportation systems–a priority for the State's HSR 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 HSR system is initially being financed with State and federal funds as a key strategy for reducing GHG emissions.

Investment throughout California in projects that modernize the passenger rail system and link seamlessly to local public transit systems will continue to build public transit ridership and shift travelers from SOVs to public transport. Rail modernization in California will increase benefits for passengers, including improved mobility and safety, with a reduced carbon footprint. In 2015, California invested approximately $225 million in transit capital projects, including those that improve access at stations, to reduce travel times and increase ridership thanks to the Transit and Intercity Rail Capital Program.[35] One project seeks to demonstrate a fare integration program to coordinate payment for interregional transit trips. This type of innovation is critical to improving transit access and reducing GHG emissions.

With the modernization of current facilities and connectivity to multimodal options, rail will play an increasing role in the transportation system. The addition of HSR will add and enhance statewide connectivity and travel options.

35 Caltrans, "Transit and Intercity Rail Capital Program (TIRCP)," http://www.dot.ca.gov/hq/MassTrans/tircp.html.

AIRPORTS

Another crucial component of the transportation system are California's airports. From the State's busiest airports such as Los Angeles International, to the critical rural ones that provide lifeline support, all 243 permitted airports handle both people and goods throughout their regions, with many linked to global markets. California does not own or operate any airports; however, aviation system conditions are monitored and aviation plans are guided by the State to consider regional capacity, surface transportation, the movement of freight, and overall economic development. In recent years, several California airports have become more robust community partners and continue to expand their economic potential through integration of multimodal transportation systems and sustainable community strategies.

Although California is currently home to 12 of the top 100 cargo-carrying airports in North America, an increasingly efficient air cargo network is essential to competing in today's global marketplace. Air cargo, which is usually high in value and time sensitive, can ship both domestically and internationally via dedicated cargo aircraft or in the belly of passenger planes. The volume and value of freight transported differs dramatically for each airport.

On the environmental front, many airports are being encouraged to switch shuttles and other motorized handling equipment to alternative fuel sources including natural gas and electricity. The Federal Aviation Administration (FAA) is working to enable the U.S. to use one billion gallons per year of sustainable alternative jet fuels created from renewable sources by 2018. These fuels will mimic the chemistry of petroleum jet fuel and can be used in today's aircraft and engines without modification, and provide the same level of performance and safety as today's petroleum-derived jet fuel.

Airports provide local, regional, national, and worldwide linkages in transporting people and goods. With changing technologies, these facilities will become more efficient and provide multimodal connectivity to other modes of transportation in the system.

TRIBAL

There are 109 federally recognized Native American Tribes throughout California (see **Appendix 5**), each with its own tribal government and whose communities have a variety of unique transportation needs.[36] 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 and accommodate all of its users.

NATIVE AMERICAN TRIBES AND THE STATE OF CALIFORNIA

California has the largest Native American population of any state in the nation. This population consists of both federally recognized tribes and tribes without federal recognition. Further, federal policies implemented in the 1970s relocated Indians from reservations to urban centers. Many Native Americans in the State are not from tribes indigenous to California. Strong concentrations of Native Americans exist in major cities such as San Francisco, San Jose, San Diego, and Los Angeles. 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 (2011), the state of California engages with Native American groups in consultation and for the advancement of environmental justice (EJ) 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.

Sovereignty is very important to tribal communities and forms the backbone of California's relationships with Native American tribal governments. Federally recognized tribes are sovereign nations. Each tribal government administers essential programs and provides services to both tribal and non-tribal members of its community. Once a tribe achieves federal recognition status, the US and California governments, by law, must engage with the tribe in a formal, government-to-government relationship. The US government has a fiduciary obligation to protect tribal lands, assets, resources, and rights for the benefit of tribes and their members. The state of California respects these rights and conducts its transportation planning accordingly.

In addition to supporting federal laws, such as Section 106 of the National Historic Preservation Act of 1966, 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 respect for tribal sovereignty and pursuit of 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" as well as to "[consult] with tribal Governments prior to making decisions, taking actions or implementing programs that may impact their communities."

36 The Office of the Federal Register, Federal Register 79, no. 19, (January 29, 2014): page 4748, http://www.gpo.gov/fdsys/pkg/FR-2014-04-15/pdf/2014-08477.pdf.

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

Partnerships 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 multimodal 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 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, all government agencies involved in transportation, such as the Bureau of Indian Affairs (BIA) and Federal Highway Administration (FHWA), must be included.

TRIBAL LANDS AND THE TRANSPORTATION SYSTEM

Tribal governments provided essential tribal input to the CTP 2040 to guide its direction. Through ongoing coordination, tribal governments help 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 (LRPs). 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 the Reference section of the CTP 2040 website: www.californiatransportationplan2040.org.

At the state level, consistency in consultation processes across state modal plans provides greater clarity and transparency in the planning process. Consultation also provides tribal governments an opportunity 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, coordination with and providing information to tribes about upcoming projects that affect them is required. The consultation process helps Caltrans understand the diverse needs of tribal governments across the State and avoid a one-size-fits-all approach.

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.

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, meaning the federal government holds legal title, but the beneficial interest remains with the tribe or individual Indian. These 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 either a federally recognized or an unrecognized tribes live on allotment lands that the federal government holds in trust for individual allotment owners.

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 109 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.[37] The figures in **Appendix 5** 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 SHS 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 face the obstacles of living in a socio-economically challenged area without access to private vehicles. These members rely on transit services for access to medical services, employment, education, social activities, and shopping. To meet the demand, some tribes have established a variety of transit, paratransit, and other public transportation programs. For example, 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 FY 2013, five California tribes received $651,000 in discretionary funds (12.9 percent of the national total for discretionary funds).[38] In Federal FY 2014, eight tribes received $531,845 in formula funds (2.1 percent of national total for formula funds).[39] Partnership opportunities also exist to enhance interregional transportation system access through expanded

37 Caltrans, "Caltrans Internal Report and Analysis," 2010.

38 Office of the Federal Register, "Fiscal Year 2013 Public Transportation on Indian Reservations Program Project Selections," Federal Register 79, no. 72 (April 15, 2014): page 21347-21350, http://www.gpo.gov/fdsys/pkg/FR-2014-04-15/pdf/2014-08477.pdf.

39 Federal Transit Administration, "FY 2014 Apportionment Tables," 2014, http://www.fta.dot.gov/12853_14875.html.

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.[40] 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. Many tribes in California have adopted TEROs. 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.[41] These guidelines mandate that when Caltrans constructs a project on tribal lands, Caltrans will work with a TERO tribe to implement applicable sections of its ordinance through a Memorandum of Understanding (MOU) with the tribe. This policy provides a mechanism for Caltrans to partner with tribes to promote their economic development.

Tribes engage in several forms of economic development, and tribal gaming has become one 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. 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.[42] 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. These gaming facilities with their complementary amenities generate significant freight activities for the shipment of food, supplies, building materials, and waste. 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.

Transportation infrastructure can further benefit tribal economies by providing vital access to goods, services, and employment. Due to the critical importance and scarcity of transportation for tribes, it is essential that State and local agencies consult with tribes on transportation planning and construction. To ensure the best planning outcomes, State and local agencies should include tribes as early as possible in the process. The consultation and coordination process ensures that transportation improvements will reflect the unique needs of tribal communities.

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 convenient transit, bicycle, road, and pedestrian services. When working with tribal governments, Caltrans recognizes each tribe has unique needs that may change over time. This fact makes it important to continually involve and include tribes in the transportation process. 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 successfully customizing transportation solutions that meet their communities' needs.

40 Caltrans, "Complete Streets: Integrating the Transportation System. Deputy Directive DD 64-R2," 2014.

41 Caltrans, "Tribal Employment Rights Ordinance (TERO). Deputy Directive DD 74-R2," 2010, http://dot.ca.gov/hq/tpp/offices/ocp/nalb/Images/TEROsigned.pdf.

42 California Nations Indian Gaming Association, "Economic Impact Study: Tribal Government Gaming a Powerful and Growing Economic Engine for California, Generating $8 Billion for State's Economy in 2012," 2014, http://www.cniga.com/media/pressrelease_detail.php?id=117.

REGIONAL AND LOCAL

Regional transportation often serves commuters, which count for many of the daily trips on the transportation system. This component of the system will only become more critical as the population and economy continue to grow.

The local transportation system often serves shorter trips that are accomplished on local roads, streets, and bike and pedestrian facilities. These trips may stay local or feed into the larger transportation system. Many of these short trips can also be completed by active forms of transportation such as walking or biking. Trends show increasing support for active transportation and the infrastructure needed to support this component of the system.

COMMUTING TRENDS

According to the Census Bureau, between 2012 and 2013 California's statewide average one-way car commute was 27 minutes. The number of people driving longer than 60 minutes to work was 1.54 million, or 9.9 percent of workers over the age of 16 (working outside of the home).[43]

Some areas across California report average commute times that are higher than 50 minutes each way, including some parts of Los Angeles County, Butte County, and Madera County. Several places with shorter reported commute times are the Siskiyou County area, portions of Inyo County, and San Bernardino County. Other reported means of transportation used to commute to work includes public transportation. Projections suggest (according to the Public Policy Institute of California) that from 2000 to 2020, the rate of employment growth in inland areas will outstrip the rate in coastal areas—perhaps by a factor of two-to-one. But in absolute numbers, the vast majority of new jobs will still be located in coastal zones. Population growth in inland areas is expected to be higher relative to population growth in coastal areas, causing an even greater jobs/housing mismatch. This "drive 'til you qualify" trend suggests that, without continued policies to encourage smart-growth, pressure on inland-to-coastal-area commutes could increase substantially. In addition, projected demographic trends may lead California towards compact housing patterns and less solo driving and increased public and active transportation use. Efforts to encourage more efficient use of the existing transportation infrastructure is paramount.[44]

ROADS AND STREETS

Similar to the SHS, but at a different scale, California has a vast network of roads and streets. California's 58 counties and 482 cities own and maintain a network of 140,491 centerline miles of local streets and roads.[45] 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 total vehicle miles–are traveled on this local street network. Conservatively, this network is valued at $271 billion.[46] California's roads and streets serve to connect communities from the neighborhood to town scale. These sustainable, integrated corridors serve not only for conveyance of people, goods, and services, but also as livable public spaces. Communities rely on local streets and roads to access retail goods and services, get to work and school, and recreate. Enhancing safety and access through innovative design and strategic investment can ensure greater mobility choice and lead to GHG reductions as efficient travel options, such as walking, biking, and transit use, increase.

43 Rawes, E., "8 States with the longest commute times," 2014, http://www.usatoday.com/story/money/business/2014/10/19/cheat-sheet-States-longest-commutes/17428945/.

44 Barbour, E., "Time to Work," 2006, http://www.ppic.org/content/pubs/cacounts/CC_206EBCC.pdf.

45 Caltrans, "California Transportation Quick Facts," 2015, http://www.dot.ca.gov/hq/tsip/data_library/QuickFacts/CaQF/CAQuickFacts2015.pdf

46 Leiter, B., et al., "2011 Statewide Transportation System Needs Assessment," 2011, http://www.catc.ca.gov/reports/2011Reports/2011_Needs_Assessment_updated.pdf.

ACTIVE TRANSPORTATION CONNECTIVITY

Bicycle and pedestrian facilities are integral components of the statewide transportation system. Analysis of data from the 2013 California Household Travel Survey (CHTS) 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 10** and **Figure 9**, bicycling and walking for transportation purposes have both experienced a significant increase in popularity, with each doubling its mode share since 2000.[47] Caltrans recently expressed a strategic goal to triple cycling and double walking and transit use statewide by 2020 relative to the 2010 mode share.[48]

Many California cities and counties have created bicycle and pedestrian plans. Caltrans is creating the California Statewide Bicycle and Pedestrian Plan (CSBPP) to plan for safe and integrated bicycle and pedestrian projects for enhanced connectivity with all modes of transportation. Some MPOs and RTPAs also have such plans, included either 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 CHTS.[49] Given that 15 percent of auto trips are less than one mile, and 70 percent are less than 10 miles, replacing even a modest number of trips with biking or walking would dramatically reduce GHG emissions and improve public health.

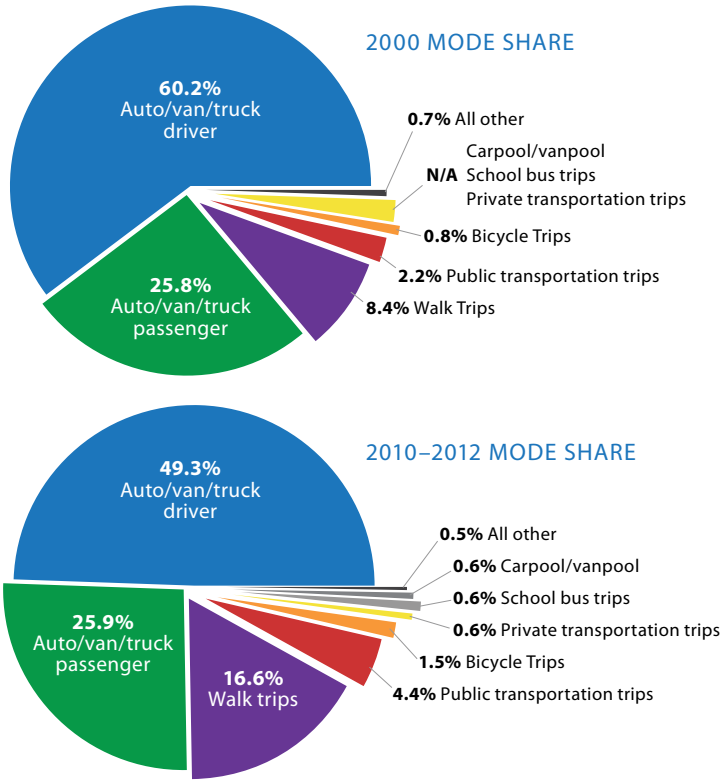
Bicycle and pedestrian facilities increasingly are included as standard elements in transportation projects. One notable project includes the first portion of bicycle and pedestrian path on the East Span of the San Francisco-Oakland Bridge. A study is underway exploring the feasibility of completing the path to San Francisco.[50] 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 safe and efficient transportation choice for more people, more often. The ATP at Caltrans will help fund projects like this by administering an average of $120 million a year in federal and State funds meant to increase active transportation.

Table 10
CALIFORNIA TRANSPORTATION MODE SHARE 2000–2012

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

Source: Caltrans Travel Forecasting and Analysis branch

Figure 9
CALIFORNIA TRANSPORTATION MODE SHARE 2000–2012



Source: Caltrans Travel Forecasting and Analysis branch

47 Caltrans, "Comprehensive Travel Survey Shows More Californians are Walking, Biking and Riding Transit," 2014, http://www.masstransitmag.com/press_release/11326880/ca-comprehensive-travel-survey-shows-more-californians-are-walking-biking-and-riding-transit.

48 Caltrans, "Strategic Management Plan," 2015, http://www.dot.ca.gov/perf/library/pdf/Caltrans_Strategic_Mgmt_Plan_033015.pdf.

49 Leiter, B., et al., "2011 Statewide Transportation System Needs Assessment," 2011, http://www.catc.ca.gov/reports/2011Reports/2011_Needs_Assessment_updated.pdf.

50 Cabanatuan, M., "Plan for Bay Bridge bike path from Oakland to S.F. in high gear," 2014, http://www.sfgate.com/bayarea/article/Plan-for-Bay-Bridge-bike-path-from-Oakland-to-5889208.php.

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 2013, California transit operators provided 1.43 billion unlinked passenger trips. California public transit systems provide connectivity to the National Railway system (Amtrak), and nearly all commuter rail users use multiple modes for their trips. For example, 23 percent of Caltrain passengers take transit to their originating station.[51]

While operating costs per passenger mile traveled have largely remained steady in the past 20 years, capital costs for transit facilities in California have increased by an average of $20 million per year as operators introduce new rail and busway services. Due to this substantial increase in cost over the past quarter century, capital costs for these transit facilities are roughly 10 percent of capital expenditures for the construction of new highways and roads.[52]

To help fund transit-oriented projects that are low carbon emitters, an additional funding amount of $25 million for transit and intercity rail capital projects will be received from the Cap-and-Trade Program, which is 10 percent of the total auction proceeds for this program beginning in 2015-16.[53] This amount, combined with the existing State funding from the Statewide Transportation Improvement Program (STIP), Traffic Congestion Relief Program (TCRP), and Prop 116, 1B, and 1A, will significantly aid the expansion, maintenance, and operations of California's transit systems.

For more information on State transit programs and funding, please visit the Reference section of the CTP 2040 website: www.californiatransportationplan2040.org.

REGIONAL AND LOCAL LAND USE CONSIDERATIONS

Regions are working to meet mobility, safety, and sustainability objectives in an integrated way pursuant to the State's climate change and greenhouse gas emission reduction laws.[54] SB 375 encourages local governments and regions to consider alternative land use patterns that promote compact urban infill development. This reflects collective efforts to provide a regional transportation system capable of meeting these objectives and a more efficient use of land.

SCS and other legislation call for transportation planning, housing projections, and land use planning to be more integrated. Since SCS is part of a RTP effort and ultimately feed the larger CTP 2040 plan, housing and land use are keys to developing the vision of the CTP 2040 and fulfilling State planning priorities. New revenue sources such as Cap-and-Trade funds can provide local and regional agencies opportunities to support location efficient land use development and implement integrated transportation and land use plans. The Affordable Housing and Sustainable Communities (AHSC) grants provide one such source of funds to better integrate housing and efficient transportation infrastructure. In 2015, California invested $121.9 million from the AHSC program in 28 projects that are reducing GHG emissions and providing communities with better access to efficient transportation choices.[55]

51 Caltrans, "California Statewide Transit Strategic Plan: Recommendations for Caltrans," 2012, http://www.dot.ca.gov/hq/MassTrans/STSP/STSPrecommendations.pdf.

52 Ibid.

53 CalSTA, "Transit and Intercity Rail Capital Program," 2014, http://www.calsta.ca.gov/res/docs/pdfs/2014/TIRCP%20Fact%20Sheet.pdf.

54 California State Transportation Agency, "California Transportation Infrastructure Priorities: Visions and Interim Recommendations," 2014, http://calsta.ca.gov/res/docs/pdfs/2013/CTIP%20Vision%20and%20Interim%20Recommendations.pdf.

55 Strategic Growth Council, "Strategic Growth Council Approves $122 million in Affordable, Transit-Friendly Housing Grants," 2015, http://www.sgc.ca.gov//docs/Press_Release_2_AHSC_Program_06302015.pdf.

OPPORTUNITIES AND CHALLENGES

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 present numerous opportunities and must be understood in order to accurately predict travel needs and further policy goals in the statewide multimodal transportation system. The sections below highlight some economic, demographic, and policy trends and opportunities to influence today's transportation system that should be taken into account in long-range planning. These trends and opportunity areas are:

- Demographics Trends
- Uptick in Walking, Biking, and Transit
- Per Capita VMT Trends
- Technology
- Growth in Cleaner Vehicles and Cleaner Fuel Markets

DEMOGRAPHIC TRENDS

California is one of the most diverse states in the nation (see **Table 11**).[56] The annual growth rate is expected to be one percent throughout the forecasted years.[57] A growing and diversifying population presents new innovative opportunities for transportation planners. Strategic investment will ensure that limited resources are able to respond to anticipated increases in transportation demand by a population that is aging and diversifying. The State's 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 11
CALIFORNIA ETHNIC/RACIAL DIVERSITY COMPARED TO NATIONAL ETHNIC/RACIAL DIVERSITY

ETHNIC/RACIAL GROUP	CALIFORNIA	USA
American Indian and Alaska Native alone	1.7%	1.2%
Asian alone	14.4%	5.4%
Black or African American alone	6.5%	13.2%
Hispanic or Latino	38.6%	17.4%
Native Hawaiian and Other Pacific Islander alone	0.5%	0.2%
White alone, not Hispanic or Latino	34.6%	60.1%
Two or more Races	3.7%	2.5%

Source: United States Census Bureau, U.S. Department of Commerce, 2014

56 US Census Bureau, "State and County QuickFacts," 2016. http://www.census.gov/quickfacts/table/PST045215/00.

57 Public Policy Institute of California, "California 2025: Planning for a Better Future in California. In California Population, 38." 2014. http://www.ppic.org/content/pubs/report/R_113BKR.pdf.

POPULATION GROWTH

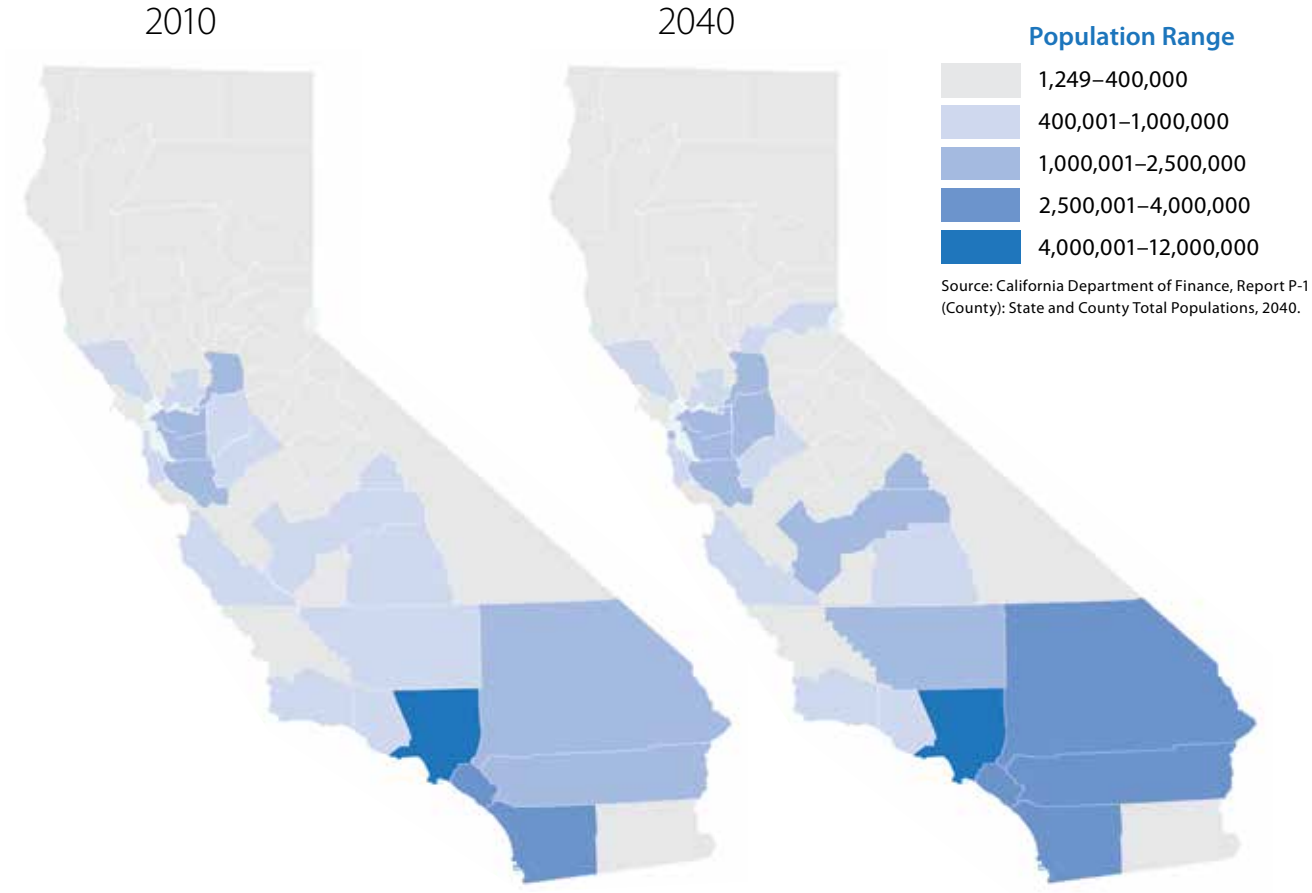
The State's population today is over 38 million,[58] and is projected to reach 48 million by 2040.[59] There are approximately 24 million licensed drivers and over 32 million vehicles registered annually in the State. [60]

Population growth, with the vast majority of California's population living in urbanized areas, amplifies the need to improve transportation access through better connectivity and efficiency in order to meet future demands. 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 12** and **Figures 10–11**),[61] 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 near future.

California's population growth before 1990 was largely a result of migration. Prior to 1990, population increase each year from people moving into California from other states and countries was greater 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.

Figure 10

2010–2040 Projected Population by County



Source: California Department of Finance, Report P-1 (County): State and County Total Populations, 2040.

58 California Department of Finance, "Population Estimates for California, 1," 2015, http://www.dof.ca.gov/research/demographic/reports/estimates/e-1/documents/E-1_2015PressRelease.pdf.

59 California Department of Finance, "New population projections: California to surpass 50 million in 2049," 2013.

60 Caltrans, "Executive Fact Booklet," 2015, http://dot.ca.gov/hq/tsip/data_library/EFB/2015_EFB.pdf.

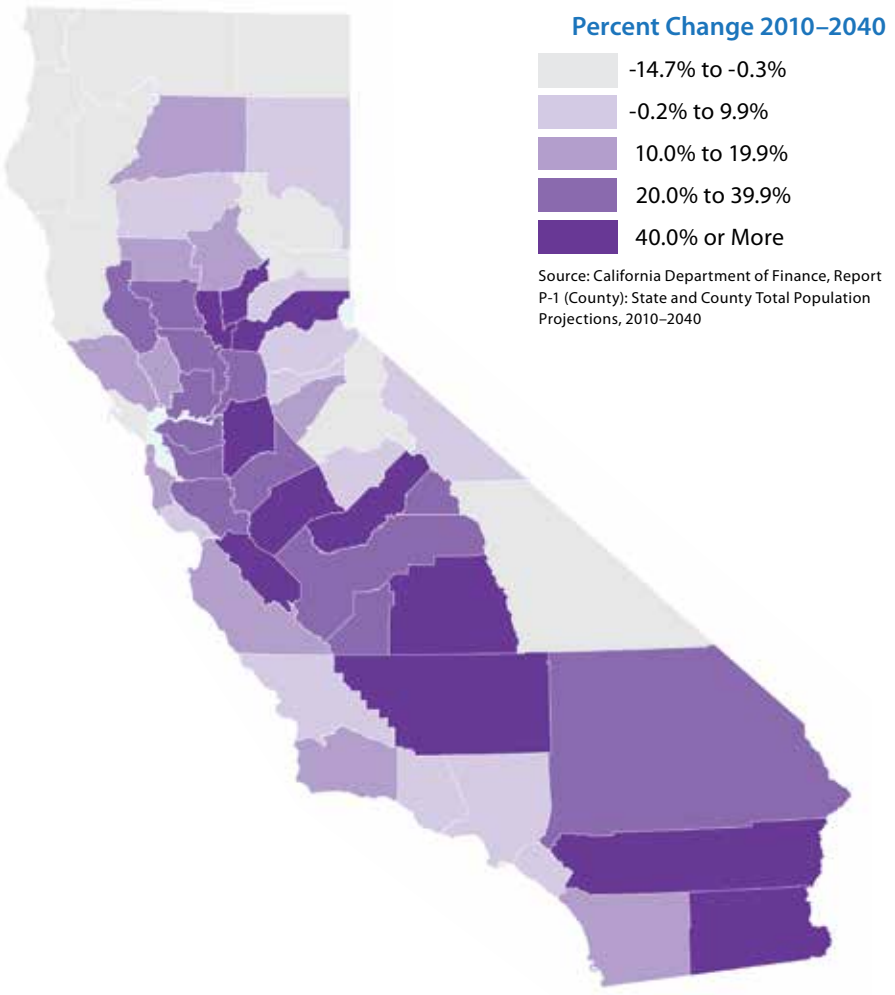
61 Schwarm, W., "Report P-1 (Total Population): State and County Population Projections," 2014, http://www.dof.ca.gov/research/demographic/reports/projections/P-1/documents/P-1_Total_CAProj_2010-2060_5-Year.xls.

Table 12
2010-2040 PROJECTED POPULATION GROWTH IN HIGH GROWTH INLAND COUNTIES

COUNTY	2010 POPULATION	2040 PROJECTED POPULATION	CHANGE (PERCENT INCREASE)
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: California Department of Finance, 2013

Figure 11
2010-2040 Projected Percent Change in Population by County



Source: California Department of Finance, Report P-1 (County): State and County Total Population Projections, 2010–2040

MILLENNIALS 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.[62] People born in the 1990s travel 18 percent fewer miles and take 4 percent fewer trips than previous generations.[63] There are many theories as to the reasons for this, including 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 is 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. Transportation planning and investment should encourage the market trend, by providing safe and efficient mobility choice that enhances the livability and economy of California.

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 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.[64] *As people age, they are less likely to drive due to health limitations, requiring alternative transportation modes.*

Sustainable forms of transportation, such as HSR, transit, shared mobility (car and bike share), and active transportation, will be important to accommodate and encourage these shifts to more efficient 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 multimodal system that connects people to crucial destinations.

62 Baxandall, P., "Moving Off the Road: A State-by-State Analysis of the National Decline in Driving, 3," 2013, http://calpirgedfund.org/sites/pirg/files/reports/CAP%20DrivingRpt%20Aug13.pdf.

63 Blumenburg, E., et al., "What's Youth Got to Do with It? Exploring the Travel Behavior of Teens and Young Adults. UCTC," 2012, http://www.uctc.net/research/papers/UCTC-FR-2012-14.pdf.

64 Pitkin, J., & Myers, D., "Generational Projections of the California Population by Nativity and Year of Immigrant Arrival, 12," 2012, http://www.usc.edu/schools/price/futures/pdf/2012_Pitkin-Myers_CA-Pop-Projections.pdf.

UPTICK IN WALKING, BIKING, AND TRANSIT

With the urgency to cut down our State's GHG emissions, Californians need to develop a new perception of traveling. One of the benefits and hopes of land use and redevelopment strategies is to have people live in areas where access to work, school, and amenities can be achieved through the ease of walking, bicycling, or using transit. This in turn can help relieve vehicle congestion and improve public health.

In recent years, there has been a noticeable increase in support for walking, bicycling, and transit, making it even more important to incorporate safe accessibility to these modes of travel. As stated in the CHTS, from 2010-2012 nearly 23 percent of household trips were taken by walking, biking, and public transportation, but in 2000 that share was only 11 percent.[65] This increase is a push for cities to start investing in more Complete Streets projects, which improves pedestrian and bicyclist safety by adding bike lanes, road diets, and more signage. According to the American Public Transportation Association, Americans took 10.8 billion trips on public transportation in 2014, which is the highest annual public transit ridership number in 58 years.[66] Going forward, transit services will need to be maintained and improved as public transportation is becoming increasingly popular within our nation. An example would be for regions to implement a Bus Rapid Transit (BRT) system, where bus-only lanes are created specifically for this high-capacity transit system in order to bypass traffic congestion. Integrating active transportation and transit connectivity into planning, design, and construction will ensure that access to these efficient travel modes increases. For example, Los Angeles recently announced endorsement for their Mobility 2035 Plan, which would rework major boulevards to provide better transit and active transportation access.

There are also economic benefits that can arise through bicycling, walking, and using transit more within communities. For instance, there is a higher probability that businesses are more visible and easier to access through bicycling or walking without having to find vehicle parking, whereas traveling by car at higher speeds may cause these businesses to be overlooked. Studies show that retail customers using active transportation improve business for local establishments. A lot of this can be attributed to infrastructure that can accommodate active transportation; for example, businesses located near bicycle parking corrals in Portland estimated that one-quarter or more of their customers arrived by bicycle.[67] Transit can also increase exposure of businesses by developing mobility hubs, where all of the following modes would be under one station such as bike share, bus and rail, taxi, and rideshare services. These hubs can serve as advertising platforms and can be a new strategy for businesses to build their companies near or around these stations. With an uptick of walking, bicycling, and transit usage, our vision of decreasing GHG emissions, reducing congestion, and improving safety will be realized.

65 Caltrans, "Comprehensive Travel Survey Shows More Californians Are Walking, Biking, and Riding Transit," 2014, http://www.dot.ca.gov/hq/paffairs/news/pressrel/14pr021.htm.

66 American Public Transportation Association, "Record 10.8 Billion Trips Taken on U.S. Public Transportation In 2014," 2015, http://www.apta.com/mediacenter/pressreleases/2015/Pages/150309_Ridership.aspx.

67 Transportation Research Board, "TR News: Active Transportation Implementing the Benefits," 2012, http://onlinepubs.trb.org/onlinepubs/trnews/trnews280.pdf.

PER CAPITA VMT TRENDS

According to Caltrans' Historic Vehicle Miles of Travel data, although overall VMT continues to steadily climb, per capita VMT has seen a dip since the early 2000's (**Figures 12–13**). This aligns with a nationwide drop in per capita VMT. In 2014, the FHWA estimated that national per capita VMT dropped again in 2013, making it the ninth consecutive year of decline. Total VMT in the United States increased by 0.6 percent from 2012, hovering just below 3 trillion, and per capita VMT dropped to 9,402.

Evidence suggests that the national dip in driving had no clear, lasting connection to economic trends or gas prices, and is likely due to changing demographics, saturated highways, and a rising preference for compact, mixed-use neighborhoods, which reduce the need for driving. Some key factors that pushed VMT upward for decades–including a growing workforce and rising automobile ownership–have also slowed considerably.[68]

After declining every year since 2004, VMT per capita in the U.S. ticked up by 0.9 percent in 2014 compared to 2013, according to the FHWA.[69] Accounting for the effect of population growth, total miles driven has increased by 1.7 percent.

The amount of driving is a closely watched statistic, with implications for transportation investment decisions as well as for land development, GHG and other air emissions, energy use, and other issues. Driving also determines how much revenue is raised from fuel taxes and tolls. From World War II until the 1990s, highway travel grew year after year, but more recently, that trend slowed.

TECHNOLOGY

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 (V2V)–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 emissions.

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. A mobile application that consolidates transit ticketing, routes, and timetables to promote user-friendly ridership is an example of streamlined technology. 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.

Shared-use mobility is growing interest in the transportation field as a solution to put fewer vehicles on the road. Advances in wireless technologies and mobile applications for shared-use mobility have the capability to provide real-time information to efficiently source users to more mobility choices, improve road capacity and parking, reduce costs, and address last mile and first mile solutions. A multitude of these transportation services would include bikesharing, carsharing or ridesharing, transit, shuttle, and delivery services.[70]

As the demand for economically 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.

68 McCahill, C., "Per Capita VMT drops for ninth straight year; DOTs taking notice," 2014, http://www.ssti.us/2014/02/vmt-drops-ninth-year-dots-taking-notice/

69 Sundquist E., & McCahill, C., "For the first time in a decade, U.S. per capita highway travel ticks up," 2015, http://www.ssti.us/2015/03/for-the-first-time-in-a-decade-u-s-per-capita-highway-travel-ticks-up/.

70 Shared-Use Mobility Center, "What is Shared-Use Mobility?" 2015, http://sharedusemobilitycenter.org/what-is-shared-mobility/.

Figure 12
TOTAL VMT AND POPULATION IN CALIFORNIA: 1990–2012

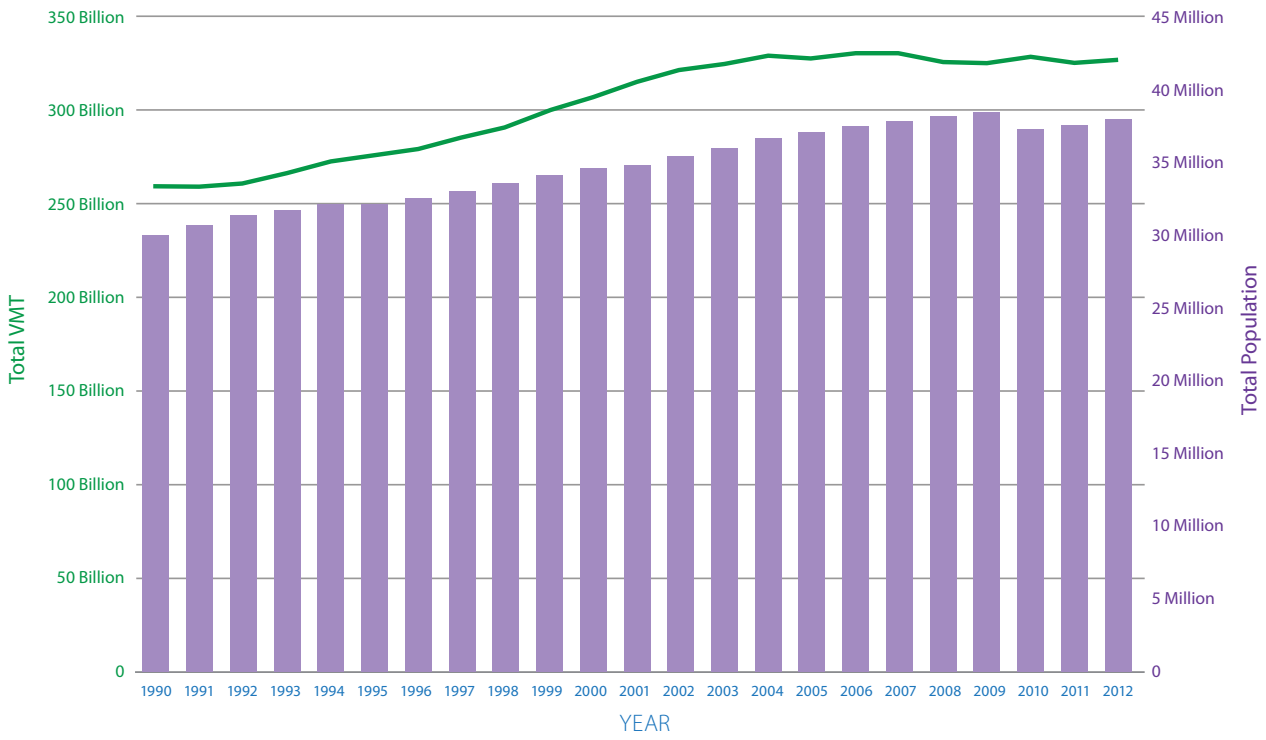
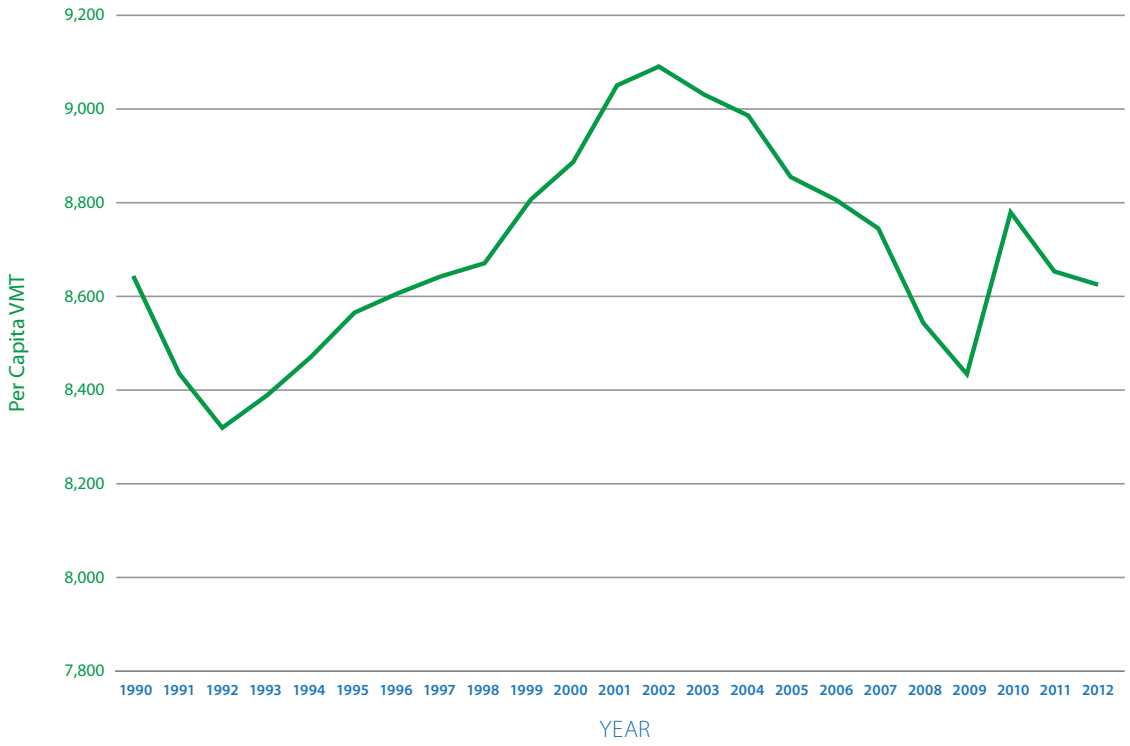


Figure 13
PER CAPITA VMT IN CALIFORNIA: 1990–2012



GROWTH IN CLEANER VEHICLES AND CLEANER FUEL MARKETS

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), renewable and bio-fuels, electricity, and natural gas are each forecasted to grow at extremely fast rates in response to California's push for cleaner fuels. California currently has the largest alternative fuel network of any state, with over 3,000 electric vehicle (EV) charging and twenty hydrogen fueling stations, and an increasing number of natural gas stations.[71] Due to the increased demand for alternative fuel infrastructure caused by increased purchasing of vehicles that run on alternative fuels, California's alternative fuel network will need to be expanded in order for supply to meet demand in the decades to come. The CTP 2040 accounts for alternative transportation fuels and the services and infrastructure needed to find favor with the public.

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. Governor Brown recently set a goal to reduce petroleum use by up to 50 percent by 2030, and has targets for 1.5 million ZEVs in California by 2025. We are poised to meet these goals with over 160,000 ZEVs on California's roads today.

Prior to the recession, California experienced steady growth in gasoline and diesel fuel purchases and VMT, regularly exceeding the rate of growth in the State's population. Since World War II, the trend of continued VMT growth 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.[72] Consumption of diesel fuel appears to rise and fall roughly in direct proportion to the per-capita gross state product (GSP)–in other words, to the economic climate in general.

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

For now, transportation system mobility relies primarily on petroleum-based fuels, but this will change dramatically by 2040. Emerging alternatives include bio-methane and renewable diesel, hydrogen, butanol, and algae-based fuels. Commercial production of some alternative fuels is already underway. Market forces will ultimately determine if any become commercially viable. Continuing State policies to encourage cleaner fuels and vehicles will ensure a low-carbon future and reduced reliance on petroleum.

71 US Department of Energy, "Alternative Fuel Data Center. Electric Vehicle Charging Station Locations.," 2012, http://www.afdc.energy.gov/fuels/electricity_locations.html.

72 Caltrans, "2007 California Public Road Data," Highway Performance Monitoring System, 2008. http://www.dot.ca.gov/hq/tsip/hpms/hpmslibrary/hpmspdf/2007PRD.pdf

NOT IN SERVICE

CHAPTER 3

MODELING THEORETICAL TRANSPORTATION SCENARIOS

The CTP 2040 is required under State law (SB 391) to analyze how California can reach the State's GHG emissions targets, while improving mobility, accessibility, safety, economic development, and quality of life throughout the State. These targets include reaching 1990 levels by 2020, 40 percent below 1990 levels by 2030, and 80 percent below 1990 GHG levels by 2050 (displayed in **Figure 14**). The CTP 2040 is the first iteration of the CTP to include analyses of multimodal transportation improvement strategies, clean fuels, and future vehicle technologies necessary to achieve the maximum feasible reduction in the transportation sector's GHG emissions.

This analysis, as well as the impact to California's economy was conducted using available modeling tools such as the new California Statewide Travel Demand Model (CSTDM), ARB's Vision for Clean Air (VISION) Model, and Transportation Economic Development Impact System (TREDIS). Additionally, consultation of prior research was conducted on the effects of transportation strategies.

The CTP 2040 prioritizes enhancing mobility for all with focus on reducing GHG emissions. Both goals can be achieved by providing travelers with more robust carpool, transit, pedestrian and bicycling options, transportation-efficient land use, and maximizing the efficiency of existing and planned transportation infrastructure while utilizing low and ZEV technologies and fuel. This chapter presents a summary of the modeling analysis and outcomes.

The modeling used in this plan is helpful to define the scale of the GHG reduction challenge, and suggest the magnitude of the solutions needed, but limitations of the models and modeling methods should be recognized. Forecasting models make predictions of the future based on current and past data. In addition, the modeling used here does not incorporate changes that might occur from new technologies and innovation. The model scenarios inform policymakers, but individual strategies of the scenarios should not be assumed to be recommendations–see Chapter 4 for recommendations. **Appendix 7** shows in more detail the CTP 2040 assumptions, findings, analyses, and performance measures. This chapter includes the following sections:

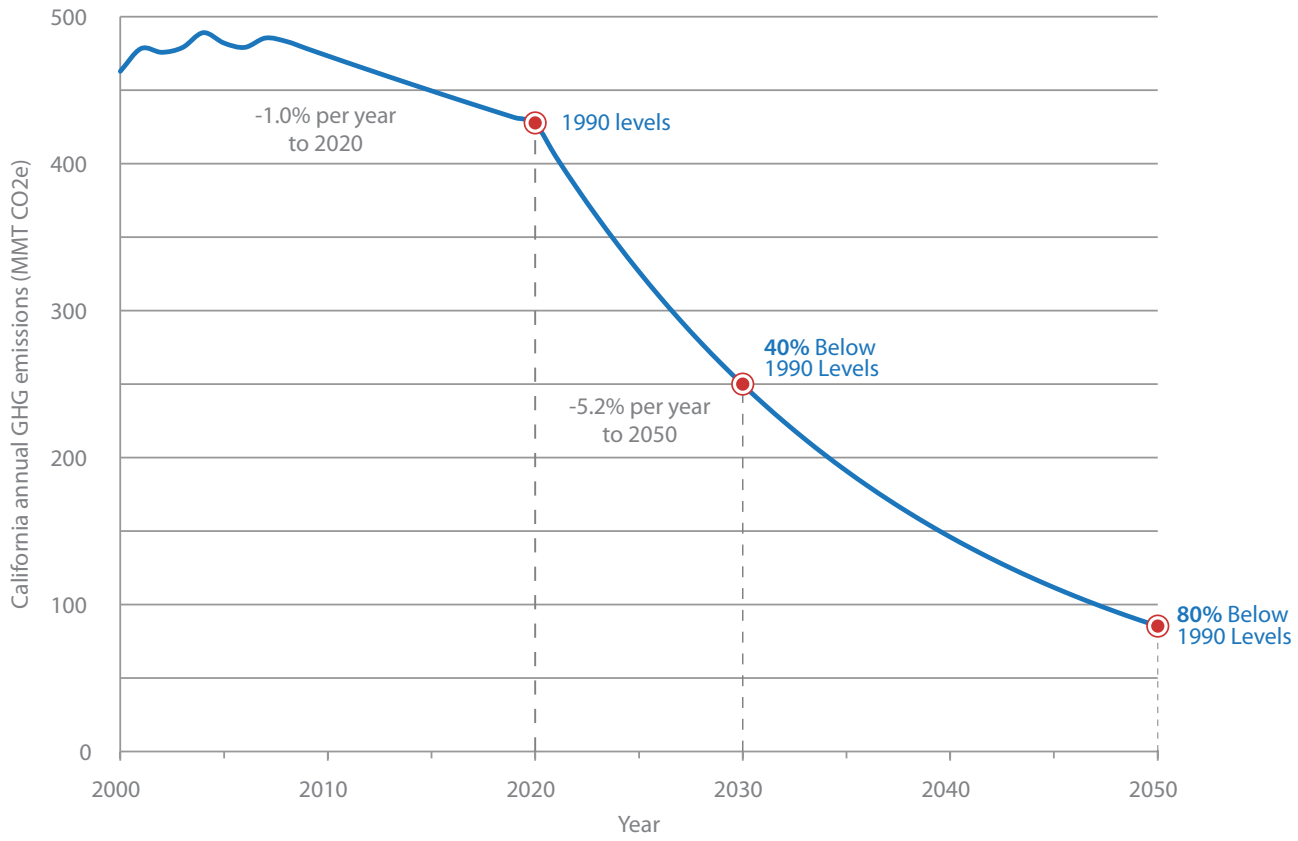
- Modeling vs. Recommendations
- Modeling Results
- Analysis Summary
- Conclusions and Findings

Figure 14

FRAMING A PATH FOR CALIFORNIA'S EMISSIONS REDUCTIONS TO 2050 (ARB SCOPING PLAN, MAY 2015)

California Greenhouse Gas Emissions Change

Pre-2020 and Post-2020 Emissions Trajectories



Achieving the low-carbon future and transportation network described in the CTP 2040 and other related plans such as ARB's Scoping Plan, will require the pace of GHG emissions reductions in California to accelerate significantly. Emissions from 2020 to 2050 will have to decline several times faster than the rate needed to reach the 2020 emissions target (at a minimum shifting from a 1% reduction a year until 2020, to a 5.2% reduction per year until 2050). The above chart shows California's overall projected emissions picture. The modeling discussed in this chapter focuses on the Transportation Sector and tests theoretical strategies that represent one possibility for this sector to achieve maximum feasible reductions towards the goal of AB 32 GHG emissions targets (1990 Levels by 2020 and 80% below that by 2050). The Governor's Executive Order B-30-15 (setting a target to reduce emissions in the State to 40% below 1990 levels by 2030) was announced after the modeling was completed for the CTP 2040; however, the theoretical analysis shows the Transportation Sector trending towards reaching this target much like the above chart showing California's overall projected emissions picture for all sectors.

CTP 2040 MODELING VS. RECOMMENDATIONS

The modeling exercise is intended to test and analyze three scenarios and show how they perform toward meeting California's GHG reduction targets by 2020, 2040, and 2050. These are not intended to be specific policy recommendations or outline which strategies the State will incorporate over the next 25+ years, but show what kind of strategies and technologies may be needed to meet these targets. The recommendations that transform the CTP's Vision for a low carbon transportation system into a set of actions appear in Chapter 4. **Figure 15** outlines the differences between the modeling exercise crafted in Chapter 3 and the policy recommendations suggested in Chapter 4.

Figure 15

CTP2040 Modeling vs. Recommendations

MODELING / ANALYSIS (CHAPTER 3)

- A theoretical exercise in **modeling** possible scenarios and GHG reduction strategies to meet California's GHG reduction and economic goals.
- The CTP 2040 is required under State **law** (SB 391) to analyze how California can reach the State's GHG emissions targets.
- The CTP 2040 includes three **transportation** scenarios that utilize a cumulative process where each builds upon the prior scenario.
- The third transportation scenario is designed to meet the 2050 statewide GHG emissions reduction **target**.
- The GHG reduction strategies are NOT policy recommendations, but instead strategies tested for the theoretical exercise to meet the AB 32 GHG targets (within the models). For specific recommendations, see Chapter 4.

RECOMMENDATIONS (CHAPTER 4)

- While the **modeling** is a theoretical exercise, the recommendations are intended to transform the CTP's Vision for a low carbon transportation system into actions.
- While the goals, policies, and recommendations in Chapter 4 are informed by conclusions drawn from the modeling, in terms of meeting the required GHG reduction targets prescribed in State **law**, they also strive to achieve additional transportation objectives.
- A vision for the **transportation** system is to keep California moving toward a low carbon transportation system with sustained economic vitality (some recommendations are informed by the modeling analysis).
- While aiming to meet the State's GHG emission reduction **target**, the recommendations also lay out how California's transportation system can provide equitable and effective mobility and accessibility. The recommendations also aim to enhance California's economy and livability, while being safe, sustainable, integrated, and efficient.

MODELING RESULTS

CTP 2040 TRANSPORTATION SCENARIOS

The CTP 2040 includes three transportation scenarios that utilize a cumulative process where each builds upon the prior scenario. These transportation scenarios and GHG reduction strategies were designed to meet the GHG reduction targets within the models, and they do NOT represent specific policy recommendations. The third transportation scenario is designed to meet the 2050 statewide GHG emissions target. The components of the scenarios are:

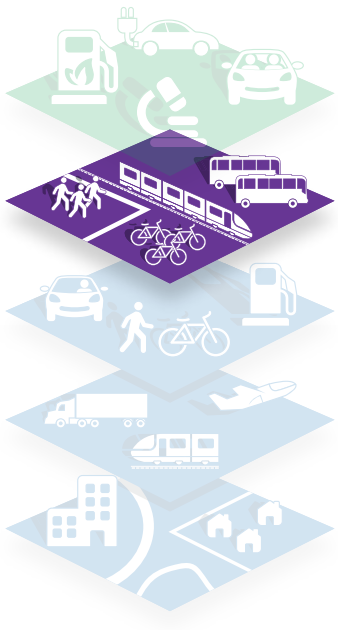
- Planned future conditions: includes transportation and land use changes associated with regional MPO SCS forecasts, and Caltrans modal plans;
- Statewide Transportation Efficiency Strategies: designed to reduce per capita VMT while also increasing mobility for all modes of transportation; and
- New Clean Vehicle Fuel and Technologies.

Transportation Scenario 1 contains only the "Planned Future Conditions," Scenario 2 includes "Planned Future Conditions" plus "Statewide Transportation Efficiency Strategies," and Scenario 3 includes "Planned Future Conditions" and "Statewide Transportation Strategies" while layering in "New Clean Vehicle Fuel and Technologies" in order to reach the 2050 statewide GHG reduction target.

The following section describes the three transportation scenarios, including key inputs and forecasted metrics. Each scenario is prepared with a 2010 base year condition, and includes forecasts for 2020, 2040, and 2050. A number of statewide metrics have been produced including VMT per capita, total VMT, and GHG emissions. The purpose of producing scenarios is to illustrate how each component of CTP 2040 contributes to meeting the requirements for SB 391. These scenarios are designed to show the GHG reductions that may be achieved by different mixes of transportation strategies and technology.

Although the CTP 2040 analysis focused on the three scenarios described in this section, meeting the State's GHG reduction goals may be accomplished by other mixes of strategies, technologies, and fuels than those modeled.

Planned Future Conditions



Statewide Transportation Efficiency Strategies

New Clean Vehicle Fuel and Technologies

Transportation Scenario 1: CURRENT MPO AND STATE MODAL PLANS

MPO RTP/SCS assumptions plus Caltrans Modal Plans combine to form Transportation Scenario 1. This scenario also includes ARB's Advanced Clean Cars program. Transportation Scenario 1 represents the sum of current planning at the State and MPO level, including land use changes and transportation improvements in all RTPs/SCSs as of Spring 2013. The RTP/SCS assumptions for the four largest MPOs (Southern California Association of Governments [SCAG], Bay Area Metropolitan Transportation Commission [MTC], SANDAG and Sacramento Area Council of Governments [SACOG]) all contain significant changes to land use assumptions compared to prior regional plans in response to SB 375 requirements. For a list of RTP/SCS assumptions included, see **Appendix 7** Technical Analysis.

Caltrans' Modal Plans are also integrated into CTP 2040, notably the 2013 CSRP. The CSRP includes the Authority Business Plan Phase 1 assumptions as well as the blended high-speed and conventional rail system. The Modal Plans include:

- The California Aviation System Plan
- California Freight Mobility Plan
- Interregional Transportation Strategic Plan
- California State Rail Plan
- Statewide Transit Plan

Transportation Scenario 2 builds on Scenario 1, but also introduces transportation GHG reduction strategies.

Transportation Scenario 2: CURRENT PLANS + PROPOSED TRANSPORTATION EFFICIENCY STRATEGIES

Transportation Scenario 2 is a theoretical treatment that includes a package of transportation efficiency strategies designed to reduce GHG throughout the state of California. The transportation efficiency strategies of Transportation Scenario 2 were combined with Transportation Scenario 1 assumptions for the MPO RTPs/SCSs, State Modal Plans, and the current Advanced Clean Cars program. GHG reduction strategies associated with Transportation Scenario 2 are discussed in more detail further below in this chapter and in **Appendix 7** Technical Analysis.

Transportation Scenario 3 builds on Scenario 2, but also introduces additional fuel and vehicle technology improvements. These technological improvements outline a path to the GHG reductions necessary to achieve a proportional share for transportation of the statewide goal of 80 percent below 1990 levels by 2050 as mandated by SB 391.

Transportation Scenario 3: MEETING THE GOALS

To achieve the 2050 GHG target, Transportation Scenario 3 included assumptions for light duty vehicles (LDVs), heavy duty vehicles (HDVs), and ZEVs. The 2050 assumptions for LDVs included fuel efficiency increasing four times higher than today's levels, and an assumption of approximately 20 million LDV ZEVs on the road. The HDV assumptions are for fuel efficiency of more than 50 percent higher by 2030 for new trucks. ZEVs are assumed to represent 12 percent of total vehicle sales by 2030.

Additional freight rail and aviation efficiency increases of 2.0 percent per year are assumed, starting in 2015. Fuel efficiency assumptions for HSR and conventional passenger rail remained the same as in Scenario 2.

For transportation fuels, this analysis assumed 7 billion gallons gasoline equivalent (BGGE) bio-fuels are available, including drop-in renewable fuel, by 2050 (approximately 1 BGGE in Scenario 1). Also assumed is a 75 percent renewable electricity and hydrogen supply mix by 2050, compared to 33 percent for both in Scenario 1 (2020-2050).

Transportation Scenario 3 is reviewed in more detail later in this chapter and in **Appendix 7** Technical Analysis.

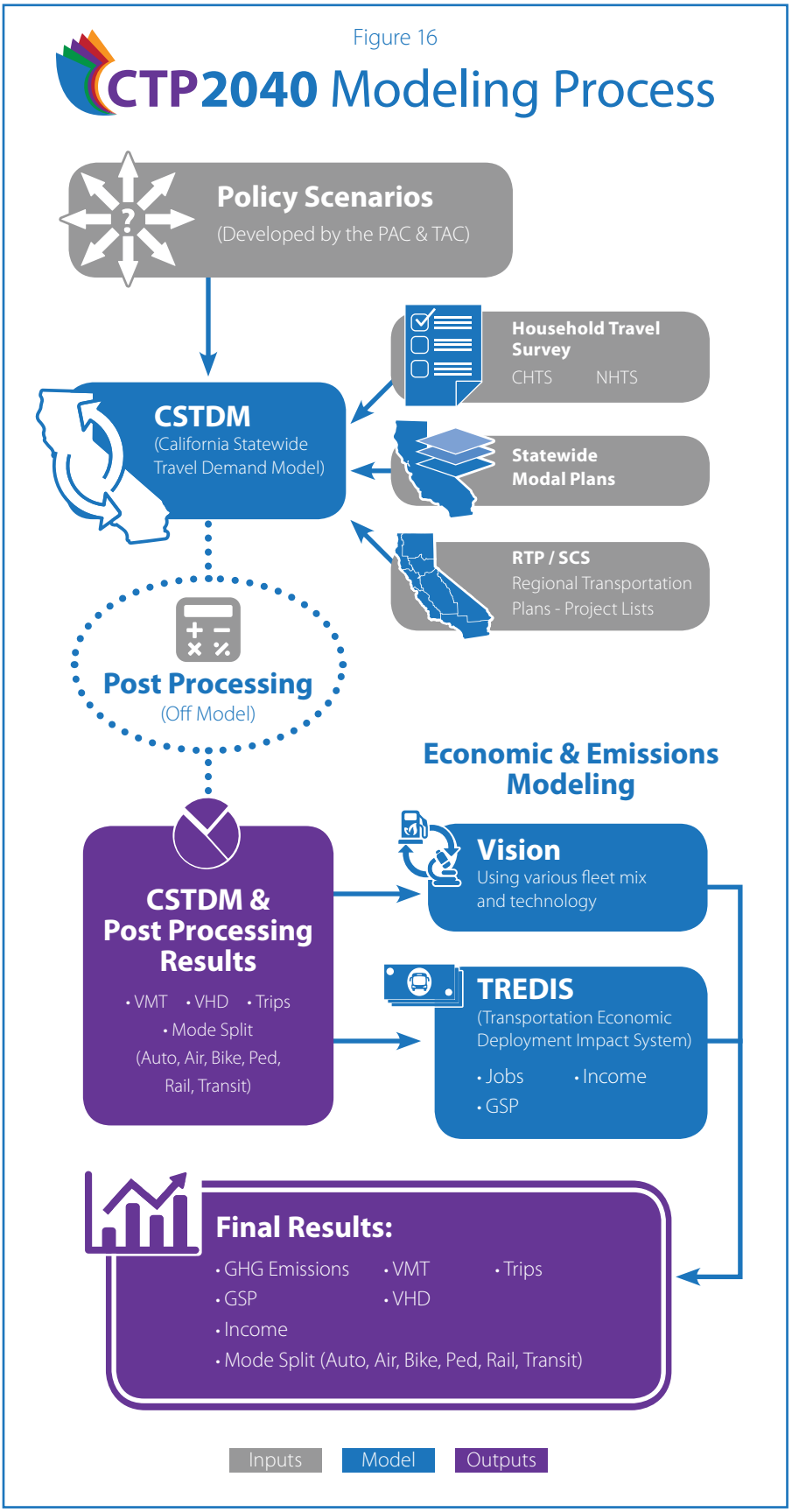
THE TOOLS

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)
- ARB's EMission FACtors model (EMFAC) and Vision for Clean Air (VISION)
- Transportation Economic Demand Impact System (TREDIS) Model

For a complete description of the tools, their individual functions, and how they contribute to the overall analysis, please see **Appendix 7** Technical Analysis.

Figure 16



THEORETICAL GHG REDUCTION STRATEGIES TESTED

The CTP 2040, with guidance from the policy advisory committee (PAC) and technical advisory committee (TAC), extended the regional analysis with 15 statewide transportation strategies included in Scenarios 2 and 3. Regionally significant GHG reduction strategies pertaining to transportation are already being identified by the MPO RTPs/SCSs as required by SB 375; however, the CTP 2040 GHG reduction strategies build off of these to attain additional reductions. The transportation strategies were designed to provide maximum reductions in GHG emissions. However, these strategies were created for the purposes of the modeling exercise and do not represent specific policy recommendations. For the CTP 2040s recommendations, please refer to Chapter 4.

Since a vital goal for Caltrans and the state of California is to increase accessibility, alternatives to single occupant automobile travel were enhanced. All 15 transportation strategies were measured in VMT. However, some measures had to be converted off-model into equivalent VMT savings, and then converted into equivalent GHG reductions through ARB's VISION model in the next step of our analysis. The transportation strategies were divided into four categories:

- Demand Management
- Mode Shift
- Travel Cost
- Operational Efficiency

Table 13 shows the 15 transportation GHG reduction strategies. Transportation GHG strategies were developed based on input from the CTP 2040 PAC and TAC, and with input gathered from all of the State's 44 MPOs and RTPAs. Additionally, public comments helped provide direction for modifications of the initial Public Review Draft Report released in 2015. These outside sources were necessary to identify gaps and overlap in the 15 GHG reduction transportation strategies. The transportation strategies comprise a range of options. Transportation strategy analyses were conducted using the CSTDM, or off-model assumptions from research gleaned from ARB Policy Briefs or MPO SCSs. The CTP 2040 will ultimately serve as a vision document to guide future transportation-related policy and funding. Caltrans recognizes that more transportation efficient land uses can provide even greater reductions in GHG emissions beyond those modeled in the CTP 2040 (see "Role of Land Use" call out box). See **Appendix 7** Technical Analysis for a more in-depth review of each transportation strategy.

ROLE OF LAND USE

Per SB 391, this CTP must consider how MPO-level land use forecasting (through SB 375) and implementation of SCSs will contribute to statewide GHG emission reductions. The first round of SCSs developed by California's MPOs included significant shifts to future regional growth patterns compared with prior regional plans.

The SCSs are demonstrating how safe, convenient, walkable communities with parks, schools, businesses and shopping in close proximity to each other and to viable transit can reduce dependency on autos. Cleaner transportation modes can further support more efficient land use development by spatially connecting people to destinations.

For the purposes of SB 391, Caltrans utilized the SCS land use assumptions as inputs in the CSTDM. Alternative land use strategies beyond the SCSs have not been assessed for the CTP 2040. Recent research has shown that transportation-efficient land uses can reduce auto dependency and improve public health through more use of active transportation and safer streets. Caltrans recognizes that even more transportation efficient land uses can provide even greater reductions in GHG emissions beyond those modeled in the CTP 2040.

Table 13

CTP 2040 TRANSPORTATION GHG REDUCTION STRATEGIES – ESTIMATED CHANGE FROM 2010 BASE YEAR

	CATEGORY / STRATEGY	ASSUMPTION	EVALUATION METHOD: SOURCE	VMT REDUCTION (ESTIMATED)
	DEMAND MANAGEMENT			
1	**Telecommute/ Work at Home**	2.1% increase in work at home rate	Off-Model: SACOG	-0.39%
2	**Increased carpoolers**	5% increase in carpool vehicles	Off-Model: Calculated using CSTDM data	-2.9%
3	**Increased Car Sharing**	Net 5% increase in adoption rates -- short distance travel	Off-Model: MTC, ARB Draft Policy Brief	-1.1%
	MODE SHIFT			
4	**Transit Service Improvements (Urban and Intercity – rail, bus and ferry)**	Transit speeds increased by 50%; headways doubled, free transfers, reduced transfer wait times	CSTDM	-6% (includes Transit Service Improvements and HSR fare reductions)
5	**High-Speed Rail**	Maximize incentives for High-Speed Rail Ridership	CSTDM	Included as part of transit service improvements
6	**Bus Rapid Transit**	Ridership change from converting Local Bus Routes to BRT	Off Model: TCRP 118, CSTDM Data	-0.07%
7	**Expand Bike**	Doubled bicycle shares	Off Model: CSTDM Data	-0.41%
8	**Expand Pedestrian**	Double walk shares	Off Model: CSTDM Data	-0.43%
9	**Carpool Lane Occupancy Requirements**	Increase minimum 2+ occupancy to 3+	CSTDM	-0.80%
10	**Increased HOV Lanes**	Added HOV lanes, Interregional connectors; Fill missing gaps (mixed flow lanes converted to HOV)	Off Model; Estimate	-1.0%
	TRAVEL COST			
11	**Implement Expanded Pricing Policies**	Utilize pricing and vehicle fees to fund infrastructure improvements, manage congestion and improve roadways	CSTDM	-17%
	OPERATIONAL EFFICIENCY			
12	**Incident/Emergency Management**	Implementation of Caltrans System Management and Operations Plan	Off Model: Caltrans	-1.0% equivalent VMT savings
13	**Caltrans' (TMS) Master Plan**	Implementation of TMS Master Plan	Off Model: Caltrans	-1.2% equivalent VMT savings
14	**ITS/TSM**	Implementation of ITS/TSM strategies	Off Model: SACOG	-0.62%
15	**Eco-driving**	Reduced fuel consumption through changes in driving habits	Off Model: ARB Policy Brief	-0.23% equivalent VMT savings

RESULTS OF THE THEORETICAL TRANSPORTATION SCENARIOS

The following modeling results show the forecasted:

- Mobility improvements for all travel modes/system performance
- GHG emission reductions
- Economic impact of the CTP 2040 Scenario 2

For more in-depth documentation of the results and analysis, please refer to **Appendix 7** Technical Analysis.

Table 14
VMT, VHT, VHD FOR SCENARIO 1 VS. SCENARIOS 2 & 3

	2010	2020	2040	2050
TRANSPORTATION SCENARIO 1				
Vehicle Miles Traveled (Daily Miles X 1 Million)	691	757	929	-
Vehicle Hours Of Travel (VHT) (Daily Hours X 1,000)	14,865	16,312	21,587	-
Vehicle Hours Of Delay (VHD) (Daily Hours X 1,000)	898	1,055	2,942	-
Daily VMT Per Capita (Personal Travel In Miles)	15.9	15.4	15.5	-
Daily VMT Per Capita % Difference From 2010	-	-3% ↓	-2% ↓	-
Daily Total VMT % Difference From 2010	-	10% ↑	34% ↑	-
TRANSPORTATION SCENARIOS 2 & 3				
Vehicle Miles Traveled (Daily Miles X 1 Million)	691	747 ↓	719 ↓	-
Vehicle Hours Of Travel (VHT) (Daily Hours X 1,000)	14,865	16,037 ↓	16,125 ↓	-
Vehicle Hours Of Delay (VHD) (Daily Hours X 1,000)	898	982 ↓	1,494 ↓	-
Daily VMT Per Capita (Personal Travel In Miles)	15.9	15.1 ↓	11.5 ↓	-
Daily VMT Per Capita % Difference From 2010	-	-5% ↓	-28% ↓	-
Daily Total VMT % Difference From 2010	-	8% ↑	4% ↑	-

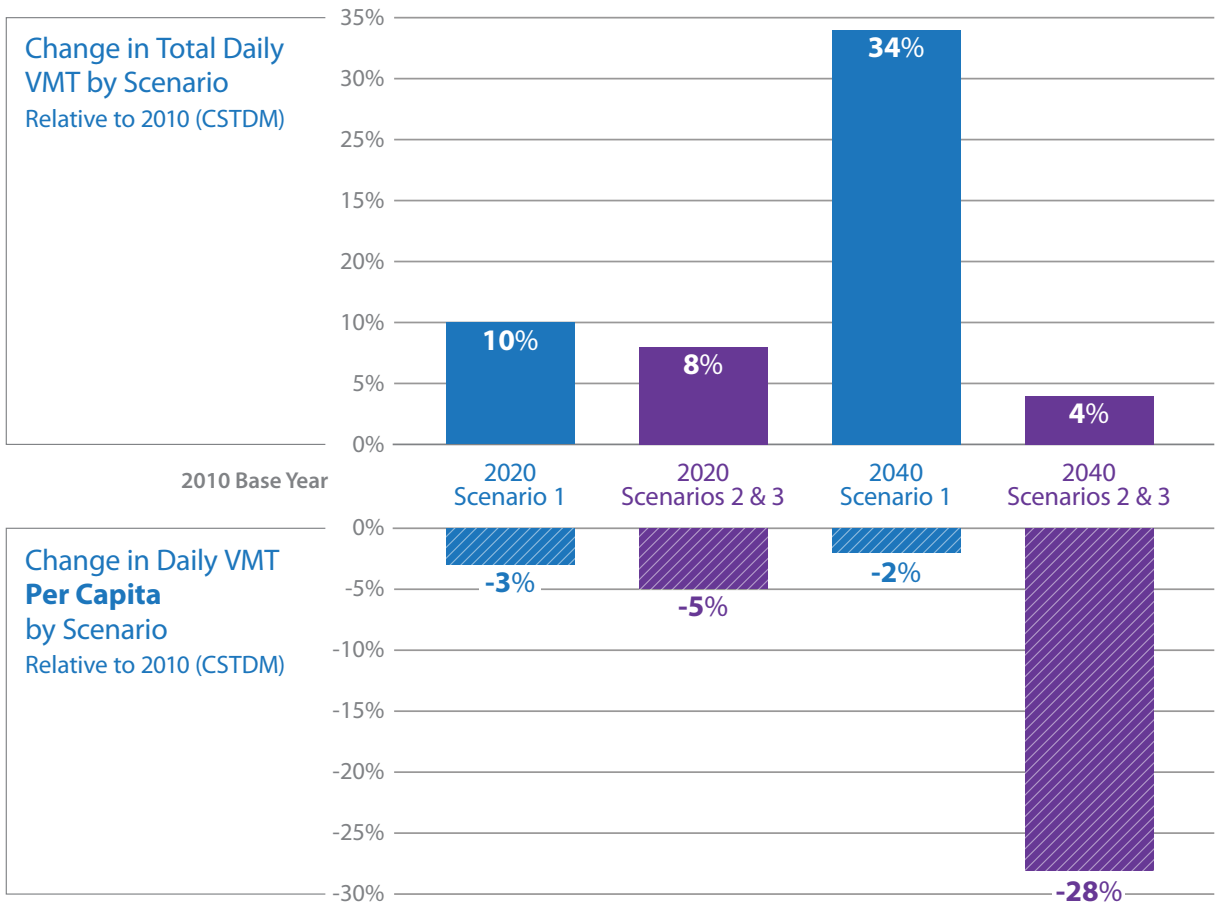
VMT AND MOBILITY RESULTS

VMT, vehicle hours traveled (VHT), and vehicle hours of delay (VHD) were calculated using the CSTDM for the CTP Transportation Scenarios 1, 2, and 3 (2010 base year, 2020, 2040). The 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 LDVs, HDVs, HSR, aviation (intrastate), and rail (passenger and freight).

VMT is the total number of miles traveled on all roadways by all personal and commercial light duty and HDVs. VMT per capita is the total number of miles traveled per person (including total population).[73] VHT measures the amount of time spent in personal vehicles, and VHD is a measure of congestion. Many of the transportation VMT reduction strategies were intended to reduce VMT as a means to reduce GHG emissions. However, reducing VHT and VHD can also reduce GHG emissions and improve mobility. The VMT reduction strategies tended to have the added benefit of reducing congestion; thus, VHD was also reduced significantly under Transportation Scenarios 2 and 3.

Table 14 displays all these metrics for Scenario 1 and Scenarios 2 and 3 (2010 base year; 2020. 2040). The percentage change in VMT between Scenario 1 and Scenarios 2 and 3 relative to 2010 is also shown. CTP transportation strategies under Scenarios 2 and 3 (2040) resulted in a 30 percent reduction in total daily VMT from Scenario 1 (2040) as illustrated in **Figure 17**. For more in-depth information on all of the calculations and assumptions, refer to **Appendix 7** Technical Analysis.

Figure 17
CHANGE IN TOTAL AND PER CAPITA DAILY VMT BY RELATIVE TO SCENARIO 1 2010 (CSTDM)



73 For the purpose of the scenarios, forecasted VMT represents average weekday trips by California residents on the state highway system and major arterials, and excludes certain trips such as light duty commercial vehicles. This is due to the CSTDM using California Household Travel Survey data.

INTERREGIONAL SINGLE OCCUPANCY VEHICLE TRIP RESULTS (SCENARIO 1 VS. 2 & 3)

It is imperative to reduce or minimize SOV trips on California's highways to help achieve the GHG reduction goals set forth by the State and federal government, as well as reduce congestion and limit attrition of our existing infrastructure. Transportation Scenario 2 is designed to reduce GHG emissions throughout the state of California by introducing strategies to encourage non-auto modes of transportation, and create a significant shift away from SOV trips in the model.

By using the daily VMT results generated by the CSTDM, **Table 15** and **Figure 18** show the percentage change in interregional travel for SOV Trips from the 2010 base year to Transportation Scenarios 1, 2, and 3 (2040), along with the Transportation GHG Reduction Strategies implemented. Looking at the percentages **Figure 18** and **Table 15**, there is a dramatic decrease in SOV trips when comparing Scenario 1 results with Scenarios 2 and 3. For more in-depth information on all of the calculations and assumptions, refer to **Appendix 7** Technical Analysis.

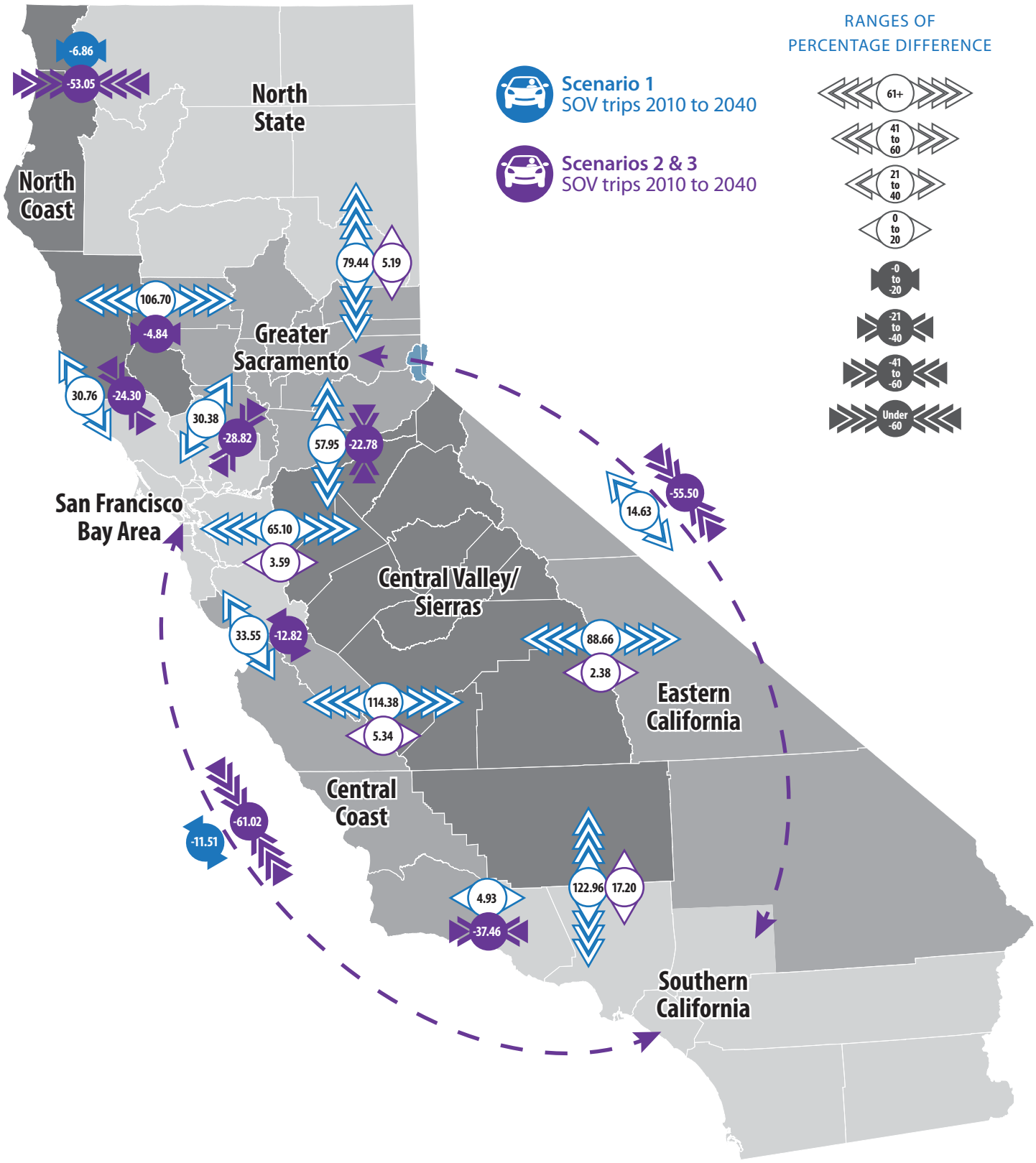
Table 15

Interregional Single Occupancy Vehicle (SOV) Trips Scenario Comparison For 2040

ITSP Regions	Scenario 1 Totals	Scenarios 2 & 3 Totals
North State to/from North Coast	-6.86%	-53.05%
North State to/from Greater Sacramento	79.44%	5.19%
North Coast to/from Greater Sacramento	106.70%	-4.84%
North Coast to/from San Francisco Bay Area	30.76%	-24.30%
Greater Sacramento to/from San Francisco Bay Area	30.38%	-28.82%
Greater Sacramento to/from Central Valley/Sierras	57.95%	-22.78%
Greater Sacramento to/from Southern California	14.63%	-55.50%
San Francisco Bay Area to/from Central Coast	33.55%	-12.82%
San Francisco Bay Area to/from Central Valley/Sierras	65.10%	3.59%
San Francisco Bay Area to/from Southern California	-11.51%	-61.02%
Central Valley/Sierras to/from Eastern California	88.66%	2.38%
Central Valley/Sierras to/from Southern California	122.96%	17.20%
Central Valley/Sierras to/from Central Coast	114.38%	5.34%
Central Coast to/from Southern California	4.93%	-37.46%

Figure 18

Interregional Single Occupancy Vehicle (SOV) Trips Scenario Comparison for 2040



GREENHOUSE GAS EMISSIONS

AB 32 and related policies require that California's 2020 total GHG emissions inventory be the same as the 1990 GHG emissions inventory. In addition, GHG emissions must be 80 percent below the 1990 GHG emissions inventory by 2050. The law does not require that each individual sector achieve its absolute 1990 value. Because the CTP 2040 does not include all sectors, it has assumed that the transportation sector 2020 GHG emissions value calculated for Scenario 1 will be the reference point for the 2050 GHG reductions. The CTP 2040 assumes an equivalent or proportional share reduction from the transportation sector; thus, transportation emissions in Scenario 3 are 80 percent below 2020 by 2050.

ARB calculated GHG reductions based on CSTDM VMT outputs for the years 2020 and 2040. ARB's EMission FACtors Model (EMFAC) 2014 assumptions for GHG reductions were used for the final model runs in this report. For more in-depth information on all of the calculations and assumptions, refer to **Appendix 7** Technical Analysis.

In 2012, the transportation sector's vehicle share of the State's overall GHG emissions was roughly 36 percent (167 million metric tons [MMT] of carbon dioxide equivalent [CO2e] per year) (**Figure 19**). GHG emissions are typically expressed in metric tons of CO2e, an international unit of measurement equivalent to approximately 2,200 pounds. For a visual representation of the volume of one metric ton of CO2, please refer to **Figure 20**.

Figure 19

2012 Baseline GHG Inventory

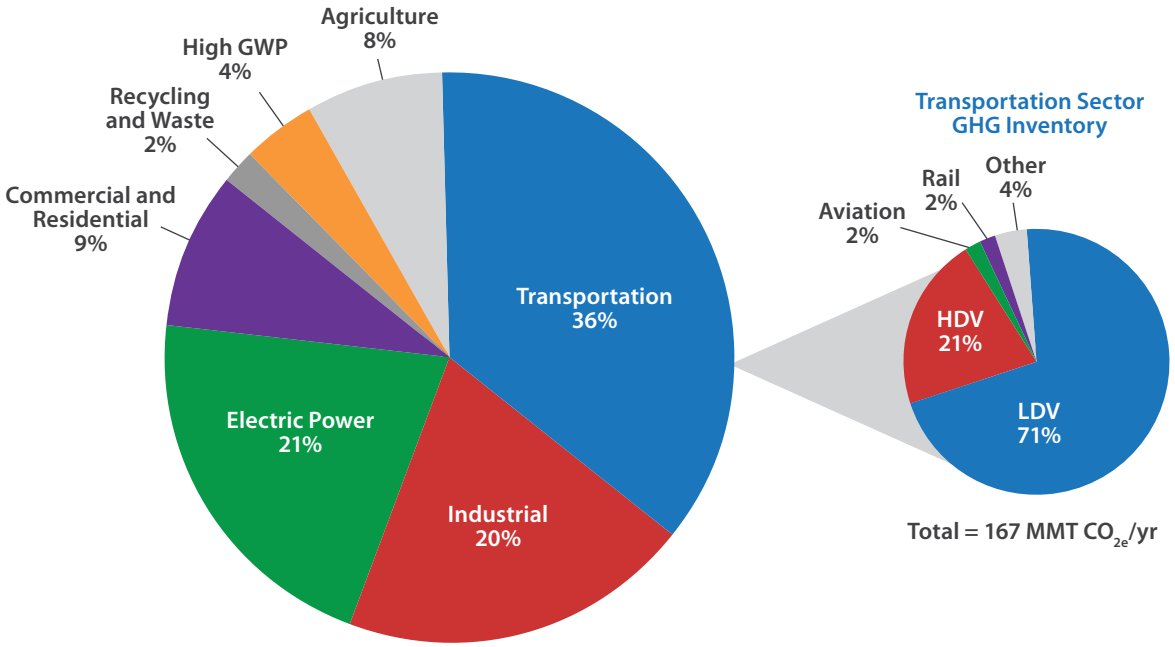


Figure 20

Scale of 1 Metric Ton of CO_{2e} Emissions

GHG REDUCTIONS FROM SCENARIO 1 TO SCENARIOS 2 & 3

GHG reductions from Transportation Scenarios 1, 2, and 3 are shown in **Table 16** and **Figure 21**. This table displays total GHG emissions (MMT of CO2e/yr) and relative percentage reductions below 2020 for 2040 and 2050.

Transportation Scenario 3 was designed to meet maximum feasible reductions to achieve the State's AB 32 targets, and does so through layering on an aggressive mix of alternative vehicle fuels and technology to the Transportation GHG Reduction Strategies introduced in Scenario 2.

Table 16
STATEWIDE GHG EMISSIONS BY CTP TRANSPORTATION SCENARIO (ARB)

		2010	2012	2020	2040	2050
SCENARIO 1						
GHG Emissions (MMT CO2e / yr)	**Total**	175	167	158	154	**175**
	Target					**32**
GHG Relative Reduction Below Scenario 1 2020[1] (%)	**Total**				**-3%** ↓	**+10%** ↑
	Target					**-80%**
SCENARIO 2						
GHG Emissions (MMT CO2e / yr)	**Total**	175	167	157	123	**135**
	Target					**32**
GHG Relative Reduction Below Scenario 1 2020[1] (%)	**Total**				**-23%** ↓	**-15%** ↓
	Target					**-80%**
SCENARIO 3						
GHG Emissions (MMT CO2e / yr)	**Total**	175	167	156	64	**32**
	Target					**32**
GHG Relative Reduction Below Scenario 1 2020[1] (%)	**Total**				**-60%** ↓	**-80%** ↓
	Target					**-80%**

1 AB 32 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, Caltrans has assumed that the transportation sector 2020 GHG value calculated for Scenario1 will be the reference point for the 2050 GHG reductions.

Figure 21
STATEWIDE GHG TRANSPORTATION SECTOR EMISSION CHANGES RELATIVE TO 2020 SCENARIO 1 (ARB)

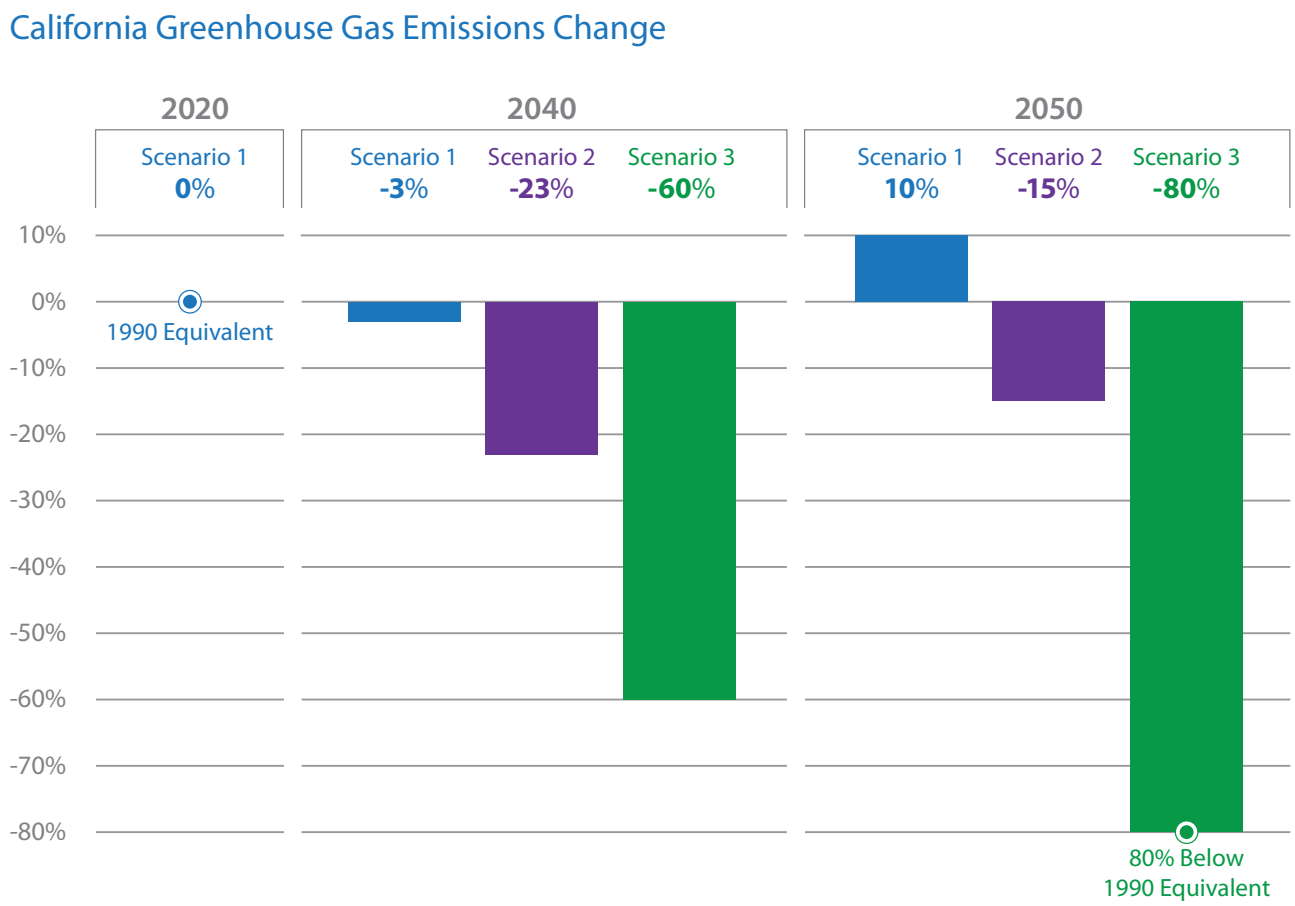
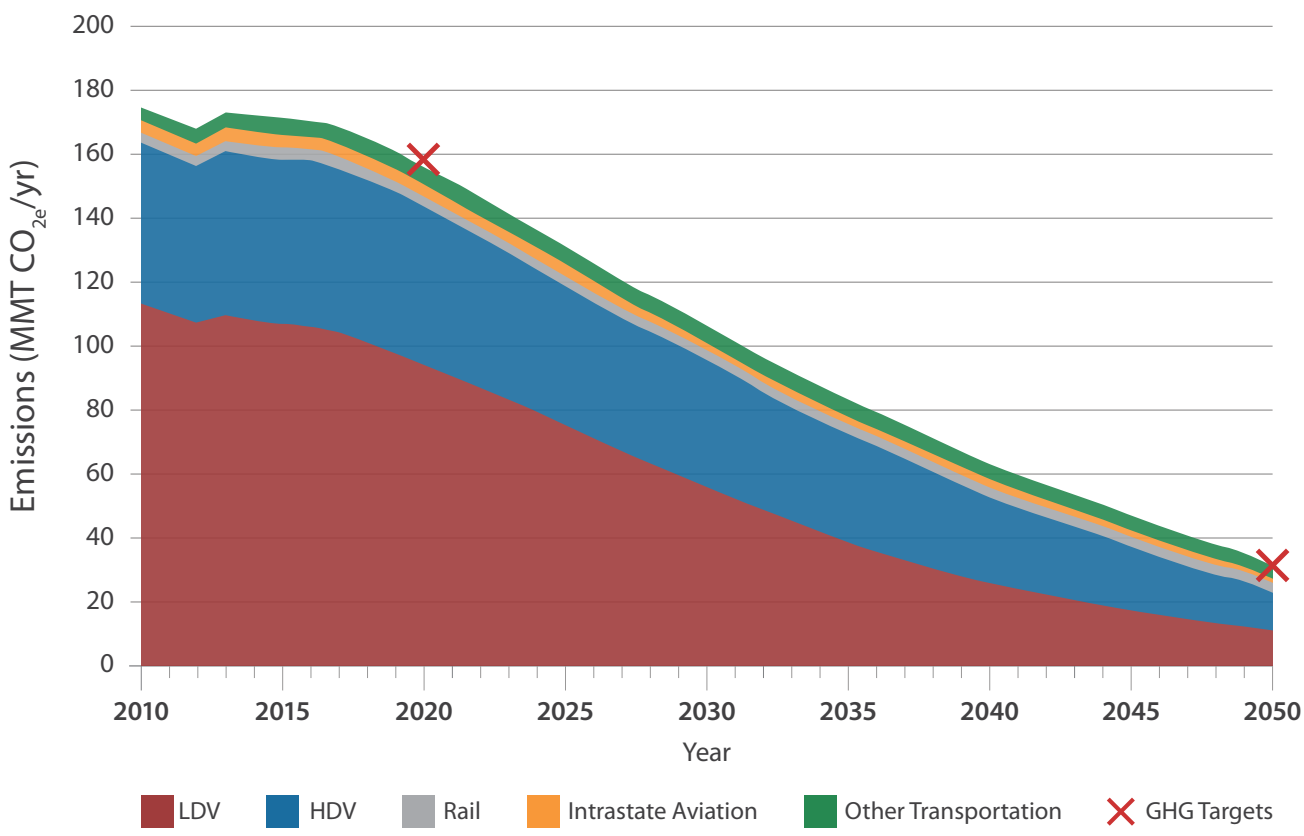


Figure 22
VEHICLE GHG EMISSIONS BY SECTOR FOR TRANSPORTATION SCENARIO 3



Figures 22–23 display the change in fuel demand and change in vehicle GHG emissions by sector from 2010-2050 in Transportation Scenario 3 within the VISION model.

In Transportation Scenario 3, 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 approximately 20 million LDV ZEVs on the road in 2050. For HDVs, the assumptions are that fuel efficiency is more than 50 percent higher by 2030 for new vehicles and ZEVs (battery electric vehicles [BEV], fuel cell vehicles [FCV]) will represent 12 percent of total sales by 2030.

For freight rail and aviation, the assumptions are that fuel efficiency increases by 2.0 percent per year starting in 2015. For conventional passenger rail, inputs were matched to Vision 2.0 and the CSRP for Scenario 1. Ridership was assumed to double for Scenario 2. Assumptions for HSR and conventional passenger rail remained the same as in Scenario 2. Inputs for HSR came from the Authority's HSR plan, which provided LDV trips (VMT) and intrastate aviation trips. The Authority assumes that HSR will be entirely powered by renewable electricity so there are no net GHG emissions associated with HSR, and HSR only affects VMT and aircraft trips. 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).

Figure 23
AGGREGATE FUEL DEMAND (WITH BIOFUEL BLENDS) BY SECTOR FOR SCENARIO 3

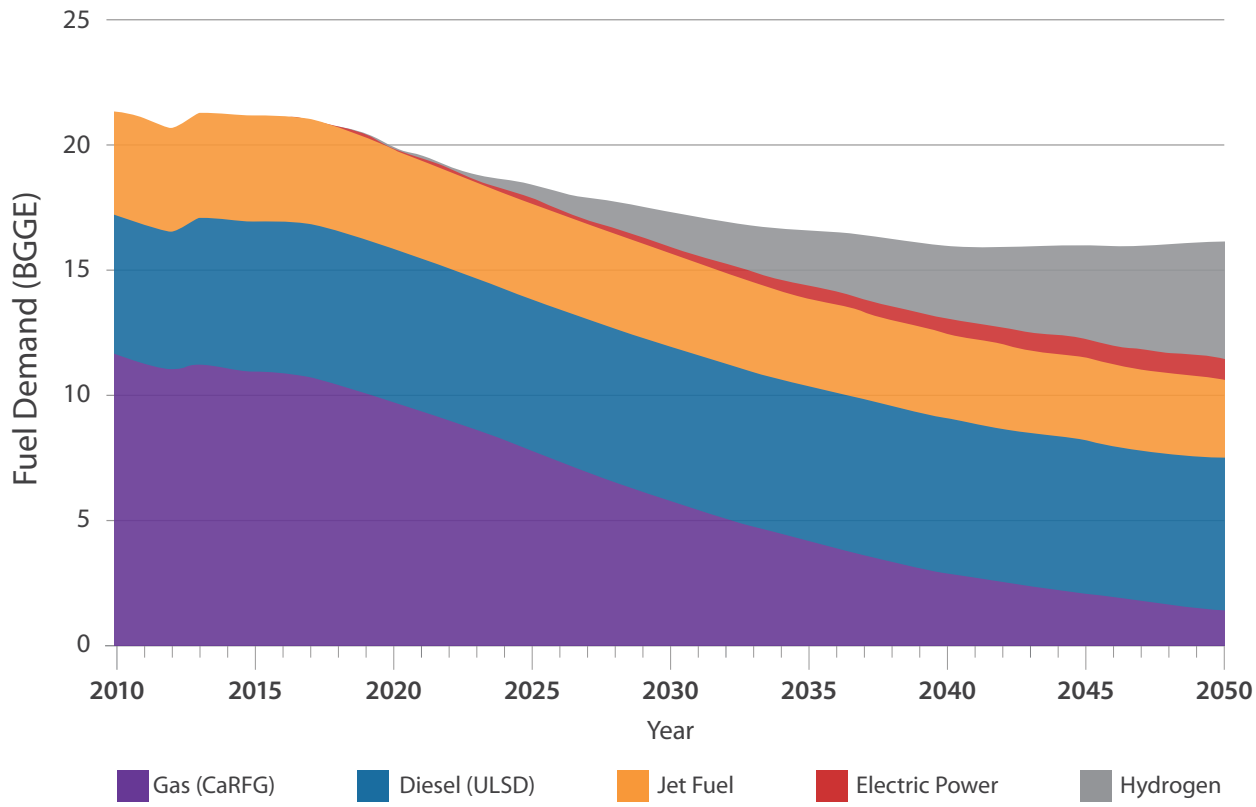


Figure 23 shows the mix of fuels used in Scenario 3 for 2010-2050 in BGGE. For transportation fuels, this analysis assumes seven BGGE bio-fuels are available, including drop-in renewable fuel, by 2050. Also assumed is a 75 percent renewable electricity and hydrogen supply mix by 2050 for Scenario 3.

Table 17
ECONOMIC IMPACT AND GROWTH

	Average Annual Impact	Economic Growth Total Value 2040
GSP ($bil)	+<1%	+400 - 500
Wages ($bil)	+1.0%	+300 - 400
Employment	+	+38,000

ECONOMIC ANALYSIS

The economic analysis conducted for the CTP 2040 provides a basic assessment of the impacts of implementing the modeled transportation GHG reduction strategies in Scenario 2 to California's economy. The outcomes produced from this analysis provide a general sense of the potential impacts associated with the strategies on travelers (time and costs) savings, and changes in access to labor, industries, and businesses (specifically, efficiency and productivity). For more information on the TREDIS model, the modeling approaches, and limitations to the analysis, see **Appendix 7** Technical Analysis.

IMPACTS OF TRANSPORTATION GHG REDUCTION STRATEGIES

The economic analysis reveals measurable positive economic impacts on the California economy occurring from the implementation of the Transportation GHG Reduction Strategies over the analysis period considered in the CTP 2040. The impacts are minor compared to the overall economic activities of the State.

The TREDIS model shows the increase in vehicle operating cost would have short-term negative impacts from increased costs of driving borne by motorists. However, along with modeled enhanced transit service and free fares, is reduced congestion, improved travel conditions, and opportunity for spatial agglomeration of markets and labor that expand economic activity. The increased economic activity associated with the agglomeration effects is expected to offset the negative impacts of increased driving costs, generating a net gain to the economy.

Overall, the net impacts are estimated to grow the economy less than one percent of the State's annual value added (GSP) over the analysis period, adding a total of $500 billion to the economy. The State will exhibit a small net job growth during the analysis period. Similarly, measurable wage gains are observed but are small, accounting for growth of about one percent of the State's wages. The outcomes of the TREDIS economic impact modeling demonstrate the price and fare strategies proposed in the CTP 2040, relating strictly to the transportation impacts, have a small net positive impact on the California economy. **Table 17** summarizes these findings.

LIMITATIONS OF THE ECONOMIC ANALYSIS

The CTP 2040 sets out to address statewide transportation strategies, taking into consideration transportation efforts designed and proposed at the local level. Caltrans recognizes that additional efforts will have economic impacts to local communities and the regions they serve beyond the modeling outputs. These include providing bicycle and pedestrian access, transit connectivity and efficient housing policy encourage community cohesiveness, and local business support. The economic impacts from the efforts described above were not assessed in this analysis.

Still, smart land use, housing, and transportation policy together can create positive economic impacts, particularly at the community level. Policies that encourage the design and development of complete communities that provide affordable housing in close proximity and/or easy access to job centers and social amenities improve opportunities for economic activity that benefit local business, household incomes, and quality of life. Transportation systems that are built to accommodate travelers by all modes safely and reliably can draw businesses to both thriving and underserved communities by attracting more people to shop and live in such places. Applying smart and efficient land use policy can increase economic activity without creating sprawl into open space. Some of these additional potential economic benefits are listed in **Figure 24**.

Figure 24

POTENTIAL ECONOMIC BENEFITS OF LOW-CARBON TRANSPORTATION AND SMART GROWTH

In addition to the marginal positive economic impacts captured in the TREDIS model, other research explores benefits to both investments in low-GHG transportation and the virtuous cycle of infill development associated with such investments. These potential economic benefits include:

Infrastructure Cost Savings. Movement of people and goods in high occupancy vehicles (HOVs) (such as rail, carpooling) translates to associated savings of more efficient use of existing infrastructure versus cost of expansion.[74]

Household Cost Savings. While housing alone is traditionally deemed affordable when consuming no more than 30 percent of income, a new Housing + Transportation Index incorporates transportation costs–usually a household's second largest expense–to show that location-efficient places with convenient transit, walking, and bicycling can be more affordable. Federal agencies are beginning to utilize the Index recognizing that, with better proximity to destinations, households can reduce the cost burden of car ownership.[75] According to the American Automobile Association (AAA), average car ownership cost $8,700 annually per vehicle.[76]

Attracting Customers. Transit investments and corresponding efficient land use patterns can further encourage community cohesiveness and local business support. A recent survey of 78 establishments in the Portland Oregon metropolitan area supports the notion that customers that arrive by modes other than the automobile are competitive consumers, spending similar amounts or more, on average, than their counterparts using automobiles. They are also more frequent patrons on average.[77]

Health Care Cost Savings. Public health research finds strong evidence that walking and biking is positively associated with better cardiovascular health, lower risk of diabetes, lower risk of hypertension–all equating to lower household health care costs.[78] Investments in safer infrastructure and slower speeds can reduce traffic injuries and fatalities thereby further lowering hospital costs.[79]

Improved Land Values and Quality of Life. Benefits attributable to transit-oriented development include improved air quality, preservation of open space, pedestrian-friendly environments, increased ridership and revenue, reduction of suburban sprawl, and reorientation of urban development patterns around both rail and bus transit facilities.[80]

Long-Term Transit Jobs. Investments in public transportation capital and operations are a significant source of dependable middle-income jobs in the United States. Economic benefits include jobs at manufacturers and at operators of public transportation equipment and facilities, plus indirect jobs.

74 Transportation Research Board, "State Department of Transportation Role in the Implementation of Transportation Demand Management Programs," 2010, http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rrd_348.pdf.

75 Center for Neighborhood Technology, "The Housing and Transportation Affordability Index," 2016, http://htaindex.cnt.org/.

76 AAA, "Your Driving Costs, how much are you really paying to drive?," 2015, http://publicaffairsresources.aaa.biz/resources/yourdrivingcosts/index.html.

77 Clifton, K. et al., "Consumer Behavior and Travel Mode Choices: A Focus on Cyclists and Pedestrians," 2013, http://nacto.org/docs/usdg/consumer_behavior_and_travel_choices_clifton.pdf.

78 Furie, G., Desai, M. Active Transportation and Cardiovascular Disease Risk Factors in U.S. Adults. Am J Prev Med. 2012;43(6):621-8.

79 TRB NCHRP Report 803 "Pedestrian and Bicycle Transportation Along Exisitng Roads – ActiveTrans" http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_803.pdf
TRB TCRP Report 95 "Pedestrian and Bicycle Facilities: Traveler Response to Transportation System Changes" http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_95c16.pdf

77 TRB TCRP Report 102 "Transit-Oriented Development in the United States: Experiences, Challenges and Prospects" http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=1156

ANALYSIS SUMMARY

This is the first CTP to analyze theoretical statewide transportation scenarios intended to reduce GHG emissions. At present, some, but not all, transportation strategies can be evaluated using the CSTDM. Additionally, the California Statewide Freight Forecasting Model (CSFFM) was not available, and therefore additional potential freight related transportation strategies were not included for this CTP.

To model and analyze the potential effectiveness of various packages of VMT and GHG reduction strategies, projects, and vehicle technologies, Caltrans developed three transportation scenarios. **Table 18** highlights how the three scenarios performed. The transportation scenarios were analyzed cumulatively, with Scenario 3 designed to meet the GHG reduction goals through a combination of existing State and regional plans, new statewide transportation strategies, and new vehicle and fuel technologies. While Transportation Scenario 3 achieves the GHG reduction goals, it also shows improvements to transportation access through significant reductions in VHT and VHD. For more in-depth information on the analysis, please refer to **Appendix 7** Technical Analysis.

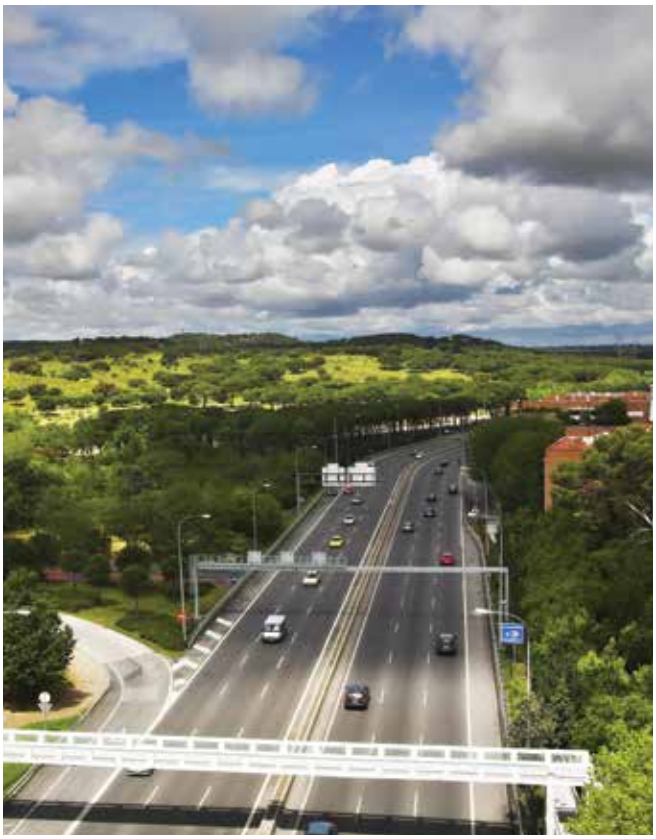
Other Potential Scenarios

CTP 2040 relies on a combination of theoretical strategies (expressed through the transportation efficiency scenarios) to meet the AB 32 goals; however, other mixes of scenarios and strategies could also be used.

CONCLUSIONS & FINDINGS

Modeling of the Transportation Scenarios was a theoretical exercise designed to test one specific path to reach the AB 32 GHG reduction targets. There are limitations to the models, and all conclusions and findings should be read with this caveat. These are not specific policy recommendations. For specific recommendations, please refer to Chapter 4.

- In Transportation Scenario 1, even by including current SCSs, High-Speed Rail, Caltrans Modal Plans, and regulations currently in place, auto travel projections in the **CSTDM increase significantly** with daily total VMT increasing 34% from 2010-2040. With the increase in vehicle trips, the VISION model projected **GHG emissions to increase 10%** from 2020-2050.
- For Transportation Scenario 2, which relies on aggressive transportation efficiency strategies to reduce VMT and in turn GHG emissions, **significant reductions in VMT and GHG emissions** are shown in the models. However, Scenario 2 falls short of the 2050 GHG reduction goal by 65%.
- Some transportation GHG emissions reduction strategies used in Scenarios 2 and 3 were able to be modeled and evaluated on model, while others relied on off model calculations. **Additional reductions in VMT and GHG emissions may be possible** through symbiotic relationships that were not available to be tested.



- The theoretical modeling analysis is consistent with the Governor's Executive Order B-30-15 (setting a target to reduce emissions in the State to 40% below 1990 levels by 2030). Although the executive order refers to overall emissions and not specifically the transportation sector, the theoretical modeling analysis shows the transportation sector trending towards reaching the target of **at least 40% below 1990 levels in 2030**. Since the executive order was released after the modeling was complete, additional analysis will have to be done for the next iteration of the CTP.
- Transportation Scenario 3 is crafted to achieve California's GHG emissions targets through aggressive implementation of alternative vehicle technology and fuels. This bridges the 65% gap from Scenario 2 to achieve the **80% reduction in GHG emissions** below the 2020 baseline.
- Many of the transportation VMT reduction strategies were intended to reduce VMT as a means to reduce GHG emissions. However, reducing VHT and VHD can also **reduce GHG emissions and significantly improve accessibility**. The VMT reduction strategies tended to have the added benefit of reducing congestion.
- In the CSTDM, the transportation GHG emissions reduction strategies proved effective in creating a shift from SOV trips (especially interregional) onto other modes of travel. It is imperative that **SOV trips are reduced or minimized** to help achieve the GHG emissions reduction goals set forth by the State and federal government, as well as reducing congestion and limiting attrition of our existing infrastructure.
- The economic analysis conducted on the Transportation GHG Emissions Reduction Strategies proposed in the CTP 2040 reveals **measurable economic benefits** occurring from their implementation. The impacts, however, are insignificant when compared to California's $2.2 trillion economy.

Table 18
SUMMARY OF PERFORMANCE MEASURES BY TRANSPORTATION SCENARIOS

	2010	2012	2020	2040	2050	2050 GHG Target
TRANSPORTATION SCENARIO 1 - PLANNED + PROPOSED STRATEGIES						
GHG Emissions (MMT CO2e / yr)	175	167	158	154	**175**	**32**
Vehicle Miles Traveled (Daily Miles X 1 Million)	**691**	-	**757**	**929**	-	-
Vehicle Hours of Travel (VHT) (Daily hours x 1,000)	**14,865**	-	**16,312**	**21,587**	-	-
Vehicle Hours of Delay (VHD) (Daily hours x 1,000)	**898**	-	**1,055**	**2,942**	-	-
VMT per Capita (Daily - Personal Travel)	**15.9**	-	**15.4**	**15.5**	-	-
Daily VMT per Capita % Difference from 2010			**-3%** ↓	**-2%** ↓	-	-
Daily Total VMT % Difference from 2010			10% ↑	34% ↑	-	-
GHG Relative Reduction (Below Scenario 1, 2020)				**-3%** ↓	**+10%** ↑	**-80%**
TRANSPORTATION SCENARIO 2 - TRANSPORTATION STRATEGIES + SCENARIO 1						
GHG Emissions (MMT CO2e / yr)	174	167	157	123	**135**	**32**
Vehicle Miles Traveled (Daily miles x 1 million)	691	-	747	719	-	-
Vehicle Hours of Travel (VHT) (Daily hours x 1,000)	**14,865**	-	**16,037**	**16,125**	-	-
Vehicle Hours of Delay (VHD) (Daily hours x 1,000)	**898**	-	**982**	**1,494**	-	-
VMT per Capita (Daily - Personal Travel)	**15.9**	-	**15.1**	**11.5**	-	-
Daily VMT per Capita % Difference from 2010			**-5%** ↓	**-28%** ↓	-	-
Daily Total VMT % Difference from 2010			**8%** ↑	**4%** ↑	-	-
GHG Relative Reduction (Below Scenario 1, 2020)				**-23%** ↓	**-15%** ↓	**-80%**
TRANSPORTATION SCENARIO 3 - FUTURE VEHICLE AND FUEL TECHNOLOGY + SCENARIOS 1 AND 2						
GHG Emissions (MMT CO2e / yr)	175	167	156	64	**32**	**32**
Vehicle Miles Traveled (Daily miles x 1 million)	691	-	747	719	-	-
Vehicle Hours of Travel (VHT) (Daily hours x 1,000)	**14,865**	-	**16,037**	**16,125**	-	-
Vehicle Hours of Delay (VHD) (Daily hours x 1,000)	**898**	-	**982**	**1,494**	-	-
VMT per Capita (Daily - Personal Travel)	**15.9**	-	**15.1**	**11.5**	-	-
Daily VMT per Capita % Difference from 2010			**-5%** ↓	**-28%** ↓	-	-
Daily Total VMT % Difference from 2010			**8%** ↑	**4%** ↑	-	-
GHG Relative Reduction (Below Scenario 1, 2020)				**-60%** ↓	**-80%**	**-80%**

GHG REDUCTION STRATEGIES FROM AROUND THE WORLD

The following case studies are examples from around the world of transportation networks, where multimodal system policies and system enhancements were put in place to encourage alternatives to SOVs. In these examples, not only were GHG emissions reduced, but the changes had added economic and congestion benefits, as well as accessibility and livability improvements.

For example, Los Angeles County Metropolitan Transportation Authority (LA Metro) showed a 42 percent increase in weekday ridership on a corridor when improvements such as bus signal priority, fewer stops, frequent service, and faster speeds were deployed. Similarly, Bogata's investment in an extensive transit, bike, and pedestrian network has translated to not only cleaner air, but also reduced commute times. Finally, while few variable user pricing strategies have been deployed in American cities, London's congestion pricing has resulted in quicker commutes, substantial new revenues poured into 14,000 new bus seats, and increased downtown economic activity.

LONDON CONGESTION CHARGING	
Type of Charge	Flat Daily Fee
Charge Amount	£8 ($13 USD)
Traffic Reduction	-30%
Economic Benefits	Businesses within the zone growing twice as fast as those in comparable areas
Greenhouse Gas Reduction	-16%
Increase in Transit Ridership	+18%
Annual Net Revenues	£137 million ($216 million USD)
Population	7.5 million

Source: Transport for London

GHG Reduction around the World: London, England (Congestion Pricing)

Since 2003, drivers traveling Central London have been assessed a flat daily fee during weekdays. Before congestion pricing was implemented, traffic in central London was flowing at 2-5 mph. Now traffic averages 10 mph. Many Londoners switched to transit, and businesses have remained healthy, because of substantial net revenues poured into transportation improvements–including 14,000 new bus seats.

London has also experienced public health benefits. According to a recent empirical study, 1,888 extra years of life have been saved among the city of London's more than seven million residents who are now breathing cleaner air.

London's downtown economy has also experienced benefits since the pricing program has been implemented: businesses within the charged zone are growing faster than businesses outside the zone. Other studies have found evidence of higher spending levels in Central London by transit users and pedestrians as compared with automobile drivers.

Source: San Francisco County Transportation Authority, "Mobility, Access, and Pricing Study; Case Studies: Stockholm and London," 2010, http://www.sfcta.org/sites/default/files/content/Planning/CongestionPricingFeasibilityStudy/PDFs/MAPS_case_studies_111310.pdf.

GHG Reduction around the World: Los Angeles, California (Bus Rapid Transit)

The Los Angeles Metro Rapid system, showed a 26,800 (42 percent) increase in weekday ridership on the Wilshire/Whittier corridor and 3,600 (27 percent) on the Ventura corridor when the system was introduced in 2000. The analysis estimates a net reduction in annual GHG emissions of 9,188 metric tons. Initial ridership increased by up to 40 percent, with one third of that ridership increase from new riders who had never used public transit. Following the successful Demonstration Program, the Metro Rapid Program has expanded to a network of nearly 400 miles of Metro Rapid service in operation with more service planned.

Metro Rapid routes have a number of key attributes including bus signal priority, fewer stops, frequent service, and faster speeds. These routes have distinctive red and white exteriors, stations designed to be like a rail stop, and simplified routes. All of these characteristics were designed to improve the customer experience and to attract non-transit riders.

BUS RAPID TRANSIT	
City	Los Angeles
Facility	Metro Rapid, Wilshire-Whittier and Ventura
Ridership Increase	26% to 33%
Prior Mode	One-third were new riders, one-third existing riders traveling more often, and one-third diverted from other corridors
BRT Features	Mixed traffic Distinctive, easy-to-board vehicles ITS Frequent, all-day services

Source: Millard-Ball, A., et al., "Bus Rapid Transit and Carbon Offsets," 2008, http://www.climateactionreserve.org/wp-content/uploads/2009/03/future-protocol-development_bus-rapid-transit-and-carbon-offsets.pdf.

GHG Reduction around the World: Bogotá, Colombia (BRT, Pedestrian and Bicycle Infrastructure)

In 1998, the mayor of Bogotá, Colombia, made it his priority to increase pedestrian and cyclist opportunities. Now, the city enjoys expanded cycle paths, pedestrian zones, improved parks, and an internationally recognized BRT system. Bogotá Colombia's BRT system and network of non-motorized transport infrastructure has reduced traffic congestion and air pollution. Commute times have been cut by 20 minutes and air quality has improved by 40 percent. From 2001 to 2010, the BRT system abated 236,000 tons of GHG emissions annually between 2006 and 2010. Moving forward, Colombia is pursuing a Sustainable Urban Development Nationally Appropriate Mitigation Action (NAMA) to strengthen these benefits.

Source: Center for Clean Air Policy, "Reducing Traffic Congestion in Bogotá through Bus Rapid Transit and Non-motorized Transport: Colombia," http://ccap.org/assets/CCAP-Booklet_Colombia.pdf.

SIEMENS

INTERMODAL CENTER

CHAPTER 4

4 ACHIEVING SUCCESS

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

The modeling exercise in Chapter 3 is intended to test and analyze three scenarios and show how they perform toward meeting California's GHG reduction targets by 2020, 2040, and 2050. These are not intended to be prescriptive recommendations, but rather an exploration of strategies and technologies that may be needed to meet these targets. With the modeling results in mind, specific recommendations that transform the CTP's Vision for a low carbon transportation system into a set of actions are identified here in Chapter 4.

POTENTIAL GAME CHANGERS TO ACHIEVE SUCCESS

California's goal for all sectors and economic activities is to reduce GHG emissions while we go about our daily business. For transportation, this means making significant changes in how we travel. We must provide access and mobility for people and businesses, yet reduce our single occupant miles traveled and advance cleaner vehicles and fuels. Given our current infrastructure, land use patterns, lifestyles, and business practices, this is a steep challenge for State and regional transportation agencies, businesses and the public. Transportation agencies and providers at all levels must work together and each contribute to meeting our goals. The CTP 2040 for the first time examines various strategies to help us move towards a low-carbon transportation system.

Reducing Single Occupancy Vehicle Trips

Increasing Alternate Vehicle Technology and Fuels

Improving Transit and Active Transportation

Figure 25

TRANSFORMING VISION INTO ACTION

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.

In 2040, there will be greater demands on the transportation system. Mobility needs for a greater population and increased freight movement will be required to achieve economic prosperity and an enhanced quality of life for our residents. The transportation system, in its entirety, needs to meet those demands and achieve those goals in a sustainable way to achieve California's GHG reduction targets. A vision for the transportation system is set to keep California moving toward low carbon transportation solutions coupled with sustained economic vitality (See **Figure 25**).

California residents, businesses, and visitors all need a safe transportation network that is reliable and in good condition. In addition to the challenges of funding such a robust transportation network, we have to be concerned with the community and environmental impacts of transportation including reducing GHGs as called for in SB 391. Therefore, we must use all strategies available to us to provide a robust world-class low carbon transportation system. We must optimize the efficiency of a well-connected transportation system; engage better land use planning that provides transportation mode choices to people, jobs, goods, and services with greater location efficiency. Removing bottlenecks, creating seamless transitions from one mode to the next, and using congestion pricing in managed lanes are examples of such strategies. The utilization of integrated corridor management (ICM) can improve mobility and safety for all modes; ramp meters, dynamic speed management, incident management, and integration of parallel facilities can improve mobility on the existing infrastructure.

As California approaches 50 million residents by mid-century, the entire transportation system will need to have strategic capacity improvements across all modes to handle additional demand, and each component of the multimodal system will need to operate more efficiently and cleaner in order to meet our mobility needs and objectives in 2040. For **passenger travel**, Caltrans and HSR in partnership with regional transit agencies, rail operators, and planning organizations will build out a state-of-the-art, integrated transit and rail network that will allow Californians and our visitors to move conveniently through the State. By 2040, a growing percentage of short and first-mile/last-mile trips will be by seamless connections to local transit, ridesharing, biking, and walking. With Cap-and-Trade auction revenues and other funds, California will continue to invest extensively in expanded public transit, active transportation, and efficient land use development projects.

California's freight system–land, sea, and air–will need to be expanded and operate more efficiently and cleaner. Rail will play a larger role; new technology will allow for greener systems and more efficient logistics; automation will improve competitiveness. Marine highways and drones may relieve impacts to interstates and local roads while facilitating movement of goods. California's vision has been laid out in the adopted CFMP that sets a path for how to enhance economic competitiveness by collaboratively developing and operating an integrated, multimodal freight transportation system that provides safe, sustainable freight mobility while ensuring a prosperous economy, social equity, and human and environmental health. Caltrans is further partnering with other agencies on the California Sustainable Freight Action Plan to improve freight efficiency, transition to zero-emission technologies, and increase competitiveness of California's freight system.

Safety will continue to be imperative for all transportation system modes. In 2013 there were 3,104 fatalities; 223,128 persons injured; 2,853 fatal collisions; and 156,909 injury collisions caused from motor vehicle related incidents.[81] With these numbers, improvements in **safety** are imperative for all modes. Relative to miles they travel, pedestrians and bicyclists are disproportionately injured and killed. We must prioritize decision-making and investment in achieving our goal of Toward Zero Deaths (TZD) and partner with local cities on their efforts for Vision Zero, a multi-national road traffic safety project that aims to achieve a highway system with no fatalities or serious injuries in road traffic. We must use data, performance measures, education, engineering solutions, and enforcement to accomplish these goals. In addition to the Strategic Highway Safety Plan (SHSP) adopted by California, we must have specific actionable items and stakeholder task forces actively involved in order to achieve safety goals for all users. Reducing or eliminating impaired and distracted driving must be a priority. Completing the installation of positive train control (PTC) will improve rail safety while improved planning and design of roads and highways can provide much greater safety for pedestrian and bicycle mobility.

State and local agencies have made a significant investment in our existing transportation system. It is a crucial objective to prioritize the effective management of our transportation assets and maximize the effective life of existing infrastructure. **Transportation asset management** enables more effective resource allocation and utilization based on quality information and analyses, to address system preservation, operation, and improvements. We must collectively get more sophisticated at setting performance targets, assessing current condition and performance, identifying the most cost-effective investments, and developing LRPs for all types of infrastructures.

The State–and increasingly regional and local partners—are appropriately prioritizing "**fix-it first**" activities in order to maintain our existing infrastructure in good condition. Work to improve safety, operation, and condition of the SHS is accomplished through the State Highway Operations and Protection Program (SHOPP). Planning for this program is done through the Ten-Year SHOPP Plan, which is increasingly focused on asset management. Caltrans' new analytical approach is prioritizing investment decisions across all types of infrastructures to achieve desired outcomes. More data and tools will enhance all owner-operators' ability to employ transportation asset management.

81 CHP, "SWITRS 2013 Report," 2013, https://www.chp.ca.gov/InformationManagementDivisionSite/Pages/SWITRS-2013-Report.aspx.

Californians expect a well-connected, integrated transportation system that is convenient, reliable, and **accessible to all** users. This includes rural, urban, the disabled, and those of all socioeconomic bands. It needs to accommodate across generational needs. It must make interregional travel, commute routes, and first and last mile links reliable. Shared mobility (car share and bike share) can provide key links and convenience for certain trips. Joint use mobility such as carpooling can maximize the person throughput of corridors. Complete Streets will provide infrastructure that improves accessibility for all users and also promotes active transportation.

Increasingly, **traveler information** and **transportation data**–mode availability, system delays, travel times, and mode costs–is playing a greater role in decision-making on how people and goods travel, and how system operators manage the system. The information will only become more sophisticated and more readily available between now and 2040. Data will be readily available through smart devices, along transportation system routes, and in the transportation system, including vehicles through connected and autonomous vehicle technology. Examples of this would be the Transportation Management Centers throughout the State managing the road network, or the availability of travel time and cost information at your fingertips for multiple routes and mode options before you embark on your commute, or the availability of car-share or bike-share at key points of a trip.

CTP 2040 takes a more holistic look at transportation and focuses expansion investments on the most beneficial infrastructure improvements regardless of mode of travel.

The Caltrans Strategic Plan from 2015-2020 sets appropriate performance measures and actions for the initial five years of the CTP 2040 Vision, laying the framework for a low carbon transportation plan consistent with SB 391 and subsequent related EOs and deliver a robust, interconnected transportation system including all modes, keeping environmental stewardship in mind.[82] By improving mobility, accessibility, and safety, through smart investments in a multimodal transportation system, better land use planning, and increased use of new technology, we will provide quality of life and economic benefits to our residents.

In recent years, California has taken significant steps to transform the CTP 2040 vision into action:

- The Governor has called for significant new revenue to address "fix-it first" preservation and operation of highways and roads. The Governor's 16/17 May budget revision would generate an estimated $36 billion over ten years for this purpose.
- California is committed to building the nation's first HSR system, and with the direction of Cap-and-Trade auction revenues to this project, now has sufficient funds identified for the construction and operation of a section of the HSR program, which would have passenger service within the next decade.
- Cap-and-Trade auction proceeds are being directed to improve and expand public transit, and incentivize more efficient land use decisions. To maximize the cost-effectiveness of transit investments, and make transit a competitive alternative to car trips, the State is working on a first-of-its-kind rail and transit integration plan as part of the next CSRP.
- California created the nation's largest ATP in 2013, which to date has resulted in the dedication of over $720 million in State and federal funds to the development of safe bicycle and pedestrian facilities in communities throughout California.
- California adopted a ZEV action plan in 2013, which includes a roadmap to achieve 1.5 million ZEVs on California roadways by 2025.

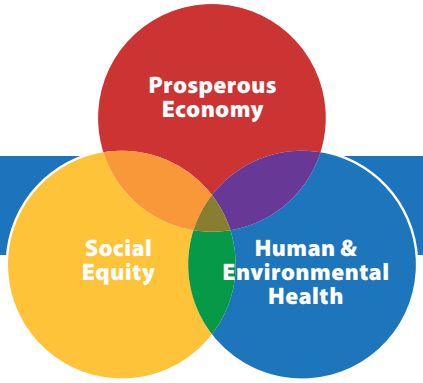
The above actions allow the State to partner with local governments as they implement their sustainable community strategies and together achieve objectives for multimodal mobility, safety and sustainability.

This chapter further outlines specific goals, policies, and recommendations, with our implementation highlights at the end. **Figure 26** shows the relationship between the CTP 2040 Vision, Goals, and Policies.

82 Caltrans, "Strategic Management Plan," 2015, http://www.dot.ca.gov/perf/library/pdf/Caltrans_Strategic_Mgmt_Plan_033015.pdf.

Figure 26

CTP2040 Policy Framework



THE VISION
SUSTAINABILITY

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.

THE 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

THE POLICIES

Goal 1	Goal 2	Goal 3	Goal 4	Goal 5	Goal 6
POLICY 1: Manage and Operate an Efficient Integrated System	POLICY 1: Apply Sustainable Preventative Maintenance and Rehabilitation Strategies	POLICY 1: Support Transportation Choices to Enhance Economic Activity	POLICY 1: Reduce Fatalities, Serious Injuries, and Collisions	POLICY 1: Expand Engagement in Multimodal Transportation Planning and Decision Making	POLICY 1: Integrate Environmental Considerations in All Stages of Planning and Implementation
POLICY 2: Invest Strategically to Optimize System Performance	POLICY 2: Evaluate Multimodal Life Cycle Costs in Project Decision Making	POLICY 2: Enhance Freight Mobility, Reliability, and Global Competitiveness	POLICY 2: Provide for System Security, Emergency Preparedness, Response, and Recovery	POLICY 2: Integrate Multimodal Transportation and Land Use Development	POLICY 2: Conserve and Enhance Natural, Agricultural, and Cultural Resources
POLICY 3: Provide Viable and Equitable Multimodal Choices Including Active Transportation	POLICY 3: Adapt the Transportation System to Reduce Impacts from Climate Change	POLICY 3: Seek Sustainable and Flexible Funding to Maintain and Improve the System		POLICY 3: Integrate Health and Social Equity in Transportation Planning and Decision Making	POLICY 3: Reduce Greenhouse Gas Emissions and Other Air Pollutants
					POLICY 4: Transform to a Clean and Energy Efficient Transportation System

GOAL 1: IMPROVE MULTIMODAL MOBILITY AND ACCESSIBILITY FOR ALL PEOPLE

People want a transportation system that gets them where they need to go–safely, reliably, and at a reasonable cost, without sacrificing the environment, public health, or community character. Efficient delivery of goods and services are vital to the State's interests. Goal 1 aims to improve multimodal mobility and accessibility, which is best achieved by providing well-integrated multimodal options and well-managing the existing transportation systems to optimize performance.

To optimize performance of the existing system, specifically the local network component, the transportation sector should support efficient, well-designed, walkable communities at density levels sufficient to support reliable transit. To maximize the efficiency of the SHS, a broad suite of strategies must be utilized that improve congestion management, fund life-cycle costs, and provide resources to fund alternative travel options in congested corridors. Targeted capacity increases should use a multimodal, corridor-wide approach and include various strategies such as adding high occupancy vehicle (HOV) and high occupancy toll (HOT) lanes, managed lanes, ramp metering, and other ITS treatments.

CONNECTED CORRIDORS PROGRAM

In collaboration with University of California, Berkeley's Partners for Advanced Transportation Technology, Caltrans is developing 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.

TRANSIT AND ACTIVE TRANSPORTATION

Establishing a robust and flexible transit is a critical component of an effective multimodal transportation system. In addition to the State Highway, local streets and roads, 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, health benefits, and provision of a reliable alternative for those who cannot or choose not to drive. Many transportation agencies throughout the State recognize the inherent value in transit (e.g., safer than driving and also contributes to VMT reduction.[83]) and are looking at improving transit.[84] For example, California's HSR will be integrated with local and regional rail systems to create a seamless traveling experience. In addition, because more people will be accessing the 24 high-speed rail stations, transit, biking, and walking will be expanded. CALSTA and Caltrans are also addressing transit, accessibility, and California's future mobility issues in the 2018 CSRP, which is a trailblazing effort designed to create an integrated rail and public transportation network. Transit agencies, rail operators, planning organizations, and stakeholder organizations from across the State are developing a draft network vision that will be released for public comment and feedback in early 2017. Our goal is to develop the vision and framework for a state-of-the-art, integrated transit and rail network that allows Californians and our visitors to move quickly, cleanly, and conveniently throughout the State, providing alternatives for future travel needs on California's transportation system.

Innovative forms of transportation will become all the more important in the coming decades as California's demographics and attitudes about driving and vehicle ownership change. Much evidence shows that the millennial generation, younger people born in the 1980s to the early 2000s, do not share their parents and grandparents' passion for driving and car centric culture.[85] For many reasons, including environmental concerns and financial savings, young people are choosing alternative transportation modes, such as carsharing, bikesharing, transit, and more active transportation options.

ACTIVE TRANSPORTATION

Several statewide initiatives are underway to identify strategies for expanding active transportation opportunities. The multi-agency collaborative, Health in All Policies Task Force (HiAP), aims to make bicycling and walking a more attractive and safer transportation option for shorter trips particularly on highways and local roads. In addition, Safe Routes to Schools (SRTS) aims to increase the number of children who walk or bicycle to school.

83 American Public Transportation, "The Benefits of Public Transportation: The Route to Better Personal Health, 3," www.apta.com/resources/reportsandpublications/Documents/better_health.pdf.

84 Matute, J. M., et al., "California Statewide Transit Strategic Plan: Recommendations for Caltrans," 2012, http://www.dot.ca.gov/hq/MassTrans/STSP/STSPrecommendations.pdf.

85 Blumenberg, E., et al., "What's Youth Got to Do with It? Exploring the Travel Behavior of Teens and Young Adults," 2012, http://www.uctc.net/research/papers/UCTC-FR-2012-14.pdf.

HIGHWAYS AND ROADS

The highway and road system was primarily constructed during the middle to late part of the 20th century. This system will continue to be vital in moving people and goods; however, the rate of constructing new highway and road capacity has slowed significantly in recent decades. While new highway and road capacity will be built where it is the most cost-effective and policy-effective solution, most of the emphasis in the coming decades should be on (1) maintaining the existing highway and road system, and (2) maximizing the efficiency and effectiveness of the existing capacity. Maintaining existing infrastructure is explored in the next goal group, but achieving greater efficiency from existing infrastructure is included here.

Efficiency on roads means getting as much operational capacity as we can from the investments we make. This can come through technology road infrastructure such as ramp metering, demand management via HOV lanes and HOT lanes, and connected and semi- or fully-autonomous vehicles to name a few.

PROGRAMS THAT PROMOTE GREATER ACCESSIBILITY

A proven best practice to ensure multimodal accessibility is implementing more Complete Streets projects, which are roadways designed to enable safe access for all users. A Complete Street is planned, designed, operated, and maintained 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 are integrated with automobile use and provide commuters with viable travel choices and an opportunity to decrease auto mode share, VMT, and GHG. These projects can also have positive economic benefits. For example, by implementing road diets, busy roadways reduce lanes and speed to accommodate all modes of travel, thus increasing foot-traffic to businesses. Transportation planning must also consider access that supports efficient movement of goods. The result is a more balanced and equitable transportation system among all modes of travel.

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, emphasizing movement of people instead of vehicles and travel needs of each consumer throughout an entire trip, not just the portion traveled on one mode. The focus is on improvements to travel services being delivered and improvements in the availability of information about those services. Instrumental to the success of Mobility Management is the effective Consolidated Transportation Services Agencies (CTSAs) that coordinate local and regional transportation services to the disabled, the elderly, youth, and low-income individuals.

The CTP 2040 identifies the following policies and recommendations to address the Goal 1 challenges and opportunities to improve multimodal mobility and accessibility for all people.

POLICIES

Policy 1
MANAGE AND OPERATE AN EFFICIENT INTEGRATED SYSTEM

RECOMMENDATIONS

- Improve transit by completing Phase 1 of the HSR System by 2029 and making it the backbone of an integrated statewide transit system with one-stop ticketing and coordinated transfers. Continuously improve the State's intercity and commuter rail system, while providing for connectivity to future HSR network, local transit, and tribal transit networks.
- Improve management systems of highways, local roads, and transit corridors to maximize system efficiency through ICM (ITS, HOV lanes, dynamic HOT lanes, BRT lanes, rail lines, linked data, autonomous and connected vehicles, smart parking, V2V and infrastructure-to-vehicle [V2I] communication, vehicle and ride-sharing services, and Complete Streets).
- Increase the supply of green transportation services to meet the needs of future population in a manner that reduces GHG emissions, such as EVs and charging infrastructure, clean fuels and fueling infrastructure.
- Implement programs to reduce vehicle trips while preserving personal mobility, such as employee transit incentives, telecommute programs and alternative work schedules, carsharing, parking policies, bikesharing, real-time ride-sharing, shuttles/jitneys, and public education programs.
- 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.

Policy 2
INVEST STRATEGICALLY TO OPTIMIZE SYSTEM PERFORMANCE.

RECOMMENDATIONS

- Invest to ensure that the transportation network is truly multimodal and integrated to serve all of the State's population.
- Provide real-time system information to the public on all major commute corridors and invest to install ICM on priority corridors. Secure funding to make data available statewide.
- Ensure at least 90 percent on-time performance for all intercity rail corridors.
- Secure permanent and stable transportation revenue to achieve state of good repair, freight efficiency, passenger movement, and other investments outlined in this plan.
- Use a broad suite of strategies to address the states most congested corridors (i.e. HOV and HOT lanes, ITS options, BRT lanes, parallel transit and active transportation improvements). This approach is being utilized on the SR 91 in Riverside; the 215 in Riverside; the I-405 in Orange County; and is being evaluated for the 101 in Silicon Valley.

Policy 3
PROVIDE VIABLE AND EQUITABLE MULTIMODAL CHOICES, INCLUDING ACTIVE TRANSPORTATION.

RECOMMENDATIONS

- Support and implement projects and policies, including Complete Streets that increase biking and walking, especially for short trips, first/last mile transit trips, and school trips.
- Grow the ATP to support a broad range of investments that provide safe, convenient, and continuous pedestrian and bicycle networks.
- Provide improved multimodal travel choices through high quality transit accessible across communities in California.

GOAL 2: PRESERVE THE MULTIMODAL TRANSPORTATION SYSTEM

California's multimodal transportation system is in jeopardy. Preservation of transportation investments has not kept pace with the demands. Failing to invest in the restoration of California's roads, bridges, airports, seaports, railways, border crossings, bicycle and pedestrian facilities, and public transit infrastructure will only lead to further 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.[86] To protect the current transportation system, Goal 2 emphasizes the need to prioritize preservation investments, maximize limited resources through asset management, and prepare the transportation system for climate change threats.

FIX-IT-FIRST

Highways are an essential part of a corridor and a crucial investment to maintain the multimodal transportation system. Maintaining the existing road system is one of the most significant transportation challenges in California. California ranked 45th in the nation in terms of highway conditions in 2012, with more than half of highway lanes either in distressed condition or in need of preventive maintenance.[87] Roadway maintenance 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.

While maintaining the highway system has a 10-to-1 return on investment over delayed replacement, poor roadway conditions are costly to motorists. With increasing public scrutiny, government agencies are under great obligation to demonstrate their stewardship of public funds. CalSTA and Caltrans recommend all levels of government fully implement the "fix-it first" policy to preserve the STS. Therefore, a major focus is on system maintenance rather than expansion.[88]

ASSET MANAGEMENT

With limited resources, asset management is an important 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 U.S. Department of Transportation (US DOT) 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. With limited funding, prioritization of projects becomes critical. Caltrans is developing a data driven, transparent prioritization methodology to help ensure funding is put to the best possible use given our goals.

Caltrans is turning to innovative strategies, including recycling, to make materials last longer and be more environmentally sustainable. For example, cold-in-place pavement 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. Recycled materials such as crumb rubber from old tires[89] and asphalt roof shingles,[90] that may have otherwise ended in landfills, have use in enhancing pavements by increasing flexibility and heat resistance, respectively.

Caltrans is also turning to advanced technology to keep the SHS in top condition. For example, Pavement Management System software (PaveM) targets future repairs that do the most good for the least amount of money.[91] By employing aggressive, quick, and preventive treatments, more costly repairs can be avoided in the future.

Preservation of the State's transit and rail system is also important as ridership is expected to rise. Aging baby boomers are a large population requiring transportation services and regions are beginning to plan for transit and paratransit maintenance and preservation. Repairing existing infrastructure that encourages non-motorized travel, such as well-maintained sidewalks and bike lanes, is essential for those unable or those who choose not to drive.[92]

86 Leiter, B., et al., "2011 Statewide Transportation System Needs Assessment," 2011, http://www.catc.ca.gov/reports/2011Reports/2011_Needs_Assessment_updated.pdf.

87 Hartgen, D. T., et al., "21st Annual Report on the Performance of State Highway Systems (1984-2012)," 2014, http://reason.org/files/21st_annual_highway_report.pdf.

88 California State Transportation Agency, "California Transportation Infrastructure Priorities: Vision and Interim Recommendations," 2014, http://www.calsta.ca.gov/res/docs/pdfs/2013/CTIP%20Vision%20and%20Interim%20Recommendations.pdf.

89 Caltrans, "2013 State of the Pavement Report: Based on the 2013 Pavement Condition Survey," 2013, http://dot.ca.gov/hq/maint/Pavement/Pavement_Program/PDF/2013_SOP_FINAL-Dec_2013-1-24-13.pdf.

90 Calrecycle, "Asphalt Roofing Shingles in Asphalt Pavement," http://www.calrecycle.ca.gov/condemo/shingles/pavement.htm.

91 Caltrans, "The Mile Marker, September 2015 Issue," 2015, http://www.dot.ca.gov/MileMarker/2015-3/index.html.

92 Sacramento Area Council of Governments, "Metropolitan Transportation Plan/Sustainable Communities Strategy: 2035, 142." 2012, http://sacog.org/mtpscs/files/MTP-SCS/MTPSCS%20WEB.pdf.

PLAN FOR CLIMATE CHANGE

Climate change is a serious threat to California's infrastructure. Extreme weather, including events such as heat waves, droughts, and torrential storms, is predicted for the future, which will add even more stress to pavement, culvert, and bridge infrastructure.[93] 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.[94] The level of change remains uncertain as global GHG emissions abatement commitments are lacking, but is estimated to rise up to almost one foot by 2030, two feet by 2050, and over five feet by 2100.[95] Roads, culverts, ports, industrial developments, beaches, wetlands, and other resources near the coast are susceptible to inundation. Due to many design constraints, SLR mitigation proves to be a challenge as well as an opportunity for stakeholders to prevent future losses. For example, roadways can be elevated to act as dams or levees,[96] and wetlands can be migrated more inland to prevent habitat loss due to exposure from SLR. However, current inland development and land use policies may prevent development of these needs. 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 SLR, which will block lateral access.[97]

These uncertainties create huge challenges for transportation managers who need to ensure that reliable transportation routes are available.[98] 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. Goal 2 aligns with CTIP's transportation vision of preservation, innovation, integration, reform, and funding. 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.

The CTP 2040 identifies the following policies and recommendations to address the Goal 2 challenges and opportunities to preserve the multimodal transportation system.

93 United States Environmental Protection Agency, "Climate Impacts on Transportation," http://www.epa.gov/climatechange/impacts-adaptation/transportation.html.

94 Caltrans, "Guidance on Incorporating Sea Level Rise: For use in the planning and development of Project Initiation Documents," 2011, http://www.dot.ca.gov/ser/downloads/sealevel/guide_incorp_slr.pdf.

95 Committee on Sea Level Rise in California, Oregon, and Washington, et al., "Sea Level Rise in California, Oregon, and Washington: Past, Present, and Future," 2012, http://ssi.ucsd.edu/scc/images/NRC%20SL%20rise%20W%20coast%20USA%2012.pdf.

96 IAFSM 2011 Annual Conference, "Is it a Levee or a Dam?" http://www.illinoisfloods.org/documents/2011_IAFSM_Conference/2%20Wednesday/3A_Is%20it%20a%20Levee%20or%20a%20Dam.pdf.

97 California Coastal Commission, "California Coastal Commission Draft Sea-Level Rise Policy Guidance, 86," 2013, http://www.coastal.ca.gov/climate/slr/guidance/CCC_Draft_SLR_Guidance_PR_10142013.pdf.

98 Caltrans, "Guidance on Incorporating Sea Level Rise: For use in the planning and development of Project Initiation Documents," 2011, http://www.dot.ca.gov/ser/downloads/sealevel/guide_incorp_slr.pdf.

POLICIES

Policy 1
APPLY SUSTAINABLE (RENEWABLE AND REUSABLE RESOURCES) PREVENTIVE MAINTENANCE AND REHABILITATION STRATEGIES.

RECOMMENDATIONS

- 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. Utilize and install new operational strategies and technologies to optimize system capacity.[99]

Policy 2
EVALUATE MULTIMODAL LIFE-CYCLE COSTS IN PROJECT DECISION-MAKING.

RECOMMENDATIONS

- Implement asset management and life-cycle costing to minimize long-run maintenance costs consistent with SB 486 and EO B-30-15. Develop and implement a risk-based asset management plan to prioritize investments.
- 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).
- Preserve and maintain roads and transportation facilities in good repair. Implement pavement maintenance programs using best practices for all roads. Reduce the number of distressed roads and bridges.

Policy 3
ADAPT THE MULTIMODAL TRANSPORTATION SYSTEM TO REDUCE IMPACTS FROM CLIMATE CHANGE.

RECOMMENDATIONS

- Expand State and regional resiliency planning and climate change impact studies of SLR, storm events, and other climate change indicators that affect the future of communities, infrastructure, and ecosystems.
- Develop a project-level checklist to evaluate facility risks and vulnerability due to climate change impacts at the time funding is programmed, and incorporate project design features to improve resiliency of facilities and infrastructure.[100]
- Incorporate system impacts from climate change, risk, and vulnerability assessments into collaborative and proactive construction, operations, and maintenance activities to provide affected agencies and freight partners with the ability to adapt and recover from climate change events.

99 Caltrans, Division of Maintenance Pavement Program, "2013 State of the Pavement Report: Based on the 2013 Pavement Condition Survey, 2013, http://dot.ca.gov/hq/maint/Pavement/Pavement_Program/PDF/2013_SOP_FINAL-Dec_2013-1-24-13.pdf.

100 A tool to evaluate projects for climate change vulnerability from the Federal Highway Administration, "FHWA's Vulnerability Assessment Scoring Tool (VAST)," http://www.fhwa.dot.gov/environment/climate_change/adaptation/adaptation_framework/modules/index.cfm?moduleid=4#tools.

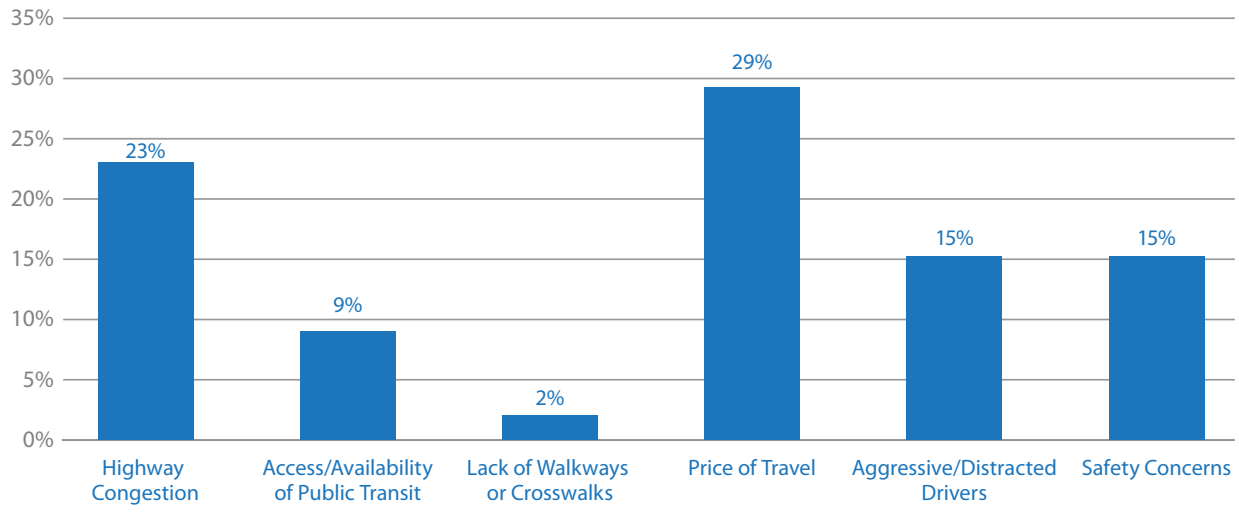
GOAL 3: SUPPORT A VIBRANT ECONOMY

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. Therefore, transportation inefficiencies such as inequitable access, 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 27**).[101] Across all socioeconomic lines, California households spend roughly 15-19 percent of their income on travel–typically the second or third largest item in a family budget.[102] Highway congestion leads to additional vehicle operation costs and productivity losses by restricting access to employment and retail markets including a constraint on the supply chain.[103] A comprehensive multimodal transportation system provides everyone with efficient and economical travel options, such as walking, biking, and transit, reducing travel expenditures and GHG emissions. A multimodal system also decreases congestion costs by offering travelers choice among modes. Reduced travel costs yield an increase to discretionary income and allow 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.

Figure 27
RELATIVE IMPORTANCE OF TRANSPORTATION ISSUES AMONG THE PUBLIC



Source: Portillo, D. (2013). National Household Travel Survey California Data. Caltrans. Visit the Reference section of the CTP 2040 website: www.californiatransportationplan2040.org.

101 Litman, T., "Affordable as a Transportation Planning Objective," 2013, http://www.planetizen.com/node/60908.

102 Rice, L., "Transportation Spending by Low-Income California Households: Lessons for the San Francisco Bay Area, 16," 2004, http://www.ppic.org/content/pubs/report/R_704LRR.pdf.

103 Weisbrod, G., et al., "Measuring the Economic Costs of Urban Traffic Congestion to Business," 2003, http://www.edrgroup.com/pdf/weisbrod-congestion-trr2003.pdf.

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.

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 are imported and exported internationally through California ports and transferred nationally through rail to freight hubs such as Chicago, St. Louis, and New Orleans.[104] 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,[105] leading to a stronger local economy. When consumers support locally-owned businesses, it creates a stronger local economy through additional jobs, revenue, and the recirculation of money within the community.

SUSTAINABLE INTEGRATED CORRIDORS

An expansive multimodal transportation system can spur job and regional economic growth, improve income equality, and increase economic resilience. Nearly 1 million transportation and material moving jobs exist in California.[106] 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 and agriculture, helping them to thrive.

Multimodal connectivity is critical in linking local, regional, national, or international areas and reducing the burden on the SHS. The explosive increase in e-commerce, with goods delivered directly to consumers in widely dispersed locations, has created an increased demand for freight movement. In a vigorously competitive global marketplace, under-funding the transportation system could place the State's economy at risk.

104 Caltrans, "Freight Planning Fact Sheet: California Freight Rail," 2013, http://www.dot.ca.gov/hq/tpp/offices/ogm/fact_sheets/Freight_Railroad_Fact_Sheet_122413_jhm.docx

105 Shamsuddin, S., et al., "Walkable Environment in Increasing the Livability of a City," 2012.

106 Caltrans, "Fast Freight Facts: Commercial Vehicles (Trucks)," http://www.dot.ca.gov/hq/tpp/offices/ogm/fact_sheets/Fast_Freight_Facts_Trucks_bk_040612.pdf.

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 dependent on fuel excise taxes, sales taxes, bonds, and local self-help revenues (see **Appendix 6**). Moreover, statutory designations of some revenue sources decrease funding flexibility.[107] 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 can be discretionarily applied to 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, such as ARB's GHG emissions trading program GGRF, can also help California address social and environmental issues.

Successful long-term planning is achievable only through a collaborative process. Caltrans is looking to maximize collaboration and leverage funding through an integrated approach to planning, designing, building, and operating transportation assets. Integrating local, regional, and State priorities can help identify opportunities for strategic investment that addresses multiple objectives. 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.

EFFORTS TO SUPPORT A VIBRANT ECONOMY

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

The CTP 2040 identifies the following policies and recommendations to address the Goal 3 challenges and opportunities to support a vibrant economy.

107 Self-Help Counties, "Transportation Needs Rise, While Funding Declines," 2013, http://www.selfhelpcounties.org/Declining_Transportation_Funds_FactSheet_021113.pdf

POLICIES

Policy 1
SUPPORT TRANSPORTATION CHOICES THAT ENHANCE ECONOMIC ACTIVITY.

RECOMMENDATIONS

- Enhance major economic clusters by providing multimodal commute corridors and multimodal freight last mile improvements, including ports and hubs.
- Support transportation solutions that support the growth of clean and/or renewable technology and other 'green' sector jobs.
- Prioritize funding toward efficient and affordable transportation options to key job centers and local businesses to stimulate economic activity.
- Implement pricing strategies that better reflect the total cost for each mode, including health and environmental costs, while not economically over-burdening low-income system users.
- Support regional and local government planning for efficient land use that improve jobs-housing proximity.

Policy 2
ENHANCE FREIGHT MOBILITY, RELIABILITY, AND GLOBAL COMPETITIVENESS.

RECOMMENDATIONS

- Prioritize Investment on freight corridors to support the objectives of the CFMP.
- Complete the California Sustainable Freight Action Plan with Governor's Office of Business and Economic Development, California Natural Resource Agency, and California Environmental Protection Agency, per EO B-32-15, including development of pilot freight projects.
- Develop and promote multimodal links between neighborhoods, job centers, and regional institutions centers.
- Promote and negotiate cross-jurisdictional coordination to bring about improved efficiencies and connectivity, including at POE, for the movement of people, goods, services, and information. Improve California's key border crossings to reduce wait times and environmental impacts
- Research, develop, demonstrate, and deploy cost-effective technologies and operational strategies to expedite goods movement, improve safety, and reduce congestion.
- Improve the State's 12 deep-water ports by pursuing active freight rail connections to the National Rail System.

Policy 3
SEEK SUSTAINABLE AND FLEXIBLE FUNDING TO MAINTAIN AND IMPROVE THE SYSTEM.

RECOMMENDATIONS

- Seek creation of national, State, and regional dedicated funding programs for freight transportation to invest in interregional goods movement corridors.
- Develop stable long-term transportation fund sources that are used equitably to address California's multimodal transportation needs. Promote flexible funding for transportation problems that have significant public benefits, regardless of facility ownership and/or jurisdiction.
- Utilize reauthorization funding opportunities, such as FAST Act, while advocating for policies consistent with the economic, environmental, and equity values of California.
- Support efforts to implement a road pricing strategy that can fund multimodal transportation improvements and that recognizes social equity issues.
- Secure stable funding for statewide data collection, model development, documentation, and data visualization activities to support policy-making activities.

GOAL 4: IMPROVE PUBLIC SAFETY AND SECURITY

The California SHSP, a comprehensive, data-driven effort to reduce fatalities and serious injuries on all public roads in California, is the "back bone" for the CTP 2040's safety goal. The main objective is to achieve a significant reduction in fatalities and serious injuries on all public roads.

The SHSP captures data and identifies trends for the entire State that includes serious injuries, fatalities, and their respective rates. For example, in 2012, the leading cause of death and serious injury on the highway system was roadway departure, which accounts for 23.3 percent of roadway fatalities and serious injuries (SHSP, 2015).

The SHSP provides an opportunity to collaborate and develop significant strategies and performance measures with stakeholders that emphasize safety challenge areas to improve safety culture throughout the State. The SHSP strategies address managing and maintaining multimodal facilities, such as local public streets and roads, transit and freight, and bicycle and pedestrian travel ways.

A high priority is ensuring peace of mind by means of creating a safe and secure environment for all citizens, neighborhoods, and communities. The proactive and preventative approach in prioritizing and implementing a course of action for the public's welfare is to invest in safety and security improvements. Caltrans, in collaboration with federal, State, tribal, regional, and local agencies, is seeing a positive trend and return on investment for safety and security design and beneficial improvements to the multimodal system. These efforts include a multitude of programs, such as collision prevention, roadway infrastructure improvements, enforcement, public education, and advances in state-of-the-art safety and security technology.

The CTP 2040 identifies the following policies and recommendations to address the Goal 4 challenges and opportunities to improve public safety and security.

POLICIES

Policy 1
REDUCE FATALITIES, SERIOUS INJURIES, AND COLLISIONS.

RECOMMENDATIONS

- Collaborate, coordinate, and identify actions with all stakeholders including State, regional, and local agencies in meeting statewide performance targets to achieve TZD and zero serious injuries.
- Implement aggressive public education and media/awareness campaigns to increase awareness of distracted motorists, impaired driving, and work zone safety.[108]
- Aggressively implement the SHSP safety improvement strategies.
- Invest in freight and passenger rail safety improvements for at-grade railroad crossings. Fully install PTC on all of California's rail corridors.
- Improve data collection and outreach through early involvement and engagement for tribal, rural, and elderly drivers.
- Improve outreach and education on bicycle and pedestrian fatalities and serious injuries by providing expertise on bicycle and pedestrian safety practices, particularly intersections and road and rail crossings.

Policy 2
PROVIDE FOR SYSTEM SECURITY, EMERGENCY PREPAREDNESS, RESPONSE, AND RECOVERY.

RECOMMENDATIONS

- In cooperation with law enforcement authorities, improve security monitoring to reduce potential threats to the system at all levels.
- Update emergency preparedness, response, and recovery planning on a strict scheduled cycle. Collaborate with all necessary stakeholders to ensure adequate preparedness.

108 CHP, "California Highway Patrol Programs and Services," 2016, https://www.chp.ca.gov/programs-services.

GOAL 5: FOSTER LIVABLE AND HEALTHY COMMUNITIES AND PROMOTE SOCIAL EQUITY

Goal 5 aims to cultivate healthy and sustainable communities that promote equity among people from all walks of life, strengthens the economy, protects the environment, and promotes public health and safety.[109] 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 impacts. Such values include maintaining affordable housing, neighborhood preservation, rural character, agricultural lands, 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. Transportation strategies must account for these diverse communities and their needs to foster livability and social equity.

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.

109 California Government Code, Section 65041.1, 2002, http://www.leginfo.ca.gov/cgi-bin/displaycode?section=gov&group=65001-66000&file=65041-65051.

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 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.

The CTP 2040 promotes strategies that assist maintaining and creating healthier communities throughout the State. Healthier communities include viable integration of transportation modes and land use development, as well as creating destinations closer together. Focus on improving interregional transit service and "first mile-last mile" transit access strategies provide greater opportunities for transit supportive development at transit stations. Historically, many lower income communities have had to bear negative impacts of transportation projects. It is crucial that an equal distribution of impacts and benefits be considered in communities across the State.

SMF calls for participation and partnership by agencies at all levels of government, the private sector, and the community.[110] In addition, "context-sensitive solutions" (CSS) is an approach that engages communities to determine their needs and find solutions. These approaches encourage community involvement to balance regional and local interests. Engaging the public early and throughout the land use and transportation planning process ensures transportation decisions reflect community values and interests, including aesthetic, historic, and environmental values; promote social equity; and support transportation safety, maintenance, and performance goals. Fortunately, new technologies, allow the public to be more 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, as well as meet the needs of local businesses.

The CTP 2040 specifically calls for 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. Active and inclusive public engagement supports the goal of fostering livable and healthy communities.

The CTP 2040 identifies the following policies and recommendations to address the Goal 5 challenges and opportunities to foster livable communities and promote social equity.

110 California Transportation Commission, "2010 California Regional Transportation Plan Guidelines, "2010, http://www.dot.ca.gov/hq/tpp/offices/orip/rtp/index_files/2010%20RTPGuidelines_Jan2011_Technical_Change.pdf.

POLICIES

Policy 1
EXPAND COLLABORATION AND COMMUNITY ENGAGEMENT IN MULTIMODAL TRANSPORTATION PLANNING AND DECISION-MAKING.

RECOMMENDATIONS

- Collaborate with stakeholders and partners early and often in the planning process. Implement transparent decision-making process for all investment considerations in transportation.
- Work with local and regional agencies to apply considerations of economic, health, equity, and sustainability to transportation decision-making.
- Work with tribal governments using principles of coordination, collaboration, and engagement to improve transportation for tribal communities.
- Develop partnerships with schools to support increased use of public and transit options, walking, and bicycling among students and teachers (SRTS).

Policy 2
INTEGRATE MULTIMODAL TRANSPORTATION AND LAND USE DEVELOPMENT.

RECOMMENDATIONS

- Invest GGRFs to incentivize regional and local best practices in land use and equity that make travel easier through the reduction of distances in consumer activities (e.g., shopping, recreation, etc.).[111]
- Improve existing freeway corridors for recreational and other community opportunities to creatively use available airspace to reconnect communities and enhance livability.
- Collaborate with local jurisdictions to apply SMF principles to optimize locational efficiencies in land use considerations.
- Ensure that transportation plans and projects reflect strategies to efficiently connect people, goods, and services to housing, work, recreation, and other destinations while at the same time avoiding negative impacts to agricultural production areas and sensitive land and water resources.
- Provide incentives for the most efficient use of land while being sensitive to regional, rural, and other community differences.

Policy 3
INTEGRATE HEALTH AND SOCIAL EQUITY IN TRANSPORTATION PLANNING AND DECISION-MAKING.

RECOMMENDATIONS

- Ensure transportation strategies and investments consider the needs of all people to move by all modes regardless of income, age, or physical ability.
- Follow the model of the California Health in All Policies Task Force (HiAP) through which more than twenty State departments and agencies collaborate to promote public health, equity, and environmental sustainability across multiple policy areas, including transportation, housing, and land use.
- Develop transportation modeling that integrates land use, transportation, health, and environmental issues for use in the next CTP and other efforts.

111 Handy, S., "Accessibility VS. Mobility-Enhancing Strategies for Addressing Automobile Dependence in the US," 2002, http://www.des.ucdavis.edu/faculty/handy/ECMT_report.pdf.

GOAL 6: PRACTICE ENVIRONMENTAL STEWARDSHIP

The built environment of transportation infrastructure and facilities and the use of the transportation system is a significant source of air pollution and GHG emissions, heat island effects, and runoff. Furthermore, transportation infrastructure is a significant land use, reducing the sequestration potential of natural lands and facilitating sprawl. To ensure a sustainable future, the CTP 2040 is anchored with the 3 E's of sustainable planning: Equity, Environment, and Economy. Planning for environmental sustainability includes strategies for new fuel technologies, alternatives to SOVs, cleaner freight vehicles, as well as conservation of natural resources. Sustainability involves planning for balanced and long-term stewardship of economic and environmental resources, now and for the future. The purpose of Goal 6 is to present strategies that preserve the State's valuable natural, cultural, and agricultural resources, while developing transportation infrastructure and avoiding costly project overruns and planning delays.

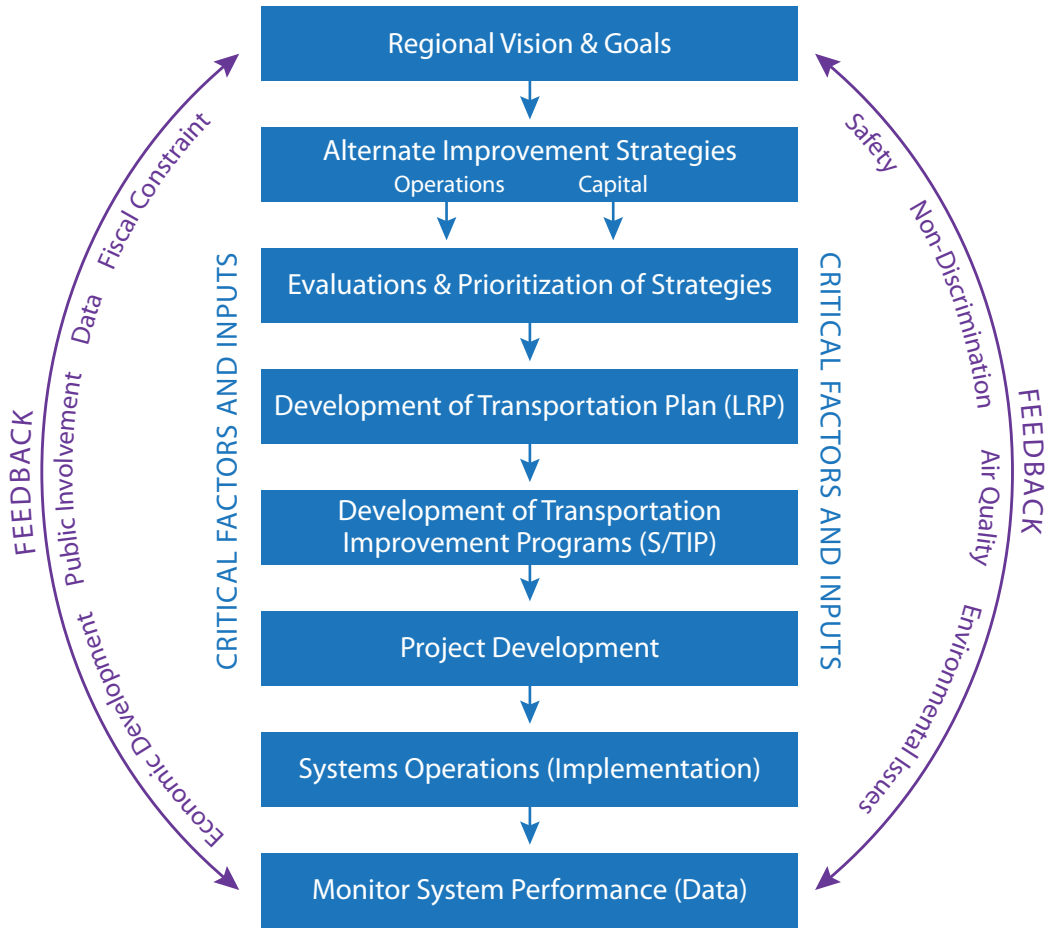
ARB VISION TOOL

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.

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. Environmental considerations should be included in all phases of a project, as indicated in **Figure 28**.

Figure 28
Development of a Project[112]



112 Federal Highway Administration, "Health in Transportation. In Moving Healthy: Linking FHWA Programs and Health," http://www.fhwa.dot.gov/planning/health_in_transportation/resources/moving_healthy.cfm.

MITIGATION AND ADAPTATION

Early consultation and evaluation of environmental resources 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, LCPs, 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 efforts.

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.

Environmentally sound transportation plans and projects require a more integrated, proactive, and consistent approach guided by landscape and watershed-level resource planning. 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 management, coastal zone management, watershed management, and habitat conservation, which support wildlife corridors and mitigation strategies.

The SWAP 2015 priorities include sustaining natural resource conservation while supporting necessary human activities related to transportation. The key to achieve these seemingly conflicting priorities both from the transportation and conservation sectors, are to engage in a functional working partnership.[113] In addition to the main document that addresses broader conservation priorities for California and its regions, The California Department of Fish and Wildlife and stakeholders from diverse transportation fields including Caltrans staff, prepared a framework for collaboration that is summarized in nine companion plans, one of which addresses transportation.[114]

113 California Department of Fish and Wildlife, "State Wildlife Action Plan," 2015, https://www.wildlife.ca.gov/SWAP/Final.

114 California Department of Fish and Wildlife, "Companion Plans," 2015, https://www.wildlife.ca.gov/SWAP/Final/Companion-Plans.

GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

Many of the recommendations in the previous goal sections of this chapter help the State reduce GHG emissions in the transportation sector toward California's goals of a 40 percent reduction below 1990 levels by 2030, and an 80 percent reduction below 1990 levels by 2050. These include increasing the share of trips via transit and active transportation, using more HOT lanes for demand management, and taking other action that will reduce per capita VMT. This section covers some of the additional GHG reduction strategies and climate adaptation.

With climate change threatening our resources, economy, and quality of life, California is focused on addressing it and protecting our natural and built environments. Over 300,000 of the California population is vulnerable to projected SLR.[115] This number would be exacerbated with the inclusion of shoreline erosion—threats to major transportation corridors and ports as well as other critical infrastructure along the coast. Adaptation strategies will be necessary to protect this infrastructure while preserving natural resources. California is also vulnerable to rising temperatures, changing precipitation patterns, and increased storm surge and intensity. Substantial reductions in GHG emissions from the transportation sector are essential to combat these negative consequences of climate change.

Combustion of fossil fuels for transportation accounts for almost 40 percent of GHG emissions in California.[116] When combined with petroleum extraction and refining, more than 50 percent of California's GHG emissions are tied to transportation. The CNRA has prepared *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 climate change vulnerability assessments.

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.

-Governor Brown's Executive Order B-16-2012

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 pollutants are decreasing due to improved vehicle emission controls and fuel requirements, increased congestion and VMT limit the effectiveness of emission control programs and generate increases in other emissions that are very difficult to control.

115 Climate Central, "Facts and Findings: Sea level rise and storm surge threats for California," 2012, http://slr.s3.amazonaws.com/factsheets/California.pdf

116 California Air Resources Board, "California Greenhouse Gas Emissions for 2000 to 2012: Trends of Emissions and Other Indicators," 2014, http://www.arb.ca.gov/cc/inventory/data/misc/ghg_inventory_trends_00-12_2014-05-13.pdf.

In order to help deal with these planning issues, OPR 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 that promote the "…reduction of GHG emissions, the development of multimodal transportation networks, and a diversity of land uses."

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. 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 that may be required. The key will be determining how to mainstream the consideration of environmental issues during the early planning process through programming, project delivery, and maintenance.

The CTP 2040 identifies the following policies and recommendations to address the Goal 6 challenges and opportunities to practice environmental stewardship.

POLICIES

Policy 1
INTEGRATE ENVIRONMENTAL CONSIDERATIONS IN ALL STAGES OF PLANNING AND IMPLEMENTATION.

RECOMMENDATIONS

- Collaborate with resource agencies through early planning and coordination to integrate environmental sustainability in all transportation project proposals.
- Expand the use of technology and tools to provide environmental impact performance measures.
- Develop robust State and regional advance-mitigation-planning efforts that will allow simultaneous consideration of the environmental effects of several planned infrastructure projects, streamlining of transportation projects, and maximizing the biological benefit.

Policy 2
CONSERVE AND ENHANCE NATURAL, AGRICULTURAL, AND CULTURAL RESOURCES.

RECOMMENDATIONS

- Convene State, regional, and local stakeholders to establish coalitions that engage communities on the importance of environmental stewardship. Provide guidance to enhance environmental stewardship and sustainability at the regional and local levels.
- Support local communities in the development of integrated transportation and land use strategies to resiliently respond to climate change through their General Plans, RTPs, and LCPs.
- Minimize environmental impacts during construction of transportation projects where feasible by developing and disseminating a list of construction best practices.

Policy 3
REDUCE GHG EMISSIONS AND OTHER AIR POLLUTANTS.

RECOMMENDATIONS

- Use SCSs to continue the Regions' lead role in managing transportation and land use to meet regional GHG targets.
- Implement SB 743 requirements in project development and project reviews across the transportation system.
- Collaborate (public and private entities) to demonstrate and deploy mobile source control technologies that will assist California in reducing air pollutants and reaching National Ambient Air Quality Standards attainment and reducing GHGs.
- Support efforts to reduce GHGs, such as the California's Cap-and-Trade Program, HSR, zero and low emission vehicles alternative fuels, new vehicle technology, pricing strategies, public transportation expansion, more bicycling, and walking.

Policy 4
TRANSFORM TO A CLEAN AND ENERGY EFFICIENT TRANSPORTATION SYSTEM.

RECOMMENDATIONS

- Support technological research and development of alternative fuels and transportation modes that can further improve air quality. [117]
- Implement Robust Clean Vehicle and Clean Fuels Programs through incentives or regulations to increase ZEVs in fleets to 10 percent through 2020, and 25 percent between 2020 and 2030.
- Ensure transportation systems, including multimodal options, are more efficient through smart land use, operational improvements, and ITS.

117 Sacramento Area Council of Governments, "Metropolitan Transportation Plan/Sustainable Communities Strategy: 2035, 142." 2012, http://sacog.org/mtpscs/files/MTP-SCS/MTPSCS%20WEB.pdf.

IMPLEMENTATION HIGHLIGHTS

- **Improve transit** by completing the entire California High-Speed Rail Authority (Authority) Business Plan Phase 1 High-Speed Rail System by 2029, and making it the backbone of an integrated statewide transit system linking all transit operators with one-stop ticketing and well-coordinated transfers.
- **Reduce long-run repair and maintenance costs** by using "fix-it first", smart asset management, and life-cycle costing, to maintain our transportation infrastructure in good condition–this should include developing a comprehensive assessment of climate-related vulnerabilities, and actions to ensure system resiliency and adaptation to extreme events.
- **Improve highways and roads** by using management systems and technologies to maximize system efficiency through integrated multimodal corridor management (intelligent transportation system [ITS], high-occupancy toll [HOT] lanes, and bus rapid transit [BRT] lanes, which are managed in coordination with active transportation and rail lines), and through new technologies and services including autonomous and connected vehicles, smart parking, vehicle-to-vehicle (V2V) communications, infrastructure-to-vehicle (V2I) communication, and vehicle sharing and ride-sharing services.
- **Improve freight efficiency and the economy** by completing the California Sustainable Freight Action Plan outlined in Executive Order (EO) B-32-15, and through creation of dedicated federal and State freight funding programs to invest in California's primary trade corridor, including multimodal last mile connections to major freight facilities including ports and hubs.
- **Improve communities** through the region-led Sustainable Communities Strategies (SCSs), which will be updated as the State moves toward 2030 and 2050 greenhouse gas (GHG) reduction targets–the State can continue to partner with regions through the investment of Greenhouse Gas Reduction Funds (GGRF) and other measures such as better use of highway corridors for recreation and to reconnect communities.
- **Reduce transportation-system deaths and injuries** through multi-agency coordination that implements the Toward Zero Deaths (TZD) vision, and public engagement to reduce distracted driving, impaired driving, and unsafe work-zone driving.
- **Expand the use and safety of bike and pedestrian facilities** by utilizing the Active Transportation Program (ATP) to support a broad range of investments that go beyond individual projects to encourage corridor-wide and city-wide strategies, and also through improved State and local implementation of Complete Streets strategies that will increase active transportation for short trips, first/last mile transit trips, and school trips.
- **Make our vehicles and transportation fuels cleaner** through incentives and regulations to increase zero-emission vehicles (ZEVs) and other methods outlined in the California Air Resources Board's (ARB's) Assembly Bill (AB) 32 Scoping Plan.
- **Improve public health and achieve climate and other environmental goals** through the strategies above and also through implementation of robust advanced mitigation to streamline transportation projects and maximize the biological benefit.
- **Secure permanent, stable, and sufficient transportation revenue** from transportation users to achieve the state of good repair, freight efficiency, and other investments outlined in this plan.

CONCLUSION

Coordinated efforts at all levels of governments are necessary to achieve our transportation goals. We are at a critical turning point in transportation where we can ensure sustainable economic growth and improved livability and equity. The goals, policies, and recommendations of the CTP 2040 respond to the rapidly changing demands of transportation services and the transportation system. 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 can contribute to transportation planning to help move toward our GHG reduction targets and the vision for a transportation system that is safe, sustainable, and globally competitive.

ABBREVIATIONS AND ACRONYMS

3 E's	Three E's of Sustainability: Equity, Environment, and Economy
3P	People, Planet, and Prosperity
AAA	American Automobile Association
AB	Assembly Bill
ADM	Active Demand Management
AHSC	Affordable Housing and Sustainable Communities
AMBAG	Association of Monterey Bay Area Governments
APM	Active Parking Management
APS	Alternative Planning Strategy
ARB	Air Resources Board
ATDM	Active Transportation and Demand Management
ATM	Active Traffic Management
ATP	Active Transportation Program
Authority	California High-Speed Rail Authority
Auto	Automobile
BCAG	Butte Council of Governments
BEV	Battery Electric Vehicle
BGGE	Billion Gallons Gasoline Equivalent
BIA	Bureau of Indian Affairs
BOE	California Board of Equalization
BRT	Bus Rapid Transit
BTU	British Thermal Unit
CalEPA	California Environmental Protection Agency
CAL FIRE	California Department of Forestry and Fire Protection
CalSTA	California State Transportation Agency
Caltrans	California Department of Transportation

ABBREVIATIONS AND ACRONYMS

Cal VIUS	California Commercial Vehicle Inventory Survey
CaRFG	California Reformulated Gasoline
CASP	California Aviation System Plan
CATIA	Clean Air and Transportation Improvement Act
CBO	Congressional Budget Office
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CFAC	California Freight Advisory Committee
CFMP	California Freight Mobility Plan
CHTS	California Household Travel Survey
CIB	California Interregional Blueprint
CNRA	California Natural Resources Agency
CO2	Carbon Dioxide
CO2e	Carbon Dioxide Equivalent
CPTED	Crime Prevention through Environmental Design
CSBPP	California Statewide Bicycle and Pedestrian Plan
CSFFM	California Statewide Freight Forecasting Model
CSMP	Corridor System Management Plan
CSRP	California State Rail Plan
CSS	Context Sensitive Solutions
CSTDM	California Statewide Travel Demand Model
CTC	California Transportation Commission
CTIP	California Transportation Infrastructure Priorities
CTP	California Transportation Plan
CTSA	Consolidated Transportation Services Agency
CV/AV	Connected Vehicle/Autonomous Vehicle

ABBREVIATIONS AND ACRONYMS	
DMV	Department of Motor Vehicles
DUI	Driving Under the Influence
E-85	Ethanol Fuel Blend of 85% denatured ethanol fuel
EAB	Caltrans' Economic Analysis Branch
EGPR	Governor's Environmental Goals and Policy Report
EIR	Environmental Impact Report
EJ	Environmental Justice
EMFAC	ARB's EMission FACtors model
EMS	Emergency Medical Services
EO	Executive Order
EOP	Emergency Operations Plan
EV	Electric Vehicle
FAA	Federal Aviation Administration
FAST Act	Surface Transportation Act, Fixing America's Surface Transportation Act
FCV	Fuel Cell Vehicle
FHWA	Federal Highway Administration
FRA	Federal Rail Administration
FSTIP	Federal Statewide Transportation Improvement Program
FTA	Federal Transit Administration
FY	Fiscal Year
G	Goal
GARVEE	Grant Anticipation Revenue Vehicles (bonds)
GGRF	Greenhouse Gas Reduction Fund
GHG	Greenhouse gas
GIS	Geographic Information System
GO-Biz	Governor's Office of Business and Economic Development

ABBREVIATIONS AND ACRONYMS	
GPS	Global Positioning System
GSP	Gross State Product
HCD	Department of Housing and Community Development
HDV	Heavy Duty Vehicle
HiAP	California Health in All Policies Task Force
HOT	High Occupancy Toll lane
HOV	High Occupancy Vehicle
HSR	High-speed rail
HTF	Highway Trust Fund
HVUT	Heavy-Vehicle Use Tax
I-O	Input-Output modeling
ICM	Integrated Corridor Management
ICS	Incident Command System
IFD	Infrastructure Financing District
IRR	Indian Reservations Roads program
IRS	Internal Revenue Service
ITIP	Interregional Transportation Improvement Program
ITS	Intelligent Transportation Systems
ITSP	Interregional Transportation Strategic Plan
LA Metro	Los Angeles County Metropolitan Transportation Authority
LCCA	Life-Cycle Cost Analysis
LCP	Local Coastal Program
LDV	Light Duty Vehicle
LOS	Level of Service
LRP	Long-Range Plan
LTF	Local Transportation Fund
MAP-21	Moving Ahead for Progress in the 21st Century

ABBREVIATIONS AND ACRONYMS	
MMT	Million Metric Tons
MOU	Memorandum of Understanding
mpg	miles per gallon
MPO	Metropolitan Planning Organization
MTC	Bay Area Metropolitan Transportation Commission
MTP	Metropolitan Transportation Plan
NAICS	Northern American Industry Classification System
NAMA	Sustainable Urban Development Nationally Appropriate Mitigation Action
NHTS	National Household Travel Survey
OPR	Office of Planning and Research
OWP	Overall Work Program
P	Policy
PAC	Policy Advisory Committee
PaveM	Pavement Management System Software
Ped	Pedestrian
PeMS	Caltrans Performance Measurement System
PM	Performance Measure
POE	Ports of Entry
PPP	Public Participation Plan
PTA	Public Transportation Account
PTC	Positive Train Control
Quad	Unit of energy equal to 1015 BTU
RAMP	Regional Advance Mitigation Planning
RHNA	Regional Housing Need Allocations
RP	Road Pricing
RTA	Reservation Transportation Authority
RTIP	Regional Transportation Improvement Program

ABBREVIATIONS AND ACRONYMS	
RTP	Regional Transportation Plan
RTPA	Regional Transportation Planning Agency
RUCS	Rural-Urban Connections
S	Strategy
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
SB	Senate Bill
SBCAG	Santa Barbara County Association of Governments
SCAG	Southern California Association of Governments
SCS	Sustainable Communities Strategy
SGC	Strategic Growth Council
SHA	State Highway Account
SHOPP	State Highway Operations Protection Program
SHS	State Highway System
SHSP	Strategic Highway Safety Plan
SLOCOG	San Luis Obispo Council of Governments
SLR	Sea-level rise
SMF	Smart Mobility Framework
SOV	Single Occupancy Vehicle
SRTS	Safe Routes to School
STA	State Transit Assistance fund
STIP	State Transportation Improvement Program
STS	State Transportation System
SWAP	State Wildlife Action Plan

ABBREVIATIONS AND ACRONYMS	
TAC	Technical Advisory Committee
TCRP	Traffic Congestion Relief Program
TERO	Tribal Employment Rights Ordinance
TEU	20-foot Equivalent Unit
TDA	Transportation Development Act
TDM	Transportation Demand Management
TIFIA	Transportation Infrastructure Finance and Innovation Act
TMS	Caltrans's Traffic Management System Master Plan Strategy
TOD	Transit-Oriented Development
TREDIS	Transportation Economic Development
TRPA	Tahoe Regional Planning Agency
TSM	Transportation System Management
TSMO	Transportation System Management and Operations
TTP	Tribal Transportation Program
TZD	Toward Zero Deaths
ULSD	Ultra-low-sulfur diesel
US DOT	United States Department of Transportation
V2I	Vehicle-to-Infrastructure communication
V2V	Vehicle-to-Vehicle communication or "Connected" Vehicles
VAST	Federal Highway Administration's Vulnerability Assessment Scoring Tool
VERA	Voluntary Emissions Reductions Agreement
VHD	Vehicle Hours of Delay
VHT	Vehicle Hours of Travel
VISION	ARB's Vision for Clean Air
VLF	Vehicle License Fee

ABBREVIATIONS AND ACRONYMS	
VMT	Vehicle Miles Traveled
WTW	Wheel-To-Wheel
yr	year
ZEV	Zero-Emission Vehicle

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