

# Smart Mobility 2010

A Call to Action for the New Decade



February 2010



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# A Message from the Director



I am pleased to present this document, *Smart Mobility 2010: A Call to Action for the New Decade*. It is with excitement that we launch this new approach to integration of transportation and land use. This approach addresses long-range challenges and provides short-term pragmatic actions to implement multimodal and sustainable transportation strategies in California. They can be used now, and in the coming decade, to help California, as well as the nation, continue work to develop a sustainable transportation system.

This document had its start with the idea that practical tools were needed to evaluate whether the goals and ideals of the Governor's Strategic Growth Plan, the California Transportation Plan, and bond program projects would be realized. Further, California statutes, plans, and policy language direct the development of a transportation system that not only accommodates future growth, but does so in a way that is equitable, respects the environment, and fosters a sustainable economy.

This document does just that. It provides new tools and techniques to improve transportation by using performance-based measures to achieve sustainable outcomes. By considering land use place types and modified performance measures, the benefits of smart mobility can be realized, both now and in the future. Further, it sets the stage for the California Interregional Blueprint and data improvement efforts that will transform transportation decisions.

Fiscal constraints demand continued diligence, better decision making tools, and extra care in management of public resources. Today we have an opportunity — and this document represents the long range thinking needed amidst short term realities. *Smart Mobility 2010* addresses issues of climate change while providing usable tools. It suggests a path to transform our transportation system while at the same time acknowledging the significant work remaining to be done. It focuses on achieving multiple mobility goals while recognizing the path ahead is a challenging one.

I would like to commend the many Department staff, project partners, consultants, and partner agency representatives that participated in the development and creation of this comprehensive document. I offer this framework to you for your use and refinement so that we can address the important issues of creating the California of the future — sustainable, multimodal, equitable, “green,” accessible, and economically viable. Caltrans has shown leadership in providing this significant contribution to the pursuit of sustainable transportation infrastructure, and is ready to move forward. I invite you to join us.

A handwritten signature in blue ink that reads "Randell H. Iwasaki". The signature is fluid and cursive.

RANDELL H. IWASAKI

Director, California Department of Transportation (Caltrans)

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To our colleague and friend, Pat Weston, whose dedication to transportation system integrity was unfailing, and whose pragmatism was always balanced with the kind of future vision which this document articulates.

Funding for this study was provided by the California Department of Transportation, the US Department of Transportation, and the US Environmental Protection Agency. In addition, it was prepared in collaboration with other project partners--the Governor's Office of Planning & Research, the Department of Housing and Community Development, and numerous external advisors through stakeholder workshops. The document does not constitute a standard, specification, or regulation.

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# Preface

The next decade will be a period of dramatic change for everyone in California concerned with transportation. On the one hand, we have new awareness of global climate change and the gravity of its impacts. On the other hand, we are called upon to respond to the emerging land use considerations and priorities of communities throughout the state. These include the desire to give social equity and environmental justice concerns a more central role in transportation decisions and also to give heightened emphasis to livability. Against a backdrop of continued demand for a very high level of personal mobility, these challenges deepen the complexity of already-complex challenges in the transportation sector.

These challenges come at a time of dramatically limited financial resources, making prudent and effective expenditure of funds a vital element of any successful solution. Solutions must address as well the State's anticipated population growth, with expectations that there will be 50 million Californians by 2030, up from a 2009 population of slightly over 38 million.<sup>1</sup> The State's demographic, environmental, economic, and quality of life challenges are relevant to virtually every dimension of public policy. The focus here is on the role of mobility in meeting these challenges, as an essential ingredient in meeting people's needs for full participation in society, as contributor to environmental quality, and as a significant factor in supporting economic activity.

The interrelated challenges posed by these issues have not gone unanswered. Sustainability principles highlighting the "3 E's" of environment, economy, and equity have widespread endorsement. The California Department of Transportation (Caltrans) has embraced these principles and incorporated them into the California Transportation Plan (CTP). A commitment to the 3 E's calls for new approaches

drawn from a full set of transportation strategies, including initiatives to address land use and development.

This Call to Action responds to those challenges by providing new approaches to implementation and laying the groundwork for an expanded State Transportation Planning Program. In addition to continuing support for the regional Blueprint Planning programs, the Department will develop a statewide interregional, multi-modal blueprint to be known as the California Interregional Blueprint (Interregional Blueprint or CIB). It will enhance the scope of the existing California Transportation Plan (CTP) by analyzing the benefits of multi-modal, interregional projects on the transportation system. It will also serve to expand the understanding of the interactions between land use and transportation investments in meeting critical strategic growth and sustainability goals. The ultimate benefit of this effort will be stronger partnerships with regional and local agencies and tribal governments, as well as better data for improved decision making at the State, regional, and local level.

Introducing new approaches to solving the mobility crunch faced by the State's households and businesses, the Smart Mobility Framework places new concepts and tools alongside well-established ones. It calls for participation and partnership by agencies at all levels of government, as well as private sector and community involvement.

This Call to Action lays the foundation for Caltrans and partner agencies to actively and successfully pursue the Smart Mobility vision, and gain its many benefits. The Smart Mobility Framework emphasizes travel choices, healthy, livable communities, reliable travel times for people and freight, and safety for all users. This vision supports the goals of social equity, climate change intervention, and energy security as well as a robust and sustainable economy. Ultimately, it will assist with implementation of multi-modal and sustainable transportation strategies in all of California.

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<sup>1</sup> State of California, Department of Finance, Population Projections for California and Its Counties 2000-2050, Sacramento, California, July 2007. 2009 estimate from California Department of Finance April 30, 2009 press release, "State Finance Department Releases New Population Data for 2008"

# Executive Summary



Sacramento, California



## Smart Mobility Purpose

“Smart Mobility 2010: A Call to Action for the New Decade” responds to today’s transportation challenges with new concepts and tools, presented with a program for putting them into action. Smart Mobility addresses:

- **The State mandate to find solutions to climate change.** Achieving the State’s goals for reduction of greenhouse gas (GHG) emissions requires a positive and integrated approach to our transportation future.
- **The need to reduce per capita vehicle miles traveled.** Reduced per capita auto use will lower emissions of GHG gas and conventional pollutants, reduce petroleum consumption and associated household transportation costs, and minimize negative impacts on air quality, water quality, and noise environments.
- **Demand for a safe transportation system that gets people and goods to their destinations.** Smart Mobility must be achieved with vigilant attention to serving the safety and reliability needs of the State’s people and businesses. The Call to Action endorses the application of land use strategies and the use of transit, carpool, walk, and bike travel to satisfy travel needs through a shift away from higher-polluting modes.
- **The commitment to create a transportation system that advances social equity and environmental justice.** Caltrans’ California Transportation Plan (CTP) already sets forth a commitment to equity, the environment, and the economy. Smart Mobility integrates social equity concerns into transportation decisions and investments.

## Smart Mobility Definition and Principles

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

- convenient and safe multi-modal travel,
- speed suitability,
- accessibility,

- management of the circulation network, and
- efficient use of land.

These terms are further discussed in the Smart Mobility Call to Action.

The following six principles express the priorities and values of Smart Mobility:

### Location Efficiency

- Integrate transportation and land use in order to achieve high levels of non-motorized travel and transit use, reduced vehicle trip making, and shorter average trip length while providing a high level of accessibility.

### Reliable Mobility

- Manage, reduce, and avoid congestion by emphasizing multi-modal options and network management through operational improvements and other strategies. Provide predictability and capacity increases focused on travel that supports economic productivity.

### Health and Safety

- Design, operate, and manage the transportation system to reduce serious injuries and fatalities, promote active living, and lessen exposure to pollution.

### Environmental Stewardship

- Protect and enhance the State’s transportation system and its built and natural environment. Act to reduce the transportation system’s emission of GHGs that contribute to global climate change.

### Social Equity

- Provide mobility for people who are economically, socially, or physically disadvantaged in order to support their full participation in society. Design and manage the transportation system in order to equitably distribute its benefits and burdens.

## Robust Economy

- Invest in transportation improvements—including operational improvements—that support the economic health of the State and local governments, the competitiveness of California’s businesses, and the welfare of California residents.

Smart Mobility principles must be introduced into a wide range of activities undertaken by many public and private organizations, so this publication is not limited to discussing activities led by Caltrans.

Blue line to Long Beach, California

Source: Ellen Greenberg



## Smart Mobility: Implementing Activities

The Smart Mobility Action Plan identifies ten implementing themes critical to advancing the principles above and gaining Smart Mobility’s benefits. These are:

### 1. Increase the impact and effectiveness of the Smart Mobility Framework and the call to action

Activities that refine and disseminate these materials will enlarge the group of stakeholders contributing to the completion and implementation of the final Call to Action.

### 2. Support an expanded Interregional Blueprint Planning program

The Blueprint program will be expanded to include preparation by Caltrans of a statewide Inter-Regional Blueprint Plan incorporating the Smart Mobility Framework principles, a modeling and data improvement program, and synthesizing the regional blueprint efforts.

### 3. Integrate the Smart Mobility Framework consistently into Caltrans policy and practice

Phase I of the Smart Mobility Framework effort included an internal reconnaissance of Caltrans’ policies and directives. The reconnaissance concluded that while some Smart Mobility concepts are consistently included in Caltrans policies and directives, others are only inconsistently included, and still others are not included at all. The Action Plan calls for moving all of the Smart Mobility concepts into policy and practice. Caltrans will be a national leader by implementing the Smart Mobility Framework’s principles and tools in the full range of functional activities at the Headquarters and District levels.

### 4. Integrate the Smart Mobility Framework policy and practice with activities of other agencies and departments

Key targets include the activities of the Strategic Growth Council and SB 375 implementation activities associated with climate change intervention and sustainable communities planning.

### 5. Collect, develop, and use data and tools needed to implement the Smart Mobility Framework including performance measures

Efforts will relate to data gathering and sharing, advancing modeling and forecasting techniques, and application of new performance measures.

### 6. Revise planning and programming procedures to reflect the Smart Mobility Framework

Principles will only be worthwhile when they are incorporated systematically into requirements for transportation planning activities and funding and program eligibility criteria. Revision of the State Transportation Improvement Program (STIP) guidelines to reflect the Smart Mobility Framework is a high-priority near term activity.

### 7. Revise design standards and procedures to reflect the Smart Mobility Framework

Two activities central to Smart Mobility Framework implementation are already underway: revision of the Caltrans Highway Design Manual (HDM) and implementation of the Department's complete streets policy. Both are essential to incorporating Smart Mobility principles across the Department's functional activities.

### 8. Undertake major cross-functional initiatives

Initiatives highlighted for near-term implementation are: (1) A comprehensive program to insure strong consideration of location efficiency factors in newly-developing areas, and (2) A funding initiative to identify adequate resources for transit and rail capital investment and operations. Initiatives for later implementation are: (1) Comprehensive implementation of speed suitability and (2) Addressing the role of aviation in the Smart Mobility Framework.

### 9. Integrate the Smart Mobility Framework into local government land use and transportation planning and implementation activities

Activities include long-range planning, zoning, and other land development regulations.

### 10. Encourage local government Smart Mobility implementation assessment and evaluation activities



Plaza de Cesar Chavez Park in Downtown San Jose, California

Activities include the California Environmental Quality Act (CEQA) compliance, performance measures, and Caltrans local development/inter-governmental review activities. A key change is advancing the use of multi-modal level of service (LOS) while de-emphasizing the use of vehicle-only LOS measurement.

## Smart Mobility: Moving Forward

Moving forward with Smart Mobility means:

- **Caltrans will be a leader in adopting a changing approach that all transportation agencies will need to embrace in order to gain Smart Mobility's benefits.** As is reflected in the list of implementation activities above, the Call for Action demands significant shifts in the role of the Department and other transportation agencies. These include:
  - Consistently directing efforts to support for lower personal vehicle use while meeting objectives for accessibility, equity, and economic growth.
  - Incorporating into transportation agencies' core missions the creation of secure funding sources for both transit capital improvements and operations, in light of the extremely significant role of transit in a Smart Mobility future.
  - Institutionalizing a new tool for context-sensitive solutions—Smart Mobility Place Types—which are intro-

duced in the Call for Action as a way to create the best fit between people, communities, and transportation.

- Consistently applying Smart Mobility performance measures (SMPMs) and transitioning away from use of performance measures that will work against Smart Mobility outcomes.

■ **Interregional network planning and implementation.**

Caltrans has responsibility for developing, maintaining, and operating a multi-modal transportation network which has a high-level function with respect to goods movement, inter-regional, interstate, and cross-border travel. To establish a basis for integrating the inter-regional system into the Smart Mobility Framework, and to deliver support for economic stewardship, connectivity, and the reliability that is valued by freight shippers and carriers, the Department will create an Inter-regional Blueprint as part of the update of the California Transportation Plan. The Inter-regional Blueprint will synthesize the Blueprint Planning work by regional agencies while focusing on the inter-regional system that is Caltrans' responsibility.

■ **An emphasis on integrated transportation and land use planning.**

Planning is an essential tool in the Smart Mobility Framework. Through the Blueprint Planning program, Caltrans has already demonstrated its commitment to supporting planning activities with a Smart Mobility focus. Further, through the modeling improvement program better tools and information will allow more informed decision making leading to better integration between transportation and land uses.

■ **Respecting unique, locally-based approaches to Smart Mobility.**

A Smart Mobility approach does not require that all partner agencies use precisely the tools and methods that are presented in the Call to Action, but rather that partner agencies pursue supportive outcomes with compatible approaches. The innovation and unique local perspective reflected in the work of different agencies is a great benefit to the development and implementation of the Smart Mobility Framework.



Source: Ellen Greenberg

- **Being positioned to respond to emerging requirements for sustainable communities planning.** This publication is a resource for Caltrans and partner agencies. Although implementation of the Smart Mobility Framework is optional for partner agencies, Caltrans fully intends to proceed with implementing this Call to Action. Work on developing the framework has been undertaken concurrent with work to define implementing activities associated with SB 375 of 2008 relating to sustainable communities planning. The Smart Mobility Framework is available as a basis for program requirements should they arise in connection with SB 375 implementation or climate change intervention programs. It further positions agencies to be successful and consistent with new Federal initiatives regarding sustainable communities.

- **Continued innovation with respect to sustainability and Smart Mobility practices.** The Smart Mobility Framework will support efforts to continue to evolve, innovate, and reinvent transportation as new opportunities for planning, designing, and operation of the State's transportation system emerge over time.

The success of Smart Mobility depends on strong relationships between Caltrans and other State agencies as well as regional and local organizations. Caltrans is the primary sponsor of this publication, but Smart Mobility's effectiveness will be determined in part by its reach beyond the Department. Attaining Smart Mobility benefits will require public support and the committed and coordinated actions of all levels of government and private sector partnerships.

## Contents of the Call to Action

This publication:

- Focuses attention on Smart Mobility as a response to the State's interrelated challenges of mobility and sustainability.
- Introduces the six principles that shape the Smart Mobility Framework: Location Efficiency, Reliable Mobility, Health and Safety, Environmental Stewardship, Social Equity, and Robust Economy. In Chapter 2, each is defined and discussed as a foundation for Smart Mobility.
- Introduces the concept of place types (Chapter 3), a contemporary approach to planning and design. Seven place types are specifically designed as tools for planning and programming that implement Smart Mobility. The place types are: Urban Centers, Close-in Compact Communities, Compact Communities, Suburban areas, Rural and Agricultural Lands, Protected Lands, and Special Use Areas.
- Presents a set of 17 SMPMs (Chapter 4), similar to metrics presently used by Caltrans but redefined to better achieve the Smart Mobility Principles. As a group, the proposed measures facilitate Caltrans' role in context-sensitive solutions, regional blueprints, sustainable communities strategies, corridor system management plans, and interstate commodity movement, and are applicable in a full range of Caltrans studies.
- Offers summary comments about moving forward with Smart Mobility (Chapter 5).
- Includes, in an extensive Resources section (Chapter 6), materials that illustrate best practices and provide research evidence of the benefits of a Smart Mobility approach.
- Includes a Glossary of key terms (Appendix A).
- Illustrates the application of SMPMs using three hypothetical examples (Appendix B)
- Creates an Action Plan (Appendix C) identifying projects and programs that apply the concepts, methods, and resources essential for implementation of the Smart Mobility Framework.

# 1 Introduction



Bay Bridge in San Francisco, California

- Purposes and Organization of the Smart Mobility Call to Action (Section 1.1)
- History of the Smart Mobility Framework Effort (Section 1.2)
- Relationship to California Transportation Plan, Caltrans Strategic Plan, and SB 375 Implementation (Section 1.3)

## 1.1 About the Smart Mobility Call to Action

The foundation for Caltrans' Smart Mobility Framework is established here with concepts, tools, and resources that respond to today's transportation challenges. Material included in this publication is relevant to all agencies and organizations concerned with the State's transportation system, from local governments to State agencies. It:

- Focuses attention on Smart Mobility as an overall approach to respond to the State's interrelated challenges of mobility and sustainability.
- Presents concepts and tools that should be used to incorporate Smart Mobility into the full range of transportation planning, programming, and operations decision-making: Smart Mobility Place Types (Chapter 3) and Performance Measures for Smart Mobility (Chapter 4).
- Includes, in an extensive Resources section, materials that illustrate best practices and provide research evidence of the benefits of a Smart Mobility approach.

The Call to Action is organized into the following chapters:

- 1. Introduction:** Describes the context for the Smart Mobility Framework project, the project's phases, and the organization of this publication.
- 2. Understanding Smart Mobility:** Presents Smart Mobility applications, definitions, visions, benefits, and principle.
- 3. Smart Mobility Place Types:** Introduces Smart Mobility Place Types and provides guidance for each of seven place types relevant to Smart Mobility applications in different parts of the state.
- 4. Performance Measures for Smart Mobility:** Presents and describes a set of performance measures for use in evaluating whether plan and project proposals advance the Smart Mobility principles.
- 5. Conclusions:** Briefly discusses some of the implications of the Smart Mobility Framework as they relate to selected activities.

- 6. Resources:** A three-part resources section provides tools, examples, and research findings relevant to the Smart Mobility Framework.

**Appendix A—Glossary:** Defines key terms and abbreviations.

**Appendix B—Using Smart Mobility Performance Measures:** Illustrates the consequences of applying Smart Mobility Performance Measures to evaluate study options in three hypothetical examples.

**Appendix C—Implementation Checklist:** Identifies high priority activities needed to implement Smart Mobility for Caltrans, for regional agencies, and for local governments.

## 1.2 The Smart Mobility Framework Effort

The Smart Mobility Framework effort began when the US EPA selected Caltrans as one of six 2007-2008 recipients of "Smart Growth Implementation Assistance" grants. The Office of Community Planning (OCP) in the Caltrans Division of Transportation Planning (DOTP) is the sponsor of the Smart Mobility Framework, with the Governor's Office of Planning and Research and the State Department of Housing and Community Development as partners. The EPA award provided technical support to Caltrans for initial work in developing a "Smart Mobility Framework" to assist with implementation of multi-modal and sustainable transportation strategies in California.

Phase I of the effort, with EPA's support, resulted in a preliminary set of Smart Mobility principles, along with supplemental material. These were the focus of a stakeholder workshop in September 2008. Participants were stakeholders and partners from throughout California, from within Caltrans, and from many other organizations. Following the workshop, the material was revised and released as the Smart Mobility Framework Phase I report (available at [www.dot.ca.gov/hq/tpp/offices/ocp/smf.html](http://www.dot.ca.gov/hq/tpp/offices/ocp/smf.html)). The first section of that report, "Definition and Principles" is incorporated into Section 2 of this publication in expanded form.

The creation of this publication and related activities to distribute it, receive feedback, and revise it, is part of a second project phase supported by Caltrans State Planning & Research funds. A draft version was presented and reviewed at a workshop in Sacramento on June 16, 2009. Like the Phase I workshop, the event drew participation from within and outside of Caltrans, with participants from throughout the state taking part in person and online.

### 1.3 California Interregional Blueprint

The Call to Action envisions a transformed State Transportation Planning Program. In addition to continuing support for the regional Blueprint Planning programs, the Department will develop a statewide interregional, multi-modal blueprint to be known as the California Interregional Blueprint (Interregional Blueprint or CIB). It will enhance the scope of the existing California Transportation Plan (CTP) by analyzing the benefits of multi-modal, interregional projects on the transportation

system. It will also serve to expand the understanding of the interactions between land use and transportation investments in meeting critical strategic growth and sustainability goals. The ultimate benefit of this effort will be stronger partnerships with regional and local agencies and tribal governments, as well as better data for improved decision making at the State, regional, and local level.

The Interregional Blueprint will aggregate planned interregional highway, transit, rail (including high-speed and intercity rail), intelligent transportation system, goods movement, and other State project concepts and strategies to complement the projects already included in Regional Transportation Plans (RTPs). Information contained in the Interregional Blueprint will be a snapshot of the best planning information available at the time it is prepared.

The Interregional Blueprint will be completed in two phases. Phase I will focus on assembling data and information from existing State and regional plans to facilitate discussions about interregional and statewide investments and policies that will support sustainable growth in California. Phase II will build on the work from Phase I with the implementation of robust modeling and data programs.

Workshops for the CIB and other outreach activities will provide an opportunity to introduce the Interregional Blueprint as well as discuss the concept with both the public and stakeholders. The workshops also will provide a forum to share data and analysis as it becomes available.

#### Interregional Blueprint Phase I

During Phase I, project data from existing plans will be compiled and analyzed at a system level. This analysis will consist of a narrative discussion of interregional system gaps, along with preferred regional growth and land use scenarios with supporting maps. Caltrans will pursue the following activities prior to the development of the CTP 2040 plan update. As each of the elements described below is completed, the resulting products will be integrated into the CIB, phase I report, to be completed by September 2010.

- Establish the connection between the CTP policy plan, the Strategic Growth Plan, and other planning efforts





that support the overall vision of a sustainable transportation system.

- Provide a baseline for the interregional transportation system by (1) updating the 10 focus routes in the 1998 Interregional Transportation Strategic Plan and (2) adding planned project concepts and strategies through a narrative synopsis and maps from the current statewide planning documents.
- Develop an initial Interregional Blueprint by aggregating all adopted RTPs statewide, mapping approved growth scenarios provided by the regions, aggregating the resulting statewide transportation demand, identifying transportation system gaps, and producing statewide and interregional performance measures.
- Develop a “roadmap” for how Phase II of the Interregional Blueprint effort will be rolled out, including recommendations for next steps.
- Continue to consult with internal and external partners.

## Interregional Blueprint Phase II

In Phase II, the project concepts and strategies, including growth and land use projections, will be modeled, and their impact on various outcomes will be quantified. One of the outcomes will be a first-ever estimate of the combined impact of these projects and system strategies on GHG emissions. Products developed under Phase II, listed below, will be part of an interim report completed in 2012. The development cycle of the CTP 2040 plan update will include, a “roadmap” incorporating these elements as recommendations for next steps to be completed by 2015.

- A Statewide Interregional Travel Demand Model will estimate long distance trips between regions and help to identify transportation efficiencies (mobility enhancements with environmental responsibility). Expected completion date is September 2010.
- To provide easier access to the Statewide Interregional Travel Demand Model, Caltrans is pursuing the development of a web-based interface tool to enable regional agencies to fully utilize the statewide model. The web-

based interface tool will focus on model operations and data management. Expected completion date is January 2011.

- The Statewide Freight Model will help the Department and the Air Resources Board better understand freight movement in California and its impacts on highway infrastructure, transportation networks, highway safety, energy use, and emissions. Expected completion date is December 2012.
- The Statewide Integrated Interregional Transportation, Land Use, and Economic Model (SIIM) will forecast the interaction of transportation system investment and land use development. With this integration of models, the Department can better analyze the impacts of policy plans, programs and major investments on transportation, the economy, and the environment at a statewide level. Expected completion date is December 2012.
- Caltrans will conduct a Statewide Household Travel Survey to forecast future travel behavior and support the development of the Statewide Interregional Travel Demand Model and the SIIM. The survey will take approximately two years to complete.
- Caltrans will complete the Goods Movement Action Plan II in 2011 with subsequent implementation of planned actions.
- Caltrans will complete the Statewide Transit Strategic Plan in August 2010 with subsequent implementation of planned actions.
- The Air Resources Board will lead development of the SB 375 final GHG targets by September 2010; RTPs that include strategies to meet those targets will be prepared by August 2013.
- Other contributions will come from: (1) current research and studies that may further refine the Interregional Blueprint; (2) partnerships that evaluate and recommend measures promoting sustainability; and (3) potential contributions from the future Federal transportation reauthorization.

In summary, the Interregional Blueprint and related efforts will provide a multi-modal, integrated vision for the State's interregional transportation system. It will create an assessment of statewide transportation investment needs to inform future policy and financing discussions and decisions. Further, it will promote the importance of a seamless, interregional transportation system and increase productivity of the system by improving linkages to regional and local systems.

## 1.4 Status

This publication is not a policy document—the California Transportation Plan 2025 includes the formal statement of Caltrans' policies for the statewide transportation system. It does not address all of the Department's values and goals—the 2007-2012 Caltrans Strategic Plan includes the Caltrans mission statement along with objectives and strategies. While much of the material in these documents is mutually supportive, this Call to Action is unique in its focus on a Smart Mobility approach. Ultimately, implementing this approach will mean using the Smart Mobility principles, place types, and performance measures as the basis for changes to many of the Department's plans and practices. Specific opportunities to align Smart Mobility with Caltrans activities and activities of partner agencies are highlighted in a Smart Mobility checklist included as Appendix C.

Many important components of Smart Mobility are already recognized by Caltrans. These include context sensitive solutions, complete streets, and environmental justice. The California Transportation Plan (CTP) includes a “mobility pyramid” that reflects the need for a full toolbox of techniques to meet the State's transportation needs. These range from system monitoring to system completion, and include operational improvements and land use strategies (see Section 2.1). This publication emphasizes careful selection of strategies from the pyramid based on context, objectives, and likely impacts assessed using Smart Mobility performance measures.

The emphasis of the Smart Mobility Framework project is on offering concepts, resources, and strategies that may be implemented at the option of any interested agency or organization. However, it does provide suggestions for implementing the State's climate change and sustainability planning statutes (the California Global Warming Solutions Act of 2006 and Senate Bill 375 of 2008). Other initiatives, such as the on-going development of California's comprehensive Climate Adaptation Strategy, may also be supported by the Smart Mobility Framework.



# 2 Understanding Smart Mobility



Downtown Los Angeles, California

- Definition and reasons for a Smart Mobility Approach (Sections 2.1, 2.2)
- Visions of a Smart Mobility Future (Section 2.3)
- Benefits that can be gained by Smart Mobility (Section 2.4)
- Six principles of Smart Mobility (Section 2.5)
- Regional accessibility and community design elements that are key to location efficiency (Section 2.5)

## Key Concepts from Chapter 2:

**Smart Mobility is defined as follows:**

*Smart Mobility moves people and freight while enhancing California's economic, environmental, and human resources by emphasizing convenient and safe multi-modal travel, speed suitability, accessibility, management of the circulation network, and efficient use of land.*

Smart Mobility is a basis for policy and action that responds to the transportation needs of the state's people and businesses, the mandate to address climate change, and the commitment to a transportation system that complements land use as well as advances social equity and environmental justice.

**The Smart Mobility Framework rests on six principles:** Location Efficiency, Reliable Mobility, Health and Safety, Environmental Stewardship, Social Equity, and Robust Economy.

Location Efficiency is a concept being introduced at Caltrans for the first time through the Smart Mobility Framework. Location Efficiency is the fit between the physical environment and the transportation system that can lead to Smart Mobility benefits. It is created by regional accessibility and community design, two sets of key factors that contribute to Smart Mobility outcomes. Location-efficient regional accessibility refers to those elements of development pattern, geographic location, and transportation system that combine to make non-local destinations easily reached. Location-efficient community design elements contribute to the development pattern and transportation system at the neighborhood and district scale that combine to support convenience, non-motorized travel, and efficient vehicle trips. Together, these factors contribute to reduced average vehicle trip length, reduced per capita vehicle trips, and greater mode share for trips by walk, bike, and transit.

Smart Mobility principles must be introduced into a wide range of activities undertaken by many public and private organizations, so this publication does not limit to discussion to activities led solely by Caltrans.

## 2.1 What Is Smart Mobility?

Smart Mobility moves people and freight while enhancing California's economic, environmental, and human resources by emphasizing convenient and safe multi-modal travel, speed suitability, accessibility, management of the circulation network, and efficient use of land.

Smart Mobility is an overarching basis for policy and action that coordinates many of Caltrans' existing activities and the activities of other public and private organizations. To be successful in attaining a Smart Mobility future that offers meaningful benefits, Smart Mobility principles must be introduced into a wide variety of activities. These include:

- **Planning and Programming:** Decision making by all levels of government pertaining to infrastructure investments, transportation operations and services, funding, and development policy.

- **Standards and Guidelines:** Standards for transportation facilities such as the Caltrans Highway Design Manual, municipal street design standards, and land development regulations including local zoning and subdivision codes.

- **Implementation—Transportation Projects and Programs:** Scoping, design, and construction of transportation projects including new facilities, maintenance and preservation, operational improvements, programs, and services including transit, traffic control, incident management, traveler information, pricing, and demand management.

- **Implementation—Development and Conservation Projects and Programs:** Investments in new construction, infill, rehabilitation, and repair are included in this category. Private sector firms undertake the great majority of these activities. Conservation activities such as land acquisition and ecological restoration are also included.



■ **Decision Support:** Activities providing the technical and non-technical basis for determining how Smart Mobility will be implemented to reflect local context, values, and priorities. Decision support includes activities as varied as freeway system monitoring, Caltrans Local Development Review programs, visual simulation, community engagement, and funding for all Smart Mobility applications.

■ **Performance Measures:** Evaluation and screening tools used in planning, programming, and ongoing monitoring are included in this category and are the focus of Chapter 4.

The success of Smart Mobility depends on strong relationships between Caltrans and other State agencies as well as regional and local organizations. Caltrans is the primary sponsor of this publication, but Smart Mobility’s effectiveness will be determined in part by its reach beyond the Department. Attaining Smart Mobility benefits will require public support and the committed and coordinated actions of:

- **Transportation Agencies:** including all of Caltrans’ functional divisions, the California Transportation Commission, local government planning and public works departments, regional transportation planning agencies and MPOs, transit operators, Congestion Management Agencies, private sector partners, and agencies administering transportation sales taxes.
- **Agencies with Land Use Authority:** Counties, cities, and tribal governments.
- **Organizations that Build and Operate Major Institutions:** Universities and colleges, school districts and other special districts, hospitals, cultural institutions, and private sector partners.



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■ **Partners in State Government:** The Department of Housing and Community Development and the State Office of Planning and Research are partners in the Smart Mobility effort. Establishing a Smart Mobility program is likely to require continued cooperation with additional entities including the Air Resources Board, the California Energy Commission, and the California High Speed Rail Authority. Many of these partners are sources for information and policy that are being used as input into the Smart Mobility Framework effort.

■ **Regional Planning Agencies:** The State’s regional planning agencies have a particularly influential role in Smart Mobility because of their control over the majority of transportation funding decisions, their leadership of Blueprint Planning programs, and their emerging role in creating the sustainable communities strategies called for by SB 375. Regional efforts have provided valuable technical analysis as well as examples of new approaches to large scale planning that pursue Smart Mobility aims.

## 2.2 Why Smart Mobility?

The issues addressed in this publication are national—even global—in scope. The American Association of State Highway and Transportation Officials (AASHTO) described the concerns faced by the transportation system as follows:

“America’s transportation system has served us well, but now faces the challenges of congestion, energy supply, environmental impacts, climate change, and sprawl that threaten to undermine the economic, social, and environmental future of the nation. With 140 million more people expected over the next 50 years, past practices and current trends are not sustainable. To meet the transportation needs of the present and pass on a better world to our children and grandchildren, we must accomplish the difficult task of expanding the transportation network’s capacity to serve growing population and communities and an expanding economy while simultaneously reducing the environmental footprint of the system.”<sup>2</sup>

California can be a national leader in facing these challenges by implementing the Smart Mobility Framework’s principles and tools in the full range of functional activities at the Headquarters and District levels.

Smart Mobility addresses:

■ **Mandate to address climate change.** The urgent need for a positive and integrated approach to the State’s transportation future is reflected in the State’s pioneering legislation, the California Global Warming Solutions Act of 2006 (AB 32), and Senate Bill 375 of 2008 which requires the California Air Resources Board (ARB) to set regional targets for the purpose of reducing GHG emissions from passenger vehicles, for 2020 and 2035. The law also establishes a process and incentives for the creation of integrated regional land use, housing and transportation plans called “sustainable communities strategies.” Successful implementation of both statutes will require



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action at all levels of government as well as by the private sector and the public.

California’s transportation sector produces almost 40% of the State’s GHG emissions. The State’s Climate Change Proposed Scoping Plan recognizes that reducing this quantity to meet the goals expressed in AB 32 and the Governor’s Executive Order S-3-05 will require change through three avenues:

- Changes in the vehicle fleet,
- Changes in fuel, and
- Changes in vehicle use.

<sup>2</sup> *Transportation: Invest In Our Future, A New Vision for the 21<sup>st</sup> Century*, AASHTO, July 2007.



Smart Mobility addresses the third path to GHG reduction by responding to the transportation needs of people and goods with mobility system changes that reduce reliance on single occupant vehicles. Recognizing that the State's contribution to combating global climate change needs to be undertaken in concert with improving communities, climate change is just one of several important drivers of the Smart Mobility approach.

■ **Need to reduce per capita vehicle miles traveled.**

An overall objective of reducing the average number of auto miles traveled by the average Californian captures a number of priorities. Reduced auto use will reduce GHG emissions and emission of conventional pollutants, reduce petroleum consumption and associated household transportation costs, and reduce negative environmental impacts on air quality, water quality, and noise environments.

- **The mobility and access needs of people and businesses.** Smart Mobility must be achieved with vigilant attention to the objective of serving the needs of the State's people and businesses. It emphasizes the application of land use strategies and the use of transit, carpool, walk, and bike travel to satisfy travel needs through a shift away from higher-polluting modes. For maximum effectiveness, transportation and land use strategies need to be complemented by travel demand management initiatives including innovative approaches to parking and to transportation pricing. The benefits don't just affect the physical environment—they affect public health as well, because reduced auto use is associated with more physically active travel that contributes to better health, lower household transportation cost, and greater reliability.

■ **Commitment to create a transportation system that advances social equity and environmental justice.**

The California Transportation Plan and GoCalifornia set forth a commitment to the 3 E's of equity, environment, and economy. Smart Mobility systematically integrates social equity concerns into transportation decisions and investments.

## 2.3 What Does a Smart Mobility Future Look Like?

The State's most populous regions have begun to answer this question by investigating alternative ways to accommodate future growth through the Regional Blueprint Planning program supported by Caltrans. Exhibit 1 presents highlights of their policies. The California Transportation Plan (CTP) provides a basis for a state-wide Smart Mobility approach, envisioning a balanced transportation system that promotes sustainability, defined as meeting the needs of the present without compromising the ability of future generations to meet their own needs. The 3 Es of Sustainability are advanced by a Smart Mobility approach.

The Smart Mobility Framework incorporates the following features that are envisioned by both the CTP and the Regional Blueprint Planning efforts:

■ **Meaningful travel choices created by:**

- A transportation system with facilities and services that offer **highly-connected multi-modal networks** with complete streets.
  - Development and urban design characteristics that create **communities where walking, bicycling, and transit use are common choices**—including density levels that contribute to shortening many trips and supporting productive transit use.
- A supply of **housing that allows people of all incomes and abilities to live within reasonable distance of jobs**, schools, and other important destinations, so travel doesn't take too big a bite out of household time and budgets.
- **Facilities for all modes that are designed and operated to enhance their surroundings**, and that support economic development by creating favorable settings for investment in development and revitalization.

## Exhibit 1: Future Visions from the Blueprint Planning Programs

### In Southern California, SCAG's Compass Blueprint Growth Vision encourages:

- Focusing growth in existing and emerging centers and along major transportation corridors
- Creating significant areas of mixed-use development and walkable communities
- Targeting growth around existing and planned transit stations
- Preserving existing open space and stable residential areas

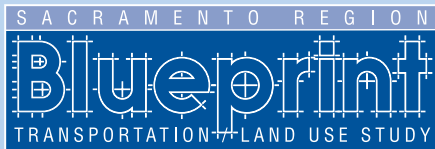
See: [www.compassblueprint.org/about](http://www.compassblueprint.org/about).



### In the Sacramento Region, SACOG's Growth Principles are:

- Transportation choices
- Mixed-use developments
- Compact development
- Housing choice and diversity
- Use of existing assets
- Quality design
- Natural resources conservation

See: [www.sacregionblueprint.org](http://www.sacregionblueprint.org).



### In the San Diego Region, SANDAG defines Smart Growth as:

"...a compact, efficient, livable, and environmentally sensitive urban development pattern which focuses future growth and infill development close to jobs, services, and public facilities to maximize the use of existing infrastructure and preserve open space and natural resources."

- The vision associated with SANDAG's smart growth approach includes:
- Higher-density development
- Mixed land uses
- Appealing community design
- Walkable streets in areas near public transit

See: [www.sandag.org](http://www.sandag.org).



**The eight-county San Joaquin Valley Regional Valley Blueprint effort has resulted in seven blueprint principles that include:**



*Principle #1: Sustainable Planning and Growth*, described as:

“New growth patterns that meet the needs of the present, without compromising the ability of future generations to meet their own needs, within well-defined cities and communities.”

Associated with the principle are strategies which target growth in specifically identified areas with an emphasis on:

- Efficient design
- Land conservation
- Infill
- Redevelopment

See: [www.sjvalleyblueprint.com](http://www.sjvalleyblueprint.com).

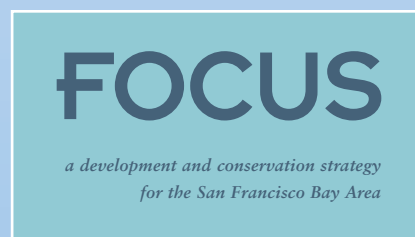
**The San Francisco Bay Area’s regional planning activities took shape with the Smart Growth Strategy Regional Livability Footprint Project. Activities supported by Caltrans’ Blueprint program come under the banner of “FOCUS: A development and conservation strategy for the San Francisco Bay Area.” FOCUS is:**

“...a regional development and conservation strategy that promotes a more compact land use pattern for the Bay Area.”

The Bay Area’s four regional agencies are united in the program which links land use and transportation by encouraging the development of complete, livable communities in areas served by transit, and promotes conservation of the region’s most significant resource lands. FOCUS directs financial assistance and other resources to selected Priority Development Areas (PDAs) and Priority Conservation Areas (PCAs). For all of the PDAs, FOCUS promotes planning for and developing complete communities.

Sponsoring agencies are the Bay Area Air Quality Management District, the Association of Bay Area Governments, the Metropolitan Transportation Commission, and the Bay Conservation and Development Commission.

See: [www.BayAreaVision.org](http://www.BayAreaVision.org).



- Sensitive **environmental areas, natural and agricultural resources** protected from adverse impacts of transportation and development.
- An **inter-regional network for longer-distance travel and freight movement**, connecting the State’s towns, cities, and regions to each other, to major intermodal freight transfer points, and to national and international destinations via air and ground transport.
- **Distinctive communities and places** that reflect their own histories, contexts, and economic foundations, and that use Smart Mobility principles in ways that are appropriate to their communities.

These features have a great deal of overlap with the vision of Smart Growth, as set forth by the agencies and organizations cited in Exhibit 2.

Creating a Smart Mobility future that realizes the aspirations emerging from these regional planning efforts as well as meeting statewide objectives will require shared goals and cooperative efforts by State, local, and regional agencies, including Caltrans and the California Transportation Commission (CTC), the State Department of Housing and Community Development (HCD), the Governor’s Office of Planning and Research (OPR), California Air Resources Board (ARB), and other State agencies and departments.

Regional transportation planning agencies and metropolitan planning organizations (RTPAs, MPOs), county congestion management agencies, as well as regional and local transit agencies and air districts must be included. Local governments play an essential role because they hold authority for land use and development decisions that must lead the way in building a Smart Mobility future. The basis for this type of shared commitment has gained considerable strength as a result of programs such as regional blueprint planning grants and legislative mandates contained in AB 32, California’s Global Warming Solutions Act, and SB 375. Because of this need for consistent, complementary action, this publication cites Smart Mobility strategies for many agencies, not just for Caltrans. The checklists included with this publication identify high-priority implementing activities for Caltrans, for regional agencies, and for local governments.

## 2.4 What Are Smart Mobility’s Benefits?

Smart Mobility is about changing the way the transportation system performs so that negative environmental and social impacts are reduced and options for people and businesses are increased. The performance measures presented in Chapter 4 are designed to evaluate system performance relative to desired outcomes, and also to assess proposed plans, projects, and programs to determine their potential to contribute to gaining the benefits identified below.

Smart Mobility outcomes, achievable over a long-term time frame, include:

- **Improved accessibility** making it convenient for people to reach the goods, services, and activities they need. Accessibility—people’s ability to reach their destinations—can improve even when traffic congestion is a problem. Improvements can result when housing, jobs, and shopping become closer together, when non-driving modes are more efficient, or when both types of changes occur. Good accessibility is one reason why households in central, accessible locations have been shown to drive up to 50% less than households in peripheral locations.<sup>3</sup> The Smart Mobility principles presented in the next section introduce Location Efficiency as a concept that advances accessibility.
- Smart Mobility will create the right conditions for **reducing the average length and number of vehicle trips** that Californians make, thereby reducing energy consumption and GHG emissions.
- **Social equity** will be supported by ensuring that historically underserved communities receive a fair share of the benefits of transportation system improvements. Improved accessibility itself has social equity benefits, by making walk and bike trips competitive choices—thereby improving access for non-drivers and decreasing the impact of transportation costs on household budgets.

<sup>3</sup> “Location Efficiency: Neighborhood and Socio-Economic Characteristics Determine Auto Ownership and Use—Studies in Chicago, Los Angeles and San Francisco,” John Holtzclaw, et al, 2002.

- Greener mobility strategies that **reduce the environmental impacts of travel** by
  - (1) Reducing vehicle miles traveled (VMT) as a result of improved accessibility,
  - (2) Increasing use of lower-polluting modes, and
  - (3) Transitioning to cleaner fuels and vehicles

Such strategies are likely to be essential parts of the sustainable communities strategies required by SB 375. The Air Resources Board’s Proposed Scoping Plan highlights these three different and necessary pathways to greener mobility as they relate to climate change.

- Greener transportation facilities and operations that **reduce direct environmental impacts** such as habitat destruction, stormwater pollution, and GHG emissions, as well as avoiding indirect impacts on land development patterns, such as fostering sprawl.
- **Improved public health** will result from fewer serious collisions, fewer pollutant emissions, and more physically-active travel among all population groups.

- **Reduced energy costs and vulnerability to price escalation** will be achieved as the State becomes less dependent on petroleum production.

- **Economic development** will be achieved by minimizing the distance between housing and job centers, revitalizing distressed urban and suburban communities, limiting public infrastructure expenditures to serve far-flung developments, and creating attractive communities that draw and retain talented workers as well as residents.

Evidence of the potential to gain these benefits is based on practical experience as well as a long history of research investigating the relationship between the built environment and travel behavior. In recent years, a body of research has emerged that specifically focuses on strategies for compact communities, or smart growth. Ample evidence is available to demonstrate the long-term opportunity to yield the benefits listed below. Citations for a number of key research findings associated with Smart Mobility topics are in Section 6.2, Evidence Supporting Location Efficiency Benefits.

Transportation research consistently validates real world experience in highlighting the fact that Smart Mobility benefits will be realized over time as transportation options, land use patterns, and household and business choices evolve. Some of these goals will take a long time to realize. In addition to requiring time, Smart Mobility strategies require complementary services and comprehensive programs.

“Comprehensive” will mean including some difficult choices in the Smart Mobility Framework. While it is appealing to imagine that Smart Mobility’s benefits can be reached through strategies that simply make different travel choices more convenient, there is convincing evidence that achieving Smart Mobility’s benefits will also require deterrents to certain travel behaviors.



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For example, traffic congestion is consistently demonstrated to spur public transportation ridership when quality transit services are available. Single occupant vehicle travel is also reduced when tolls, parking fees, and other forms of pricing are in place. The combined impact of these different sets of strategies has been addressed by Dr. Susan Handy of UC Davis. She explains that both types of strategies—those that improve accessibility and those that manage mobility—are needed:

“Together, they balance the need to ensure access to needed and desired activities with the imperative of reducing the environmental impacts of driving.”<sup>4</sup>

This Call to Action focuses on putting accessibility-enhancing strategies into place. However,

mobility-management strategies will also be required to achieve the greatest and most reliable gains.

## 2.5 Smart Mobility Principles

Progress toward attaining Smart Mobility’s benefits can best be achieved through focus on a set of key principles. These principles can direct activities in each of the six application areas introduced in Section 2.1.

The Smart Mobility principles of Location Efficiency, Reliable Mobility, Health and Safety, Environmental Stewardship, Social Equity, and Robust Economy are described below. The principles are summarized in Exhibit 3.

## Exhibit 2: Smart Mobility and Smart Growth: Ideas, Examples, and Inspiration

Helping to shape visions of Smart Mobility are ideas and practices from smart growth, new urbanism, and transit oriented development.

- The New York State Department of Transportation defines Smart Growth as: “sensible, planned, efficient growth that integrates economic development and job creation with community quality-of-life by preserving and enhancing the built and natural environments.” See: [www.nysdot.gov/programs/smart-planning](http://www.nysdot.gov/programs/smart-planning)
- The New Jersey and Pennsylvania DOTs offer ten themes of Smart Transportation including “Build Towns Not Sprawl.” See the rest, and case study examples, at: [www.smart-transportation.com/themes.html](http://www.smart-transportation.com/themes.html)
- The U.S. EPA’s 10 Smart Growth Principles and a collection of resource materials are online at: [www.epa.gov/dced](http://www.epa.gov/dced)
- Resource materials from the Smart Growth Network are at: [www.smartgrowth.org](http://www.smartgrowth.org)
- The principles of New Urbanism are online at: [www.cnu.org/charter](http://www.cnu.org/charter)
- The Ahwahnee Principles are available at: [www.lgc.org/ahwahnee/principles.html](http://www.lgc.org/ahwahnee/principles.html)
- For resources on transit oriented development, see: [www.reconnectingamerica.org](http://www.reconnectingamerica.org)

<sup>4</sup> Handy, Susan. “Accessibility- Vs. Mobility-Enhancing Strategies for Addressing Automobile Dependence in the U.S., Prepared for the European Conference of Ministers of Transport, May 2002. Accessed 3/26/09 from [http://www.des.ucdavis.edu/faculty/handy/ECMT\\_report.pdf](http://www.des.ucdavis.edu/faculty/handy/ECMT_report.pdf).

## Exhibit 3: Smart Mobility Principles

### Location Efficiency

- Integrate transportation and land use in order to achieve high levels of non-motorized travel and transit use, reduced vehicle trip making, and shorter average trip length while providing a high level of accessibility.

### Reliable Mobility

- Manage, reduce, and avoid congestion by emphasizing multi-modal options and network management through operational improvements and other strategies.
- Provide predictability and capacity increases focused on travel that supports economic productivity.

### Health and Safety

- Design, operate, and manage the transportation system to reduce serious injuries and fatalities, promote active living, and lessen exposure to pollution.

### Environmental Stewardship

- Protect and enhance the State's transportation system and its built and natural environment.
- Act to reduce the transportation system's emission of GHGs that contribute to global climate change.

### Social Equity

- Provide mobility for people who are economically, socially, or physically disadvantaged in order to support their full participation in society.
- Design and manage the transportation system in order to equitably distribute its benefits and burdens.

### Robust Economy

- Invest in transportation improvements – including operational improvements – that support the economic health of the State and local governments, the competitiveness of California's businesses, and the welfare of California residents.

## 1. Location Efficiency

**Location Efficiency—Statement of Principle:** Integrate transportation and land use in order to achieve high levels of non-motorized travel and transit use, reduced vehicle trip making, and shorter average trip length while providing a high level of accessibility.

**Location Efficiency—Discussion:** Location efficiency is an emerging concept being introduced in Caltrans activities for the first time in the Smart Mobility Framework. It

describes the fit between a specific physical environment and its transportation system and services. Two sets of factors indicate to a large extent the potential for achieving Smart Mobility benefits. Both relate to the characteristics of the transportation system—modal characteristics, network features, and services, and also to development characteristics, with respect to form, location, and uses. The difference between the factors is the spatial and economic scale at which they operate. The factors are:

## Exhibit 4: Location-Efficient Community Design Elements

### Development, Use, and Form Elements (Community Design)

- Building and use intensity, with greater intensity desirable
- Land use mix, with greater mix generally preferable
- Proximity to local destinations including parks, schools, and shops and services from all neighborhoods
- Small blocks

### Transportation System Elements (Community Design)

- Convenient and safe access to a variety of destinations by walk and bike for all users
- Multi-modal circulation network connectivity
- Well-connected complete street system
- Multi-modal circulation network connectivity to the region



Source: Ellen Greenberg



Source: Ellen Greenberg

**1. Community Design:** Characteristics of development use, form, and location that combine with the multi-modal transportation system to support convenience, non-motorized travel, and efficient vehicle trips at the *neighborhood and area scale*.

**2. Regional Accessibility:** Characteristics of development use, form, and location that combine with the multi-modal transportation system to make destinations available through non-SOV travel and efficient vehicle trips at the *regional, interstate, and international scales*.

These two factors have been shown in recent research, in California and nationally, to be key to affecting transportation system performance. Summaries of relevant research are included in Chapter 6. Regional accessibility is consistently found to be a powerful influence on travel behavior. Research and real-world experience consistently point also to the value of certain community design features in supporting Smart Mobility outcomes. These offer:

- A mix of retail businesses and frequently-needed services that are conveniently located from home and work.
- Places that are appealing, safe, and easily-reached by walk and bike trips.
- High-quality urban design that successfully integrates different development types and densities.
- Public facilities and services—including schools, public open space, and quality public realm—well distributed throughout the area.
- Reliable transit service and streets and roads in a state of good repair.

These location-efficient community design elements are listed in Exhibit 4. Location-efficient regional accessibility elements are listed in Exhibit 5. Together these provide a basis for assessing the quality of a neighborhood, area, or community with respect to the potential for Smart



## Exhibit 5: Location-Efficient Regional Accessibility Elements

### Development, Use, and Form Elements (Regional Accessibility)

- Affordable housing supply within and near urban centers and major employment centers
- Regional attractions such as major parks and open space, places of higher learning, health care and cultural institutions at central locations with high accessibility



Source: Ellen Greenberg



Source: Ellen Greenberg

### Transportation System Elements (Regional Accessibility)

- High level of multi-modal circulation system connectivity to:
  - Other parts of the region
  - Interregional, and, where applicable, interstate and international destinations
  - Neighborhood and district-level circulation systems
- High level of multi-modal access for all users to:
  - Major institutions and neighborhoods throughout the region
  - Airports, ports and interregional rail facilities

Mobility benefits. In all cases, an increasingly strong presence of these factors builds the potential to create Smart Mobility benefits.

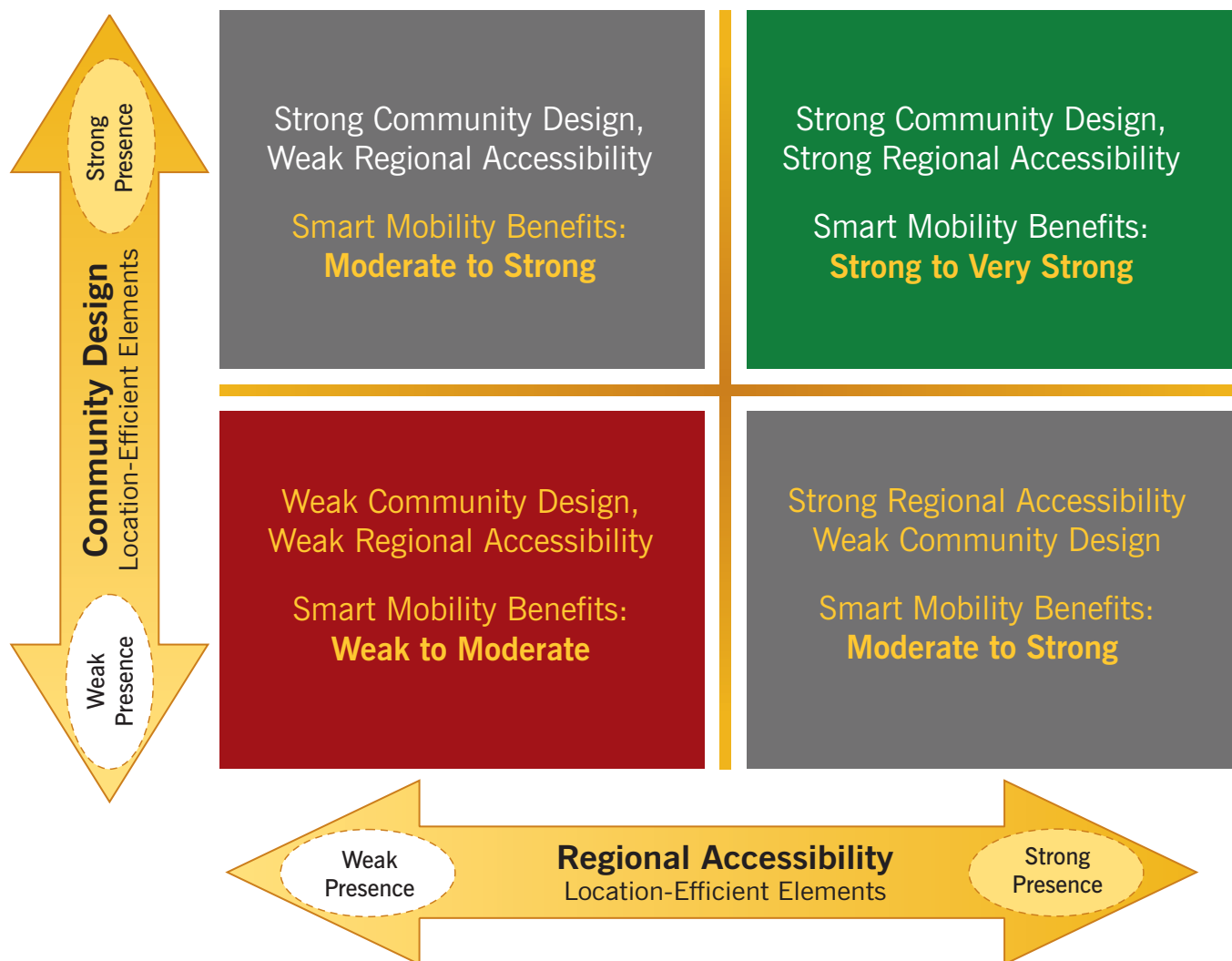
As shown in Exhibit 6, the greatest potential to achieve location efficiency—and thus gain positive Smart Mobility outcomes—is when there is a strong presence of both community design and regional accessibility factors. Practical application of the location efficiency concept is described in Chapter 3: Applying the Smart Mobility Framework to place types.

As detailed in Section 3.3, Guidance for Smart Mobility Place Types, the principle of location efficiency calls for transportation activities that focus on:

- Prioritizing system and service improvements that serve places with good regional accessibility, higher densities of population and jobs, and mixed land uses, or improvements that support evolution of these characteristics.

- Creating a more highly connected network to support both community design and regional accessibility elements, thereby promoting Smart Mobility outcomes, recognizing that some parts of the state need a more highly-connected interregional network while others may need more connectivity at the local scale to provide walkability and choice of routes.
- Diversifying travel choices in all locations with an emphasis on serving all users through Complete Streets and the supportive land use and urban design features of community design supportive of location efficiency.
- Addressing interregional travel needs in a way that supports location-efficiency in urbanized areas and avoids unintended growth inducing effects contrary to the Smart Mobility Framework.

## Exhibit 6: Location Efficiency Factors and Smart Mobility Benefits



## 2. Reliable Mobility

**Reliable Mobility—Statement of Principles:** Manage, reduce and avoid congestion by emphasizing multi-modal options and network management. Provide predictability and capacity increases focused on travel that supports economic activity.

**Reliable Mobility—Discussion:** Reliable Mobility addresses several aspects of Smart Mobility:

**Response to congestion:** Operational strategies will focus on congestion avoidance and reduction for freight and passenger movement through:

- Incident management and work zone planning to address non-recurring congestion.
- Operational improvements (including ITS) across modes to produce stable traffic flow.
- Using pricing to help manage peak-period demand.

**Multi-modal choices:** The Smart Mobility Framework recognizes that walk and bike trips offer the advantage of highly-reliable travel times, in addition to health and budget benefits to individuals, and environmental and climate benefits to the broader community.

- Walk, bike, and transit options allow people to choose reliable travel modes, thereby opting out of congestion. A focus on complete streets facilities has been formalized by Caltrans in Deputy Directive 64-R1: Complete Streets: Integrating the Transportation System, and in State statute through 2008 amendments to Sections 65040.2 and 65302 of the California Government Code.
- Transit service reliability is a key element in attracting and keeping riders. Prioritizing bus movements on state highway facilities to improve transit reliability is one strategy for transit service reliability, recognized in Caltrans Deputy Directive 98, Integrating Bus Rapid Transit into State Facilities.

**System capacity:** System expansion decisions will:

- Favor transportation investments where existing or planned location efficiency factors will create Smart Mobility benefits.
- Support interregional and interstate travel with investments that serve productive travel that sustains economic activity
- Seek to avoid capacity increases likely to induce additional vehicle travel.

Strategic planning for long-term reliability will diversify and increase the flexibility of the system by:

- Establishing secure long term funding for transit capital and operating expenses so that investments and services

can stimulate private sector investments in land development and revitalization.

- Improving the ability to respond and adapt to natural and human-made disasters and changes.
- Providing for maintenance and reconsideration of existing assets.

### 3. Health and Safety

**Health and Safety—Statement of Principle:** Design, operate and manage the transportation system to reduce serious injuries and fatalities, promote active living, and lessen exposure to pollution.

**Health and Safety—Discussion:** This principle joins together concerns from different but related parts of the public health spectrum. Positive outcomes relating to multiple health concerns can be reached through strategies ranging from providing walk/bike facilities throughout communities to incorporating pollutant exposure criteria into school siting decisions.

An emphasis on health and safety calls for the Department and partners to:

- Promote travel by walking, bicycling, and transit to reap benefits to individual health as well as to offer reliable travel options. Physically active travel contributes to reduced rates of obesity and diabetes and offers independent mobility for non-drivers. Its benefits are recognized by new policies on complete streets which require changes in the circulation network throughout the state to accommodate multi-modal travel. Complete streets are complemented by community design that increases the number of trips that can comfortably and conveniently be made by walking and bicycling. Transit services improve accessibility to destinations too far to walk or bike. Safe Routes to School is one program focusing on a specific trip type to make it safe and appealing.
- Design, manage, and operate the system to minimize fatalities and serious injuries through methods including speed management and access management. These measures work best in concert with a comprehensive set of traffic safety initiatives ranging from teen driver edu-



Source: Ellen Greenberg

cation to vehicle safety improvements to improvements in emergency services, as reflected in Caltrans' Strategic Highway Safety Plan (SHSP).

- Reduce public exposure to toxic pollutants generated by the transportation sector. The issue of exposure to diesel exhaust is of particular concern because of its serious health impacts and the rising volume of freight movement. Reducing public exposure will include approaches that consider vehicle technology and alternative fuels, siting of sensitive land uses (e.g., schools, hospitals, etc.), multi-modal freight system management, and highway operations.

## 4. Environmental Stewardship

### Environmental Stewardship—Statement of Principles:

Protect and enhance the State's transportation system and its built and natural environment. Act to reduce the transportation system's emission of GHGs that contribute to global climate change.

**Environmental Stewardship—Discussion:** Caltrans has a long-standing commitment to stewardship. This Smart Mobility principle extends the definition to include stewardship of the built environment, and of climate and energy sustainability. An expanded approach to stewardship complements the principle of robust economy, helping Caltrans and other public agencies prioritize scarce resources by evaluating return on investment—not only in terms of transportation assets but also in terms of economic performance, natural resources, energy sustainability, and community measures.

- **The State's transportation assets.** Smart Mobility emphasizes asset management not just as prudent conservation of the state's infrastructure investments, but also as an important way of supporting re-investment in established urban areas.
- **California's built and natural environments.** State and federal environmental laws focus on avoiding and mitigating adverse environmental impacts. Smart Mobility goes beyond statutory requirements to call for transportation investments and programs that add value to their surroundings, whether they are urban centers, rural towns,

or protected lands. The practice of Context Sensitive Solutions, institutionalized through Caltrans Director's Policy 22, is one component of realizing this broad approach to stewardship.

- **Climate and energy sustainability.** The October 2008 Climate Change Scoping Plan from the California Air Resources Board (ARB) identifies 38% of the State's total GHG emissions as attributable to the transportation sector, the single largest contribution of any sector. Smart Mobility benefits are an essential part of implementing AB 32, the Global Warming Solutions Act of 2006, as has been recognized by the State Legislature and ARB. Legislative findings adopted as part of SB 375 note that "without improved land uses and transportation policy, California will not be able to achieve the goals of AB 32." Land use and pricing strategies are necessary components of the emissions reduction program called for in the adopted Scoping Plan as Measure T-3, Regional Transportation Related Greenhouse Gas Targets (available at [www.arb.ca.gov/cc/scopingplan/scopingplan.htm](http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm)).

## 5. Social Equity

**Social Equity—Statement of Principles:** Provide mobility for people who are economically, socially, or physically disadvantaged in order to support their full participation in society. Design and manage the transportation system in order to equitably distribute its benefits and burdens.

**Social Equity—Discussion:** A commitment to social equity and environmental justice is established in

Fruitvale Village, Oakland, California



Department policy. The Smart Mobility Framework addresses these commitments by including:

- Appropriate and affordable housing supply as a component of an integrated transportation and land use system that leads to Smart Mobility outcomes.
- Performance measures that evaluate the relative impact of plans and projects on different population groups.
- A systematic focus in planning, design, programming, and performance measurement on making walk, bike, and transit trips available, affordable and competitive with driving.

Nationwide, there is increasing awareness of the combined financial burden of housing and transportation costs. Record-high gasoline prices experienced in 2008 drove home the problem with familiar “drive till you qualify” homebuying. Absence of lower-cost commute options combined with lack of affordable housing near job centers combine to create hardship for low income households and limit their mobility. The Brookings Institute “Affordability Index”, referenced in Section 6.3, is one way to understand and quantify this burden.

## 6. Robust Economy

**Robust Economy—Statement of Principle:** Invest in transportation improvements that support the economic health of the State and local governments, the competitiveness of California’s businesses, and the welfare of California residents.

**Robust Economy—Discussion:** Transportation capacity and connectivity has long been recognized as essential to economic development. Transportation improvements contribute most to economic development when they support productive and sustaining travel while minimizing induced travel. The Smart Mobility Framework focuses on the following concepts that link economic concerns with other Smart Mobility principles:

- **Boost business competitiveness.** Efficient and reliable freight corridors, together with seamless intermodal connections, reduce the cost of goods production and distribution. Improvements in transportation reliability,

through operational measures and other strategies, can also lower production costs by enabling reductions in inventories of inputs, spare parts, and/or finished goods. All these cost reductions will enhance the competitive position of California’s businesses.

- **Minimize household transportation expenditures.** Transportation is a major expense for many California families. Households tend to spend more on transportation in locations with poor accessibility and no alternatives to driving. By improving accessibility and providing more transportation choices, Smart Mobility allows families to own fewer cars and drive less, thereby saving money.
- **Attract talented workers and tourists.** Due to rising regional competition, quality of life factors have become increasingly important in attracting talented employees and visitors. In today’s highly mobile, knowledge-driven economy, a location’s attractiveness and amenities are key components in its ability to draw and retain a skilled and productive workforce. Quite apart from the ability of transportation infrastructure to raise business productivity, it can enhance regional competitiveness through its contribution to creative place-making.
- **Maximize the public return on investment.** Traditional benefit-cost analysis considers only user benefits (change in average vehicle travel time, operating costs, and safety) and perhaps the monetized value of environmental impacts (emissions, noise). A more comprehensive approach to evaluating the return on public investment considers benefits across all modes as well as other benefits such as reliability improvements and economic development benefits. Use of life-cycle cost analysis helps to ensure that investment decisions account for the long-term operations and maintenance requirements of infrastructure projects.

# 3 Applying the Smart Mobility Framework to Place Types



San Jose, California

- The concept and uses of Smart Mobility Place Types (Section 3.1)
- The seven place types for use in Smart Mobility Framework activities (Exhibit 7)
- How place types relate to location efficiency, and opportunities to yield Smart Mobility benefits (Section 3.2)
- The Smart Mobility Framework applicable to each place type, with associated activities and investment priorities (Section 3.3)
- How place types can change to improve location efficiency (Section 3.4)
- How the generalized place types introduced in this chapter can be tailored for use in real places (Section 3.5)

## Key Concepts from Chapter 3:

The use of place-based approaches to planning and design has been growing in recent years. Stemming from an early basis in urban design and zoning, place types are increasingly being used in formulating strategies for other applications, including transit oriented development and context sensitive design. Resources applying to place-based approaches generally as well as to specific contexts are referenced in Chapter 6.

Chapter 3 introduces seven place types specifically designed as tools for planning and programming that implement Smart Mobility. The place types are: Urban Centers, Close-in Compact Communities, Compact Communities, Suburban communities, Rural and Agricultural Lands, Protected Lands, and Special Use Areas.

Guidance is provided that describes, for each place type, appropriate activities related to Smart Mobility in three categories:

- Planning
- Transportation Projects and Programs
- Development and Conservation Projects and Programs.

The most reliable and most powerful Smart Mobility outcomes will be in places with a high degree of location efficiency, which will be those places with a strong presence of both community design and regional accessibility elements.

Using place types as a planning and programming tool requires a focus on place type transitions over time. Places should be identified as primarily fitting into one of two categories:

- Anchored places—those planned to remain as their present type, and
- Transitional places—those that will be targeted for significant change, evolving over time to a different place type in order to reach a higher level of Smart Mobility benefits through location efficiency.

## 3.1 Introduction

The Smart Mobility Framework introduces Smart Mobility Place Types. The place types are a tool for a general classification of towns, cities, and larger areas to be used as a basis for making investment, planning, and management decisions that advance Smart Mobility. Each of seven place types creates a distinct context for transportation investments and distinct opportunities to gain Smart Mobility benefits. The place types, which are described in Exhibit 7, are:

1. Urban Centers
2. Close-in Compact Communities
3. Compact Communities
4. Suburban Communities
5. Rural and Agricultural Lands
6. Protected Lands
7. Special Use Areas.

The use of place-based approaches to planning and design has been growing in recent years. Stemming from an early basis in urban design and zoning, place types are increasingly being used in formulating strategies for other applications, including transit oriented development and context sensitive design. A number of Blueprint planning efforts, including the SCAG Compass Blueprint, the SACOG Blueprint, and the Bay Area Livability Footprint project have used place types as a planning tool. References to these and other place type applications are included in Chapter 6.

### Application of Place Types

The place types are for the following uses:

- Broadly categorizing areas at the scale of towns, cities, and regional subareas in order to identify the appropriate Smart Mobility Framework.

- Identifying appropriate integrated transportation and land use planning activities that can become part of ongoing local and regional planning activities with extensive community engagement, such as General Plan updates and preparation of sustainable communities strategies.
- Identifying types of transportation projects and programs that should be considered as possible priorities in order to increase the presence of location efficiency factors and yield Smart Mobility benefits.
- Identifying types of land use, community development and conservation activities that should be considered as possible priorities in order to increase the presence of location efficiency factors and yield Smart Mobility benefits.
- Identifying activities, resources, and techniques that will support planning, investment and program decision-making.
- Bringing attention to opportunities for investments and programs to influence change in places so they achieve higher levels of location efficiency and therefore greater potential to gain Smart Mobility's benefits.

These activities may be undertaken by Caltrans, partner agencies at all levels of government, and non-governmental organizations. Guidance for activities appropriate to the Smart Mobility Framework for each of the place types is presented in Section 3.3.

The place types are necessarily broad. Detailed mapping would show that types often co-exist in small areas. The place types are intended to be applied at a generalized level of detail, with the understanding that detailed planning for specific places will provide greater differentiation of locations. In fact, within any large area designated as one of the place types, there will typically be subareas with the character of other places. The State's size and complexity makes this variation inevitable. There are, for example, protected open space lands even within high-rise urban centers.



## Exhibit 7: Smart Mobility Place Types

Place Type	Summary Description (existing or planned character)	Presence of Location Efficiency Factors			Examples
		Community Design	+	Regional Accessibility	
<b>1. Urban Centers</b>	High density, mixed use places with high jobs-housing ratios overall, well-connected street networks, high levels of transit service and pedestrian supportive environments. Transit-oriented development (TOD) fits into all of the urban place types.				
1a. Urban Cores	Central cities and large downtowns with full range of horizontally- and vertically-mixed land uses and with high capacity transit stations/corridors present or planned. Urban cores are hubs of transit systems with excellent transit coverage, service levels, and intermodal passenger transfer opportunities including convenient airport access.	Strongest	+	Strongest	Downtowns of Long Beach, San Francisco, San Jose, Sacramento, Los Angeles, San Diego, Oakland
1b. Urban Centers	Major activity centers with full range of horizontally- and vertically-mixed land uses and with high capacity transit stations/corridors present or planned.	Strong	+	Strong	Berkeley, Palo Alto, Pasadena, Walnut Creek, Santa Rosa, Century City, Fresno, Stockton, Bakersfield, Modesto
<b>2. Close-in Compact Communities</b>	Located near Urban Core or Urban Centers, close-in compact communities are comprised primarily of housing but with scattered mixed use centers and arterial corridors forming the skeleton of the transportation system. Housing is varied in density and type. Transit is available to connect neighborhoods to multiple destinations, with an emphasis on serving commute trips. Residents may think of these communities as suburban, but the Smart Mobility Framework differentiates them from suburban communities because of the greater presence of location efficiency factors. This place type includes:				
2a. Close-in Centers	Small and medium sized downtowns, Transit Oriented Developments, institutions, lifestyle centers, and other centers of activity.	Moderate	+	Strong	Downtowns of San Rafael, Carlsbad, Orange, Santa Monica and Playa Vista, Uptown San Diego
2b. Close-in Corridors	Arterial streets with a variety of fronting development types, with frequent transit service and transfer opportunities.	Moderate	+	Strong	San Pablo Avenue, Alameda County,
2c. Close-in Neighborhoods	Walkable neighborhoods with housing in close proximity to shops, services, and public facilities, as well as good multi-modal connections to urban centers. Housing density varies from medium to high. Fine-grained circulation network of streets with high comfort for pedestrians and bicyclists.	Moderate	+	Strong	Midtown, Curtis Park, and Land Park Sacramento, Rockridge Oakland, Fillmore and Mission District SF, Little Italy San Diego

## Exhibit 7: Smart Mobility Place Types (continued)

Place Type	Summary Description (existing or planned character)	Presence of Location Efficiency Factors			Examples
		Community Design	+	Regional Accessibility	
<b>3. Compact Communities</b>	Historic cities and towns as well as newer places characterized by strong presence of community design elements. While most compact communities are outside of metropolitan regions, some are on the periphery of metropolitan regions.	High	+	Moderate to Low	Eureka, San Luis Obispo, Paso Robles, Santa Barbara
<b>4. Suburban Communities</b>	Communities characterized by a low level of integration of housing with jobs, retail, and services, poorly connected street networks, low levels of transit service, large amounts of surface parking, and inadequate walkability  For the purposes of the Smart Mobility Framework, suburban communities are defined by weak-to-moderate presence of location efficient community design factors. They vary with respect to regional accessibility; some suburban communities are located within easy commute distance of urban centers, while others are not. Places that share characteristics with suburban communities—such as a high proportion of detached housing, are categorized as being in the suburban community place type only if they match the place type characterization relative to location efficiency factors.				
4a. Centers	Mid-size and small downtowns, lifestyle centers, or other activity centers embedded within suburban communities.	Moderate	+	Variable	
4b. Corridors	Arterial streets with a variety of fronting development types, frequently characterized by inadequate walk and bike environments, low land use efficiency and poor aesthetics.	Weak	+	Variable	Moderate to High density examples: typical areas of Orange County and Inland Empire counties.
4c. Dedicated Use Areas	Large tracts of land used for commercial purposes such as business or industrial park or warehousing, or for recreational purposes such as golf courses.	Weak	+	Variable	Low to Moderate density examples: Central Valley, Salinas Valley and Sierra foothill suburbs
4d. Neighborhoods	Residential subdivisions and complexes including housing, public facilities and local-serving commercial uses, typically separated by arterial corridors.	Weak to Moderate	+	Variable	
<b>5. Rural and Agricultural Lands</b>	Settlement pattern with widely-spaced towns separated by farms, vineyards, orchard, or grazing lands. The rural and agricultural place type may include tourist and recreation destinations which can significantly affect land uses, character and mobility needs. Rural and agricultural lands include:				

**Exhibit 7: Smart Mobility Place Types (continued)**

Place Type	Summary Description (existing or planned character)	Presence of Location Efficiency Factors			Examples
		Community Design	+	Regional Accessibility	
5a. Rural Towns	Rural towns provide a mix of housing, services and public institutions in compact form that serve surrounding rural areas. They vary in size from crossroads with single clusters of commercial uses to towns offering a full range of retail and service businesses. Towns may also be the focus of tourist and recreational activity or gateways to recreation areas in protected lands.	Moderate to High	+	Low	Hillmer, St. Helena, Ferndale, Mariposa
5b. Rural settlements and Agricultural Lands	Scattered dwelling units and supporting commercial uses and public facilities, no significant subdivisions and limited non-agricultural industrial or commercial land use, and lands in agricultural or grazing use.	Very Low	+	Low	
<b>6. Protected Lands</b>	Lands protected from development by virtue of ownership, long-term regulation, or resource constraints.	Very Low	+	Variable	National forest and National Park, lands held in perpetuity by land trusts.
<b>7. Special Use Areas</b>	Large tracts of single use lands that are outside of, or poorly integrated with, their surroundings.	Low	+	Variable	Airports, large industrial facilities, military installations, some universities

### 3.2 Place Types and Location Efficiency

The place types are distinguished in large part based on their characteristics relative to the two location efficiency factors introduced in Chapter 2—community design and regional accessibility. Exhibits 4 and 5 list the elements that comprise each of these factors and that contribute to location efficiency. Of course, other factors also play significant roles in determining travel behavior. Notably these include

socioeconomic characteristics including household income, age, employment status, and gender.

The location efficiency elements relate to both transportation system characteristics and development characteristics. For example, urban centers, defined as the places with the strongest presence of regional accessibility and community design elements, have extensive transit systems with regional and neighborhood connectivity as well as a well-developed network of complete streets. Transportation demand and system productivity is, in turn, fueled in these

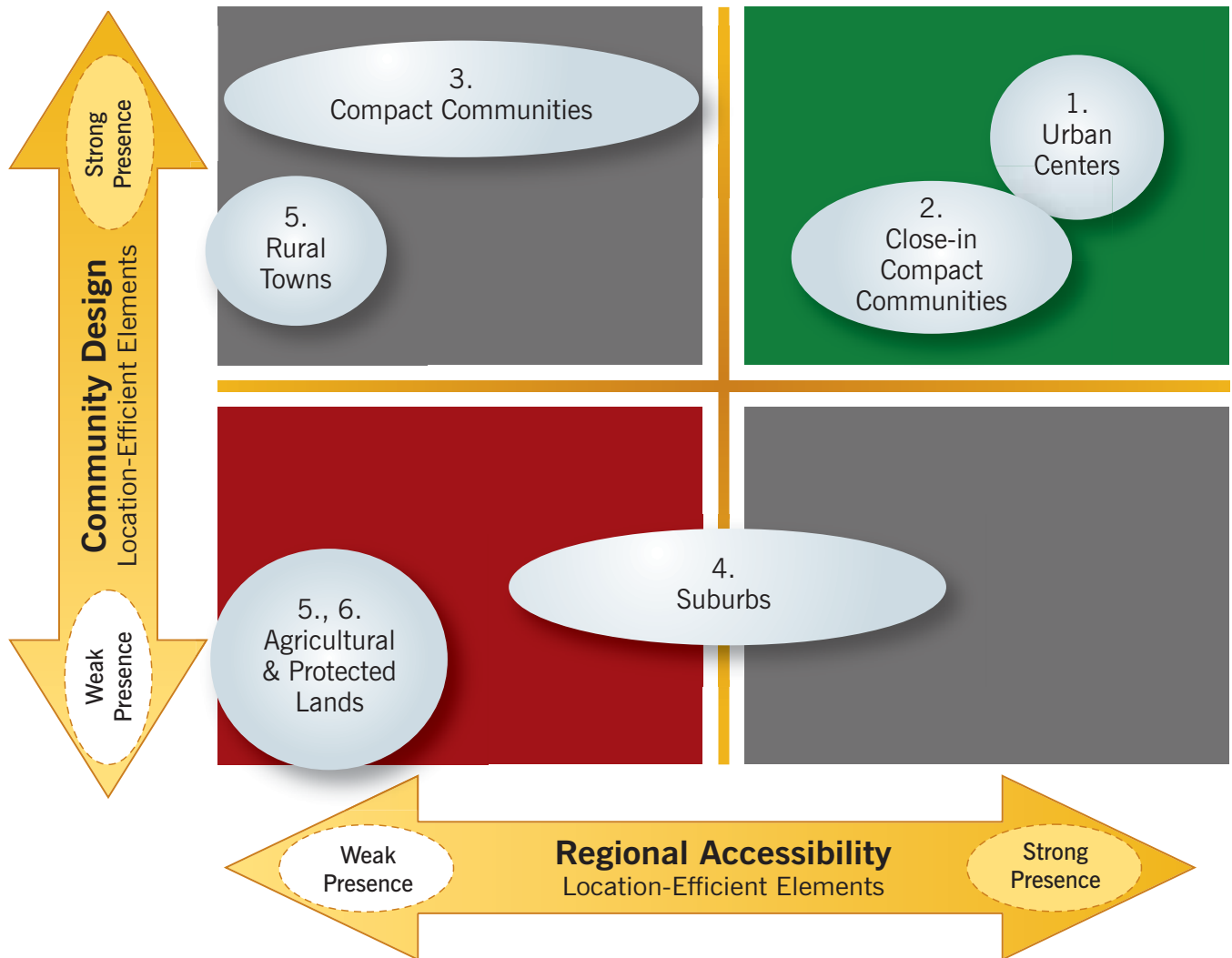
places by high development densities and concentrated mixed land uses.

Smart Mobility isn't merely about the presence or absence of the location efficiency factors—it is about an appropriate fit between the transportation system factors and the development characteristics. For example, agricultural and protected lands sufficiently large to be identified as “places” (rather than patches within other place types) will not achieve direct Smart Mobility outcomes. However, there is a location-efficient model for infrastructure investment in

these places, in which a weak presence of location efficiency factors is appropriately matched with lower infrastructure investment than in urban place types. The discussions below identify the multiple contributions to a Smart Mobility future made by these place types.

The two factors, and the elements associated with each that are listed in Exhibits 4 and 5 are identified based on review of extensive research literature addressing the relationship between built environment, transportation system characteristics, and travel behavior. The resources in Chapter 6

### Exhibit 8: Smart Mobility Place Types and Location Efficiency Potential



include a summary of selected research that synthesizes over 200 studies that together support this approach. Together, the location efficiency factors significantly influence how places function with respect to mobility and what types of investments will yield the Smart Mobility benefits described in Section 2.4.

The most reliable and most powerful Smart Mobility outcomes will be in places with a high degree of location efficiency, which will be those places with a strong presence of the elements that comprise both community design and regional accessibility. Exhibit 8 shows how the place types compare with respect to location efficiency potential.

### 3.3 Guidance for Place Types

Guidance for implementing the Smart Mobility Framework is presented below for each of the seven place types introduced in Exhibit 7. For each place type, the guidance is provided in the following sections:

#### Smart Mobility Framework

The guidance for each place type begins by describing a Smart Mobility approach to the transportation system and to development and conservation activities. The framework should guide planning, investment, design, and management decisions.

#### Key Activities

The guidance describes activities related to Smart Mobility that are appropriate in each place type, along with candidate types of investment and operational strategies. With each is listed the Smart Mobility principles that are most relevant. For each place type, key activities are grouped into the following three categories:

- **Planning:** Key activities are listed. These relate to both places that have the place type characteristics described and those that will transition to the place type.

- **Transportation Projects and Programs.** Likely priorities are listed for each place type. The lists:

- Indicate a range of possible implementation priorities—from maintenance to new construction to operations and services— without regard for what agency is responsible for implementation.
- Provide examples of appropriate and, in identified cases, less effective project types.
- Help to highlight similarities and differences between place types.

Used in combination with planning activities and application of SMPMs, these lists should assist in scenario planning, evaluation, and programming. Because these lists are of necessity general, refinements will need to be made to reflect conditions and opportunities in specific locations. The sequence of presentation does not imply priority.

- **Development and Conservation Projects and Programs.** Likely priorities are listed for each place type. Development projects are in most cases dependent on private sector investment. The lists highlight the types of projects and programs that typically need to be implemented in order to achieve Smart Mobility outcomes. Public agencies can set the stage for implementation through infrastructure investment, planning, and zoning, incentives and other regulatory and investment support. The sequence of presentation does not imply priority.

Place types are also addressed in Chapter 4, which addresses performance measures for different place types, and Section 6.1, which presents both references providing support for Smart Mobility applications when they are relevant to a particular place type and general references for the place type approach.

# Urban Centers

## Smart Mobility Framework

**Urban centers** are the places that combine high levels of activity connectedness with the lowest vehicle miles traveled per capita of any place type. They are the leading candidates for multi-modal strategies for both local and regional travel. A high share of both commute and discretionary trips should be made by transit, walk, and bike. Investments in expanded roadway capacity should be very limited, with major investments instead focused on transit capacity and system management. Urban cores are the places for transportation hubs that offer connections within and beyond the region—to the interregional road system, intercity and high-speed rail, and international airports.

Auto ownership is typically lower than anywhere else in the region, with positive implications for mode share, amount of land dedicated to parking, and cost of parking as a component of development costs. While some variation is inevitable, all locations in urban centers should have a strong presence of community design and regional accessibility elements. Location efficiency can affect mode choice and length of many trip types because of mixed use and the centrality of regional destinations such as cultural, medical, and educational institutions. Key challenges include maintaining livability and providing a high quality and coverage of transit services despite typically high costs.

Reliability is a key objective guiding investment and operations in urban centers. One dimension is providing people with the ability to conveniently use walk, bike, and high-capacity transit modes on dedicated right of way. Another is an approach to street and intersection operations that focuses on providing predictable travel times with traffic and incident management rather than seeking to relieve recurrent congestion in these high-activity areas. A high level of network connectivity increases reliability by connecting origin/destination pairs with multiple routes, making trips more direct, and supporting multiple ways to travel.



## Planning

### Key activities:

- Designate locations that have the full range of characteristics described for urban cores and centers, those planned to evolve to urban cores and centers, and new locations for urban centers.
- For new and evolving centers, identify those land use, urban design, and transportation location efficiency elements to be introduced or enhanced in order to increase Smart Mobility benefits.
- Adopt and apply performance and development standards that encourage high-density, mixed-use infill development such as multi-modal LOS and reduced parking requirements.
- Identify areas that have high “latent” location efficiency; i.e., where land use, urban design patterns, and demographic characteristics could improve Smart Mobility outcomes if a fuller range of transportation facilities and services were present.
- Address social equity and environmental justice concerns in part through equitable and comprehensive coverage and quality of transportation services.

## Transportation Projects and Programs

### Likely priorities in urban centers:

- Direct service by high capacity and high-speed transit serving local and regional destinations and state-wide destinations. (Location Efficiency, Reliable Mobility)
- Creation and improvement of major transportation hubs connecting modes for intercity and international travel as well as intra- and inter-regional movement. (Reliable Mobility)
- Pedestrian facilities with high amenity levels. (Health and Safety, Reliable Mobility, Environmental Stewardship)
- Extensive network of bicycle facilities. (Health and Safety, Reliable Mobility, Environmental Stewardship)
- Projects providing service, facility, and connectivity improvements to provide an equivalent level of activity connectedness to all population groups and all location-efficient places. (Social Equity)
- Convenient opportunities for multi-modal and transit transfers for all urban center users. (Social Equity, Location Efficiency, Environmental Stewardship)
- For all facilities, high degree of design and speed compatibility with surroundings. (Environmental Stewardship, Health and Safety)
- Ongoing re-investment in existing roadway facilities to protect asset value and provide customer satisfaction. (Environmental Stewardship, Reliable Mobility)
- Transit stations accessed primarily by interconnecting transit, walking, bicycling, typically with very limited associated parking. (Location Efficiency)
- Operating strategies to optimize use of existing roadway capacity. (Robust Economy, Reliable Mobility)

- Pricing of parking and roadway capacity. (Robust Economy, Reliable Mobility)
- Allocation of street space to benefit high-occupancy and non-motorized modes (“complete streets”)—e.g. road diets and other cross section changes. (Location Efficiency, Reliable Mobility, Social Equity, Health and Safety)
- Carshare and bikeshare programs (Environmental Stewardship, Reliable Mobility, Location Efficiency, Social Equity)

## Development and Conservation Projects and Programs

### Likely priorities in urban centers:

- High density mixed-use development. (Location Efficiency, Environmental Stewardship)
- Mixed-income housing in highly-accessible locations. (Social Equity, Location Efficiency)
- Employment centers, major institutions, and regional attractions with strong presence of community design elements.
- High density development complemented by high quality public realm and convenient access to public open spaces. (Location Efficiency, Social Equity)
- Well-located places for active and passive recreation (Environmental Stewardship, Location Efficiency)
- Design character that reflects both location-efficient community design elements and the particular design traditions and styles of the location. (Environmental Stewardship, Location Efficiency)

## Urban Centers

# Close-in Compact Communities

## Smart Mobility Framework

Close-in compact communities have high location efficiency based on the presence of both community design and regional accessibility elements. They exhibit completeness in relation to land use and activities, a high level of connectivity of transportation networks, and excellent accessibility to a range of destinations throughout their regions. Achieving Smart Mobility benefits requires a high level of local transit service, safe and convenient walking throughout, and moderately-sized arterial streets that allow for successful integration into their surroundings. Transit oriented developments should be important centers in these areas. Complementing these elements is good multi-modal connectivity to employment centers throughout the region, as well as to major institutional uses in nearby urban centers.

New freeways can be enormously damaging to close-in compact neighborhoods and they are typically not appropriate. This is because they deter walking and biking by creating barriers between portions of the community, they introduce noise, air quality and vibration impacts, and they are generally incompatible with Community Design elements needed for location efficiency benefits.

## Planning

### Key activities:

- Designate close-in compact community locations, distinguishing those that have achieved the full range of characteristics described for centers, corridors, or neighborhoods. In these places, maintenance and enhancement of appropriate community design characteristics is the long term goal.



- Designate locations evolving to close-in compact communities from suburban communities or rural places, identifying land use, urban design, and transportation characteristics to be introduced or developed in order to create centers, corridors, and neighborhoods with essential community design elements such as multi-modal network connectivity, strong presence of local-serving retail and service uses, and well-integrated public facilities.
- Designate locations for new development with the location-efficient features of close-in compact communities.
- Identify locations where multi-modal connectivity to urban centers can be improved.
- Adopt and apply performance and development standards that encourage moderate-density, mixed-use infill development, such as multi-modal LOS and reduced parking requirements.



## Transportation Projects and Programs

### Likely priorities in close-in compact communities:

- Complete streets projects. (Health and Safety, Environmental Stewardship)
- Reliability and efficiency measures to optimize use of street and freeway capacity (Reliable Mobility, Robust Economy)
- Street network connectivity including an extensive network of bicycle facilities and continuous pedestrian facilities with high amenity level. (Reliable Mobility, Location Efficiency, Social Equity)
- Ongoing re-investment in existing facilities to protect asset value. (Robust Economy, Environmental Stewardship)
- Addition of HOV systems on freeways that provide access to urban centers. (Reliable Mobility, Location Efficiency, Robust Economy)
- Transit centers and high capacity transit stations accessed primarily by walking, bicycling, and interconnecting transit, with managed parking supply. (Location Efficiency, Health and Safety, Social Equity)
- High capacity transit linking neighborhoods to employment centers and regional institutions in urban centers. (Social Equity, Location Efficiency, Robust Economy, Environmental Stewardship)
- Local transit with excellent coverage providing connections to high capacity transit lines. (Social Equity, Location Efficiency, Robust Economy)

## Development and Conservation Projects and Programs

### Likely priorities in close-in compact communities:

- Because many close-in compact communities are in older parts of their regions, priority may be on neighborhood enhancement and revitalization rather than on new development. (Social Equity, Environmental Stewardship)
- Preservation and addition of affordable housing (Social Equity, Location Efficiency)
- Where housing or commercial uses are to be added, complementary priority given to maintaining or improving public safety and other services as well as providing access to open space and other contributors to livability. (Social Equity, Location Efficiency)
- Where many residents lack access to basic daily needs such as full-service supermarkets, creating complete neighborhoods should be a priority from both the Smart Mobility and livability perspective. Availability of these services is an important element in reducing both vehicle trips and trip lengths while responding to quality of life concerns. (Social Equity, Location Efficiency)
- Open space for active and passive recreation, connectivity to regional open space as indicated by regional plans (such as green printing plans integrated with transportation blue prints). (Environmental Stewardship, Location Efficiency)

## Close-in Compact Communities

# Compact Communities

## Smart Mobility Framework

Compact communities offer the Smart Mobility benefits associated with a strong presence of Community Design elements, but without the benefits of regional accessibility that are created by central location in a metropolitan region. Many Smart Mobility benefits can be achieved in compact communities. However, because these places are either outside of or peripheral to metropolitan regions, as well as being small concentrations of activity when compared to major urban cores, prospects for increased transit use and other benefits of regional accessibility are limited. Nonetheless, Community Design elements such as compact development form, land use mix, relatively high densities, and centrally-located public institutions create efficiencies and opportunities for walk and bike trips to be important modes and for average vehicle trip length to be shortened. Particularly in areas with nearby large employment centers, rideshare may be an important Smart Mobility mode, and its share may exceed transit share for commute trips.

Location efficiency is often higher in compact communities than in surrounding areas, which may be rural or agricultural lands or isolated suburban communities. The priority is on maintaining transportation facilities and services that contribute to location efficiency, and integrating those with supporting development features. Increased development footprint should be avoided unless there is significant population or economic growth that justifies urban expansion.

Reliability is provided through convenient walk and bike trips, and is likely to be a priority for transit operations given the fact that these areas typically cannot support high service frequency.



The historic character that adds uniqueness to many of the state's compact communities makes compatibility of facilities with their surroundings particularly important. Stewardship of natural resources and agricultural production capacity calls for carefully planning any outward growth, and maintaining a compact development footprint.

## Planning

### Key Activities:

- Designate areas where there are opportunities to increase location efficiency through an emphasis on location-efficient community design elements and on providing a range of multi-modal transportation facilities and services.
- Designate areas that will evolve to become compact communities. These will typically be either (1) suburban communities, corridors and centers outside of or peripheral to metropolitan regions, or (2) rural settlements appropriate for future urbanization.

## Transportation Projects and Programs

### Likely priorities in compact communities:

- Pedestrian facilities with high amenity levels. (Health and Safety, Location Efficiency, Social Equity, Reliable Mobility)
- Extensive network of bicycle facilities; bike sharing programs. (Health and Safety, Location Efficiency, Social Equity, Reliable Mobility)
- Projects providing service, facility, and connectivity improvements to provide an equivalent level of activity connectedness to all population groups and all location-efficient places. (Social Equity, Reliable Mobility)
- Convenient opportunities for multi-modal transfers and transit transfers. (Reliable Mobility, Location Efficiency)
- High degree of design compatibility for all facilities. (Environmental Stewardship)
- Ongoing re-investment in existing roadway facilities to protect asset value. (Robust Economy)
- Allocation of street space to benefit fronting land uses and non-motorized modes (“complete streets”)—e.g. road diets that reduce the number of through travel lanes and other cross section changes. (Robust Economy, Environmental Stewardship, Health and Safety)

## Implementation: Development and Conservation Projects and Programs

### Likely priorities in compact communities:

- Moderate-to-high density mixed-use development. (Location Efficiency)
- Mixed-income housing in highly-accessible locations. (Social Equity, Location Efficiency)
- Cultural, medical, and educational destinations in locations with excellent activity connectedness. (Location Efficiency)
- Public services including schools and parks in highly-accessible locations (Location Efficiency)
- Appropriate design character for all development in this place type. (Environmental Stewardship)

## Compact Communities

# Suburban Communities

## Smart Mobility Framework

Relative to the principle of location efficiency, suburban communities are characterized by weak presence of community design elements and variable presence of the regional accessibility elements that contribute to location efficiency. Suburban communities will be impacted by these factors for years to come. Achieving Smart Mobility benefits in suburban communities is difficult. These challenges point to the importance of minimizing the creation of new suburban communities, i.e. places ranking poorly relative to both of the Smart Mobility factors. This does not mean that lower-to-moderate density development should be prevented. Rather, all efforts should be made to direct the form of new development so that new compact communities or close-in compact communities are encouraged and incentivized while new suburban community characteristics are discouraged.

New lower-density development should be in the form of urban neighborhoods or compact communities that are characterized by complete community design and whenever possible by high regional accessibility. All levels of government should work together to minimize the creation of new suburban communities because they are characterized by few location efficiency factors, and the absence of these factors will work against efforts to control GHG emissions and maintain a healthy economy and economy. Instead, new development should be in the form of compact communities, whether close-in or in planned locations remote to urban centers.

The overall Smart Mobility strategy for suburban communities is to transition suburban centers and corridors to close-in compact centers and corridors. Higher density development with location-efficient community design elements would be concentrated in these transition areas. Larger suburban centers may transition to urban centers, which will create regional accessibility benefits for surrounding suburban communities. The implementation possibilities identified below reflect this emphasis on transition away from suburban centers and corridors. Section 3.4 further addresses place type transitions. Stewardship priorities underlie the Smart Mobility Framework for transitioning away from suburban



communities to compact communities and urban centers, with a focus on change in suburban centers and corridors.

In suburban communities, freeway and arterial widening projects, including HOV systems, should be undertaken only when they can be demonstrated to be unlikely to generate increased pressure on outlying lands for suburban expansion. For the same reason, new interchanges on existing freeways should be constructed only where they are tied directly to adopted local and regional plans for new location efficient growth as evidence by SMPMs.

A strong presence of location efficiency factors is difficult to achieve in suburban communities, which is the main reason for the Smart Mobility Framework's emphasis on transformation to other place types. Within suburban communities, activity is relatively concentrated in suburban centers, so suburban opportunities for location efficiency are typically best there.

The principle of Reliability supports an approach to street and intersection operations that focuses on providing predictable travel times through traffic and incident management. Health and Safety principles direct attention in particular to conditions on suburban arterials, many of which lack basic accommodation for bicyclists and pedestrians. Slower speeds and improved facilities will address paramount safety concerns as well as promoting public health outcomes.

### Planning

#### Key Activities:

- Identify centers and corridors that can be transformed into more location-efficient places. Plan for them in terms of land use, urban design character, and transportation services. Given the high level of public investment and the lengthy time horizon required to stimulate these changes, locations should be prioritized to align with market potential and other community objectives.
- Identify near term opportunities to improve health and safety through active travel, safe routes to school programs, and traffic safety initiatives.

### Transportation Projects and Programs

#### Likely priorities in Suburban Communities places:

- Investments that improve the operational efficiency of existing arterial and freeway corridors. (Reliable Mobility, Robust Economy)
- Projects that improve connectivity leading to shorter average trip lengths and increased non-auto mode share. (Location Efficiency, Environmental Stewardship, Health and Safety)
- Investments in “complete streets” and safe routes to school measures that improve conditions for walking and bicycling. (Health and Safety, Social Equity, Location Efficiency)

- Access management and speed management on the arterial system. (Reliable Mobility, Health and Safety)
- Where there are concentrated employment centers, commute transit service and rideshare promotion. (Social Equity, Location Efficiency, Environmental Stewardship)

### Development and Conservation Projects and Programs

#### Likely priorities in Suburban Communities:

- Where high capacity transit stops and stations are located along high capacity transit corridors between cities, transit oriented development with managed parking and car and bike share at stations. (Reliable Mobility, Robust Economy, Environmental Stewardship)
- Strategic redevelopment of commercial corridors and dedicated use areas such as large shopping malls and business parks, in order to incorporate Location Efficiency factors. (Location Efficiency)
- Strong presence of community design factors for all new construction. (Environmental Stewardship, Location Efficiency)

## Suburban Communities

# Rural and Agricultural Lands

## Smart Mobility Framework

Rural settlements will continue to depend on a high level of automobile use because origins and destinations are dispersed and congestion is a relatively minor concern. A Smart Mobility approach should focus on:

### In rural towns:

- Maintaining and creating walkable rural towns with streets that are operated and designed for speeds suitable for their context and safety for all users.
- Centrally locating community-serving uses (public and private) in rural towns
- Using a flexible approach to design and operations of state highways operating as Main Streets, as described in Caltrans' Main Streets: Flexibility in Design and Operations ([www.dot.ca.gov/hq/oppd/context/mainstreets2005.pdf](http://www.dot.ca.gov/hq/oppd/context/mainstreets2005.pdf))

### In agricultural lands:

- Safety for all modes on rural roads.
- Limiting significant SOV capacity expansions (including new freeway interchanges) to avoid inducing unplanned growth.
- Preventing circulation network patterns and/or subdivision patterns that will lead to suburbanization, i.e., not increasing network connectivity in agricultural areas except when required for goods movement.
- Adequate freight capacity for movement of inputs and products.
- In areas with strong tourism components in the local economy, weekend and holiday season visitor-oriented transportation services focused on customer satisfaction and compatibility with area character.

In active farming, vineyard, and grazing areas, the emphasis of Smart Mobility strategies will be on providing access for workers, suppliers, and delivery of products, and on minimizing direct and indirect adverse impacts of transportation facilities on the agricultural economy. These adverse impacts can include fragmentation of agricultural



lands into patches that threaten viable operations, and growth inducing effects that can result in new development in inappropriate locations and forms. Lands in agricultural production are often in a relatively complex pattern with rural settlements.

Agricultural lands and protected lands (discussed below) offer urban form benefits, helping to shape the development footprints of both urban areas and rural towns. In some cases, roads can have a positive function as separators between agricultural and urban properties.

Location efficiency works differently in rural towns than in rural settlements and agricultural lands. In towns, location efficiency derives from a strong presence of Community Design factors. Central location of public facilities such as schools, hospitals, libraries, and post offices in rural towns is an important Regional Accessibility element. In rural settlements, location efficiency is achieved when infrastructure investments are appropriately scaled to the overall modest level of travel demand.

Stewardship has multiple focuses in Rural and Agricultural places. First is the protection of rural character and agricultural resources through concentrating development in towns and compact communities. Stewardship of the rural roads system through asset management is another component. Support for concentrating activities in walkable rural towns and maintaining the rural character of agricultural settlements aims to prevent impacts to natural resources that can be caused by dispersed activities, rural subdivisions, and inappropriate road network connectivity.

### Planning

#### Key activities:

- Map areas that are to retain rural identity for the long term.
- Mapping the boundaries between rural towns, surrounding settlements, and agricultural lands.
- Create cooperative planning processes including local governments, Caltrans, and other stakeholders when rural town main streets are part of the State Highway System.
- Designate lands for long-term agricultural use and distinguish them from rural towns and settled areas with different mobility needs.
- Identify transition areas between urban and suburban places and agricultural/rural ones.
- Identify key routes for goods movement.

### Transportation Projects and Programs

#### Likely priorities in rural and agricultural places:

- Outside of towns, safety improvements to walking and bicycling facilities on rural roads. (Health and Safety)
- Inside towns, walking and bicycling facilities focused on connectivity and comfort. (Location Efficiency, Health and Safety)
- Demand-responsive transit and inter-city transit connecting to major destinations such as hospitals and community colleges. (Social Equity, Reliable Mobility)
- If there are concentrated work destinations within commute distance, park and ride lots associated with freeway interchanges and regional transit services. (Environmental Stewardship)
- High-quality demand-responsive transit and intercity transit services. (Social Equity, Reliable Mobility)

- Network connectivity enhancements within towns. (Health and Safety, Reliable Mobility)
- Visitor-oriented transportation services, particularly in locations with very strong weekend or holiday peak demand. (Robust Economy, Reliable Mobility)
- Network connectivity including required access to inter-regional network needed for movement of agricultural goods and inputs. (Robust Economy)
- Effective speed management at the transition from highway to rural town and on main streets in rural towns accompanied by reduced speeds to maintain and create walkable rural towns in designated locations (Health and Safety, Location Efficiency, Reliable Mobility)

### Development and Conservation Projects and Programs

#### Likely priorities in rural and agricultural lands:

- Public facilities located in, or, for larger facilities such as schools, immediately adjoining rural towns. (Location Efficiency, Reliable Mobility)
- Full range of needed services and public facilities in rural towns. (Location Efficiency)
- Housing in rural towns meeting the needs of permanent and seasonal rural workers. (Social Equity, Location Efficiency)
- Where it does not presently exist, establishment of regulatory and taxation framework that supports long-term agricultural uses consistent with planning. (Environmental Stewardship)
- Appropriate design character for all development in this place type. (Environmental Stewardship)
- Outside of towns, open space preservation for natural resource value, with connectivity to natural and open space systems. (Environmental Stewardship)

## Rural and Agricultural Lands

# Protected Lands

## Smart Mobility Framework

Protected lands have a resource management focus and weak presence of location efficiency factors. Stewardship of natural resources is the primary principle directing Smart Mobility Framework and actions. The Smart Mobility Framework emphasizes the provision of transportation infrastructure to and through protected lands only when consistent with resource preservation and management, or when required for connectivity. Location efficiency dictates that because protected lands have an extremely low level of land use activity there should be a correspondingly low level of investment in transportation infrastructure.

Lands protected from development have the following roles in a Smart Mobility vision:

- Helping to shape development patterns of both urban areas and rural settlements.
- Providing natural setting for urban areas with habitat, watershed, and other resource values as well as providing aesthetic value.
- Serving as receiving areas for mitigation activities and/or a sending area for density transfers arising from other place types.
- Protected lands include areas of natural hazard where limited or no access is appropriate.

Reliability is a factor in those protected lands that are used for resource management or recreation, with a focus on maintaining access through extreme weather events and maintaining roads in good repair for goods movement and an appropriate level of public access.

## Planning

### Key Activities:

- Use of resource maps in delineating all place types.
- Identification of protected lands where commercial uses such as timber operations require capacity for goods movement.



## Transportation Projects and Programs

### Likely priorities for protected lands:

- Capacity and connectivity increases only when required for resource preservation and management and consistent with planned levels of public access. (Environmental Stewardship, Location Efficiency)
- Where public access and recreational use is permitted, bicycle facility, and trail projects. (Environmental Stewardship, Health and Safety)
- Connectivity increases through protected lands only when no other options are available to provide required interregional connectivity. (Robust Economy, Environmental Stewardship)

## Implementation: Development and Conservation Projects and Programs

### Likely priorities for protected lands:

- For any lands not fully protected, projects and programs should assure permanent retention in open space/resource conservation status. Green prints that identify important natural resource lands and working landscapes can provide opportunities to align open space protection efforts with regional blueprints. (Environmental Stewardship)

## Protected Lands



# Special Use Areas

## Smart Mobility Framework

Places as diverse as military installations, airports, ports, and large industrial zones are included in this place type. This variety means that there is not a consistent Smart Mobility approach for this place type. The emphasis is on using the full set of principles, decision support tools, and performance measures to craft distinct approaches to each single use area.

In single use areas, location efficiency is typically low by virtue of the fact that these areas will not offer a strong presence of location-efficient community design factors. In fact, adverse impacts generated by some of these areas mean that principles such as public health and safety may best be achieved through separation rather than integration with other activities. When single use places include essential functions with respect to regional and State economies, they may receive high investment priority even if they have low location efficiency.

When single use areas are employment centers that attract workers from surrounding places, such as commercial airports, the reliable mobility principle is particularly relevant.

## Planning

### Key activities:

Delineation of special use areas with particular attention to:

- Access and connectivity needs specific to use and location (such as the need for airports to be highly connected to the surface transportation system for passengers and freight).
- Role of the area as a local, regional, and subregional trip generator of passenger trips or goods movement, particularly during peak hours.



- Issues regarding health, safety, and environmental impacts arising from the particular activities and mobility characteristics of the use (such as health concerns associated with diesel exhaust emissions from traffic generated by port facilities).
- Long-term plans such as decommissioning of military installations or transition away from industrial use. These plans may shift areas presently in single use into a different place type.
- Surrounding context and level of connectedness to surroundings.

## Transportation Projects and Programs

*Derived from information gained during Planning.*

## Development and Conservation Projects and Programs

*Derived from information gained during Planning.*

# Special Use Areas

### 3.4 Place Type Transitions

Place types are tools to guide change so that communities evolve to achieve higher levels of Smart Mobility benefits. With significant population and economic growth projected for the State in the coming decades, change is a certainty in California communities. The place type tool, in combination with the Smart Mobility principles, sets the stage for strategic decision making about which transportation programs and projects represent a Smart Mobility Framework as cities and towns change over time.

Using place types as a planning and programming tool requires a focus on place type transitions over time. Through planning, investment decisions, and policy-making involving local communities, places should be identified as primarily fitting into one of two categories:



**Anchored Places.** Places in which the presence of location efficiency factors will increase over time, but where a single Smart Mobility Place Type framework will consistently apply. In these places, investment decisions would be based on enhancing the presence of location efficiency factors. For example, regional accessibility in an urban core area might be improved with express commute buses to outlying employment centers, or by increasing the supply of affordable housing within walking distance of high capacity transit. Such changes will yield Smart Mobility benefits without changing a place type designation. Generally, anchored places will be:

- Urban centers,
- Compact communities,
- Protected lands, and
- Lands in long term agricultural use



**Transitional Places.** These places will be targeted for significant change, “evolving” over time to feature a significantly greater presence of location efficiency factors that justifies a change in Smart Mobility Place Type framework. For example, a large suburban business park might be slated to evolve into a true downtown through the addition of housing, neighborhood park, and school, and complete streets. These fundamental changes would rep-

resent a transition from a suburban dedicated use area to a close-in compact community center. In transitional places, investment emphasis is on supporting evolution to different place types with greater potential for Smart Mobility benefits. The place types most suitable as the goals of transitioning areas or areas that are newly developing are:


















- Urban centers
- Close-in compact communities
- Compact communities
- Rural towns (in limited cases where agricultural areas are insufficiently supported by centers for commerce, services and compact development)

Exhibit 9 provides an overview of transition possibilities and possible investment emphasis in anchored places. In most cases, planning and policy-making activities including community engagement will be essential in determining whether locations are anchored or transitional, and, if they are transitional, what their future form will be.

Some of the place type designations represent a clear call for transition over time, while others can function successfully with respect to Smart Mobility under either anchored or transitional scenarios. As discussed above in the “Smart Mobility Framework” descriptions for each of the place types in Section 3.3, Guidance for Place Types, there is a prescriptive implication to designating places in the “Rural and Agricultural Lands” and “Protected Lands” categories. Infrastructure investments should not induce changes in these places that will lead to their conversion to places with low location efficiency. Similarly, designation of suburban communities indicates emphasis on transition in order to achieve the elements of Community Design that contribute to location efficiencies.

The designations as “anchored” or “transitional” place types apply generally and point to overall investment and management strategies. Exceptional locations will certainly be found.

## Exhibit 9: Place Type Transitions

<b>Anchored Place Types</b>		Investment emphasis is on increasing the presence of location efficiency factors that heighten Smart Mobility benefits.
<b>Transitional Place Types</b>		Investment emphasis is on supporting evolution to different place type with greater potential for Smart Mobility benefits.
Place Type	Smart Mobility Emphasis	Ultimate Place Type
<b>Urban Centers</b>		Urban Center
<b>Close-in Compact Communities</b>	 or 	Close-in compact communities or Urban Centers
<b>Compact Communities</b>		Compact Communities
<b>Suburban Communities</b>		
Centers, Corridors, and Dedicated Use Areas		Depending on regional accessibility and development intensity: <ul style="list-style-type: none"> <li>• Close-in compact communities,</li> <li>• Urban Centers, or</li> <li>• Compact Communities.</li> </ul>
Neighborhoods	 or 	Depending on regional accessibility and level of change attainable in presence of community design elements: <ul style="list-style-type: none"> <li>• Suburban neighborhoods,</li> <li>• Close-in Compact Community neighborhoods, or</li> <li>• Compact Communities</li> </ul>
<b>Rural Towns</b>	 or 	Depending on level of change attainable in community size and development intensity: <ul style="list-style-type: none"> <li>• Rural Towns or Compact Communities</li> </ul>
<b>Rural Settlements</b>	 or 	Depending on level of change attainable in community size and development intensity: <ul style="list-style-type: none"> <li>• Rural Towns or Compact Communities</li> </ul>
<b>Agricultural lands</b>		Agricultural lands
<b>Protected Lands</b>		Protected Lands
<b>Special Use Areas</b>	 or 	Variable depending on specific characteristics

## 3.5 Matching the Place Types to Real Places

The Smart Mobility Place Types are general. The guidance presented in Section 3.3 for achieving Smart Mobility in these places will be relevant in many cases, but variation and a greater level of differentiation will be needed to fit particular circumstances. Many places will have characteristics of multiple place types. Judgment, data, and creativity will be needed to craft appropriate distinctions and sensitive strategies.

The place type guidance in Section 3.3 will be most helpful when the following points are considered during the process of making planning and investment choices:

- Small variations in place type often do not affect the ability to attain Smart Mobility benefits. Differences that are important with respect to community character, market value, or appropriate use are not necessarily important with respect to mobility outcomes.
- The Location Efficiency factors of community design and regional accessibility are consistently significant, so the presence or absence of these factors should almost always be important factors in making transportation investment, planning, and management decisions.
- The resources, references, and best practices identified in this publication can be helpful in developing additional place types specific for the region or jurisdiction being reviewed, or refining the place types presented here.
- Empirical data from the selected locality or others with well-matched characteristics should be used to support the need to define additional place types or to confirm the relevance of the Smart Mobility Place Types.
- A number of California agencies are already using place types in their planning efforts. Materials from these efforts cited in Chapter 6 provide useful models for more detailed and region-specific types that are consistent with Smart Mobility aims.



# 4 Using Performance Measures to Advance Smart Mobility



- The purpose of Smart Mobility performance measures (Section 4.1)
- 17 performance measures and their relationship to Smart Mobility principles (Section 4.2)
- How the performance measures can be used to help achieve key objectives that synthesize the Smart Mobility principles: multi-modal focus, speed suitability, activity connectedness, network management and land use efficiency (Section 4.2)
- How the performance measures relate to Caltrans planning and project development processes, and identification of the methods and data used to apply the Smart Mobility measures (Section 4.3)
- How the performance measures apply in different place types and facility types (Section 4.4)
- The relationship of Smart Mobility performance measures to the California Transportation Plan “mobility pyramid” (Section 4.5)
- The benefits of Smart Mobility performance measures to Caltrans policy-making, planning, project development, and prioritization (Section 4.6)

## Key Concepts from Chapter 4:

California transportation agencies can integrate Smart Mobility principles into policies, planning and project development activities through a set of 17 performance measures relating to the six Smart Mobility principles: **Location Efficiency, Reliable Mobility, Health & Safety, Environmental Stewardship, Social Equity, and Robust Economy.** The Smart Mobility performance measures are similar to metrics presently used by Caltrans, but they are redefined and reemphasized to better achieve the Smart Mobility Principles.

The seventeen Smart Mobility Framework performance measures are:

- |                                  |                                     |   |
|----------------------------------|-------------------------------------|---|
| ■ Support for Sustainable Growth | ■ Multi-Modal Safety                | ■ Equitable Distribution of Access and Mobility |
| ■ Transit Mode Share             | ■ Design and Speed Suitability      | ■ Congestion Effects on Productivity            |
| ■ Accessibility and Connectivity | ■ Pedestrian and Bicycle Mode Share | ■ Efficient Use of System Resources             |
| ■ Multi-Modal Travel Mobility    | ■ Climate and Energy Conservation   | ■ Network Performance Optimization              |
| ■ Multi-Modal Travel Reliability | ■ Emissions Reduction               | ■ Return on Investment                          |
| ■ Multi-Modal Service Quality    | ■ Equitable Distribution of Impacts |   |

Use of the new measures will place Caltrans within the growing group of state departments of transportation (DOTs) and regional agencies implementing similar Smart Mobility performance measures. As a group, the proposed measures facilitate Caltrans' role in context-sensitive solutions, regional blueprints, sustainable communities strategies, corridor system management plans, and interstate commodity movement, and are applicable in a full range of Caltrans studies.

Place types, as defined in Chapter 3, affect the relative degree of emphasis applied to individual Smart Mobility performance measures. Different user needs and physical and natural environments dictate that:

- Within certain performance measures, the degree of emphasis applied to different travel modes and user groups should vary by place type.
- The priority applied to individual performance metrics should vary as a function of place type.

Which performance measures are emphasized and how they are calculated also varies by transportation facility type. Freeways, expressways, arterials, collectors, and rural highways each differ in terms of emphasis on access versus through traffic and use by different modes of travel.

Use of the Smart Mobility performance measures at all stages of planning and project development will ensure that broader economic, social, and environmental considerations are addressed and will help implement Caltrans' strategic vision for the State economy, natural and built environment and the needs of the traveling public.

## 4.1 Performance Measures: Definition and Purpose

Performance measures provide quantified evidence of the consequences of a decision or action. Performance measures are an efficient means through which to present key information for system users, managers and decision makers in an objective, concise and consistent format.

Transportation performance measures forecast, evaluate, and monitor the degree to which the transportation system accomplishes adopted public goals and mobility objectives. Smart Mobility Performance Measures (SMPMs) demonstrate the relationship between integrated transportation and land use decisions and the consequent effects on the full range of economic, social, and environmental conditions. SMPMs are intended for use in decision-making at both the planning and the project level to evaluate progress toward implementing the principles of Smart Mobility and attaining Smart Mobility benefits.

The SMPMs presented in this chapter were identified through a multiple step process:

- Agreement by Caltrans and its partner agencies and stakeholders on a set of Smart Mobility principles during the first phase of the Smart Mobility Framework discussion.
- Consultant review of current Smart Mobility practices in California and other states.
- Suggestions provided by Caltrans and other state and regional agencies, stakeholders and transportation planners at the September 2008 Smart Mobility Framework workshop.
- Additional research on successful Smart Mobility concepts, and interviews with key representatives of Caltrans, California Department of Housing and Community Development (HCD), Governor's Office of Planning and Research (OPR) and California Transportation Commission (CTC), and meetings with project management and review committees.
- Committee review of a draft Smart Mobility publication in May 2009.

- Presentations and feedback received at additional widely-attended Smart Mobility workshops in June 2009, including hands-on testing of the performance measures by workshop participants.
- Further refinements to performance measures based on comments received on the May 2009 draft publication and the June 2009 workshop.

## 4.2 Smart Mobility Performance Measures

SMPMs evaluate the degree to which Caltrans policies and planning decisions advance the six Smart Mobility principles:

- Location Efficiency
- Reliable Mobility
- Health and Safety
- Environmental Stewardship
- Social Equity
- Robust Economy

The principles are integrated into Caltrans planning and project development activities through 17 performance measures as shown below in Exhibit 10.

Each of the 17 SMPMs is quantified through a series of metrics presented in Exhibit 11.

### Location Efficiency

The Location Efficiency principle encourages integration of transportation and land use to reduce the needs for vehicle trip making and trip lengthening in a manner that contributes to California's economic well-being, environmental stewardship, health and safety, social equity and mobility. In Caltrans planning practices, Location Efficiency will be measured and evaluated in the following ways:

- 1. Support for Sustainable Growth**—measures the extent to which transportation decisions accommodate and incentivize population and economic growth consistent with regional sustainable communities strategies or alter-



## Exhibit 10: Smart Mobility Performance Measures

Principle	Performance Measure*
Location Efficiency	1. Support for Sustainable Growth
	2. Transit Mode Share
	3. Accessibility and Connectivity
Reliable Mobility	4. Multi-Modal Travel Mobility
	5. Multi-Modal Travel Reliability
	6. Multi-Modal Service Quality
Health and Safety	7. Multi-Modal Safety
	8. Design and Speed Suitability
	9. Pedestrian and Bicycle Mode Share
Environmental Stewardship	10. Climate and Energy Conservation
	11. Emissions Reduction
Social Equity	12. Equitable Distribution of Impacts
	13. Equitable Distribution of Access and Mobility
Robust Economy	14. Congestion Effects on Productivity
	15. Efficient Use of System Resources
	16. Network Performance Optimization
	17. Return on Investment

\* Most of the performance measures relate to multiple principles. This Exhibit groups each of the performance measures with the principle with which it is most strongly related.

native planning strategies meeting regional performance standards required under California's new planning and climate law (SB 375). It also measures the effects of land consumed by transportation infrastructure itself and the system's effects on shifting development to sensitive or inefficient locations.

**2. Transit Mode Share**—measures effectiveness of transit components of multi-modal corridor and regional transportation plans. It also indirectly indicates the benefits of transit use to congestion, energy consumption, and GHG emissions.

**3. Accessibility and Connectivity**—measures the ability of travelers to reach destinations efficiently by a variety of travel modes through location-efficient transportation and land use. This efficiency includes the balance and the socio-economic fit between housing supply and employment.

Exhibit 11 provides metrics used to quantify each of the Location Efficiency performance measures.

## Reliable Mobility

Reliable Mobility is a principle that resolves to manage, reduce and avoid congestion by emphasizing multi-modal options and transportation network management. For travelers, it emphasizes predictability of travel times and costs. The Reliable Mobility principle also allows for transportation system capacity increases when those increases are focused on accommodating productive forms of travel. It will be evaluated through the following measures:

- 1. Multi-Modal Travel Mobility**—measures absolute and comparative travel-time efficiency and traveler information available to users of all modes: walking, cycling, transit, carpooling, driving for individuals as well as for commercial freight.
- 2. Multi-Modal Travel Reliability**—emphasizes predictability of travel time for users of all modes, allowing for routine differences based on time and day.
- 3. Multi-Modal Service Quality**—or level of service (LOS), balances the transportation system’s provision of efficiency and comfort among users of all travel modes. LOS is a measure of customers’ satisfaction with the travel experience, and multi-modal LOS encourages multiple safe, efficient travel choices. Multi-modal Service Quality also encourages concepts such as Complete Streets, which offer comparable levels of comfort and safety for users of all travel modes.

Metrics by which the three Reliable Mobility performance measures may be quantified are listed in Exhibit 11.

## Health and Safety

Health and Safety, as a Smart Mobility principle, emphasizes the well-being of the traveling public and all Californians. It prioritizes integrated transportation systems and services that support healthy life styles, minimize environmental risks, protect travelers from hazardous conditions, and support emergency preparedness. It promotes designs and management practices that reduce serious injuries and fatalities, encourage active living, and lessen exposure to pollution. Health and safety are addressed through the following performance measures:

- 1. Multi-Modal Safety**—addresses collision rates and severity for all users, including transit users, pedestrians, cyclists.
- 2. Design and Speed Suitability**—defines physical elements and dimensions of streets and other transportation facilities to be compatible with adjoining land uses and the comfort and safety of pedestrians and bicyclists. It also prescribes operational design that achieves traffic speeds compatible with land use context and safety for all modes. It is directly associated with the design principles supporting Context Sensitive Solutions and Complete Streets.
- 3. Pedestrian and Bicycle Mode Share**—measures the effectiveness of pedestrian and bicycle elements of multi-modal corridor and regional transportation plans in terms of their ability to encourage non-motorized travel, and provide the related benefits to congestion, energy consumption and GHG emissions.

Exhibit 11 presents metrics through which to measure the Health and Safety elements of the transportation system.

## Environmental Stewardship

Environmental Stewardship strives to protect and enhance the State’s built and natural environments. This includes minimizing the transportation sector’s emission of pollutants and GHGs that contribute to global climate change.

Climate change considerations are integral to Environmental Stewardship. AB 32 and SB 375 require that transportation and land use be planned in concert with one another, so that all mandated Regional Transportation Plans (RTPs) contain “sustainable communities strategies” and that all land use and transportation plans and environmental assessments include carbon-dioxide (CO<sub>2</sub>) GHG analyses. These requirements will affect how Caltrans and regional and local planning organizations measure the performance of their plans and projects. The list of recommended metrics relevant to climate change includes not only performance measures associated with Environmental Stewardship, but also measures that consider the effects of additional capacity and operation efficiency on induced travel and long-term congestion levels.



Source: Ellen Greenberg

Caltrans and other state, regional and local agencies regularly measure a wide array of environmental factors in project development and review processes through Environmental Impact Reports and other documents prepared under the CEQA. These include noise impacts; environmental justice; consumption of agricultural, habitat, wetlands, ecologically-sensitive land; system condition; sustainable system maintenance and operating practices; equipment and recyclable materials. The recommended Smart Mobility Framework performance measures include only new measures which are not specifically or consistently used by Caltrans as of November 2009, with the expectation that Caltrans and partner agencies will also continue to apply other CEQA required evaluation criteria. The two new performance measures recommended under the Smart Mobility Framework are:

**1. Climate and Energy Conservation**—measures the effect of transportation and related land use decisions on the management of vehicle miles traveled (VMT) and compares resulting emissions to State mandated regional targets. In addition to VMT, this performance measure also takes into account the speed and stability of traffic flow, and the numbers and lengths of trips generated, as these factors also influence total GHG production and fuel consumption. GHG emissions and energy consumption are also measures of the successfulness of location-

efficiency and transportation management measures within regional sustainable communities strategy.

**2. Emissions Reduction**—addresses climate and criteria pollutant impacts at the project and regional levels.

Exhibit 11 provides related performance metrics.

## Social Equity

Smart Mobility involves the advancement of social equity in all aspects of infrastructure construction and system operation. It reflects the priority of providing mobility for people who are economically, socially or physically disadvantaged in order to support their full participation in society. Performance measures that evaluate the degree to which the design and management of the transportation system equitably distribute its benefits and burdens are:

**1. Equitable Distribution of Impacts**—assesses the degree to which planning decisions place transportation infrastructure and location-efficient land use in a manner that avoids inequitable impacts. As an example, such inequities might include disproportionate dislocation of different socio-economic groups, including the low-income, minority, disabled, young and elderly.

**2. Equitable Distribution of Access and Mobility**—measures the degree transportation system elements and services offer equitable benefits in terms of the time and costs associated with access and mobility for different socio-economic groups.

Exhibit 11 provides the metrics used to quantify these Social Equity performance measures. Consistent with current practice, equity considerations apply fully within each SMPM. All metrics are to be applied equitably across all socio-economic groups. Multi-modal metrics should be expressed individually by mode of transportation for both passengers and freight, and should be expressed in terms of user experience. Evaluation of roadway pricing strategies, for example, should take into consideration the proportions of affected travelers within different income strata and ethnic populations and present the relative degrees of benefit and impact to each affected group. Reporting should also identify the relative numbers of affected individuals within each group.

In some cases, impacts should be presented, instead of simply in dollars or time lost, in terms of cost as a percentage of income. For equity assessment, the following performance metrics should be quantified in terms of comparative benefits and impacts to individual socio-economic groups: modal collision rates and severity, design and speed suitability, modal travel-time mobility, modal travel-time consistency, activity connectedness, pedestrian and bike mode share, transit mode share, productivity lost to congestion, network optimization, return on investment, VMT per capita, energy consumption, emissions, land use efficiency, and multi-modal service quality.

## Robust Economy

Smart Mobility supports a competitive economy with a multi-modal transportation system that is responsive to travel demand associated with productive and sustaining travel. California's economy and its role in national and international commerce are important criteria influencing the State's transportation investment and impact decisions. Smart Mobility principles recognize the need for a reliable multi-modal transportation system for interregional and interstate travel. A conventional mobility measure, lost time due to congestion, can be a misleading indicator as not all time has similar impacts to the State's economy. For purposes of Smart Mobility, the measure is transformed from aggregate time lost to productivity lost. With the revised measure, the per hour cost of delay to recreational trips would be less than for a work-related trip, which in turn would be considered less costly to State productivity than delay to commercial freight movement. Measures of the effectiveness of transportation support to the economy include:

- 1. Congestion Effects on Productivity**—measures how successfully the transportation system minimizes economic productivity lost to congestion. It differentiates types of travel by relative economic value, deemphasizing “induced” travel in favor of productive and sustaining travel.
- 2. Efficient Use of System Resources**—measures the extent to which prospective expansion of the transporta-

tion system would successfully serve additional economically-productive travel and sustaining travel. It distinguishes these forms of travel from, and attempts to limit, induced development and travel. It also assesses the costs and environmental impacts of the expansion.

- 3. Network Performance Optimization**—promotes network-efficiency management, including intelligent transportation systems (ITS). It measures the effectiveness of such techniques in producing stable traffic flow, reducing excessive concentrations of traffic and moderating fuel consumption and emissions. It also promotes interconnected transportation networks by examining the benefit such networks have on reducing VMT and associated impacts, and emphasizes the importance of multi-modal centers such as transit hubs on the operation and benefits of alternative travel modes.

- 4. Return on Investment**—measures the relationship between plan-level and project-specific capital and operating costs and: a) Smart Mobility principles, and b) expected revenue benefits to the State economy. It also accounts for fairness of relationship between user charges and burden users place on the system.

Exhibit 11 describes metrics through which the economic effects of the transportation system may be measured.

Together the 17 measures produce an objective assessment of system performance in the context of the Smart Mobility Framework. The measures presented in Exhibit 11 represent only new measures which presently are not specifically or consistently used by Caltrans. While not specifically enumerated here, Caltrans and partner agencies will continue to apply other evaluation criteria consistent with the Smart Mobility principles, such as noise impacts, wetland and habitat impacts, universal Americans with Disabilities Act (ADA) accessibility, and system condition.

The individual SMPMs are mutually supportive, with many of them relevant to more than one principle. Together, the measures capture several important objectives that integrate the Smart Mobility

## Exhibit 11: Smart Mobility Performance Measures

Goal	Performance Measure	Recommended Metrics
Location Efficiency	1. Support for Sustainable Growth	Consistency with regional Sustainable Communities Strategy or Alternative Planning Strategy meeting regional performance standards. Comparison of alternatives based on acres of land consumed, and relative reductions in induced VMT through: compact land use strategies, demand management, and network management.
	2. Transit Mode Share	Percentage of trips within a corridor or region occurring by bus, rail or by other form of high-occupancy-vehicle.
	3. Accessibility and Connectivity	Number of households within 30 minute transit ride of major employment center, within 20 minute auto ride of employment, within walking distance of schools. Weighted regional travel time and cost among trip producers and trip attractors.
Reliable Mobility	4. Multi-Modal Travel Mobility	Travel times and costs by mode between representative origins and destinations, aggregated over corridor or region.
	5. Multi-Modal Travel Reliability	Day-to-day variability of travel times between representative origins and destinations by mode, aggregated over corridor or region.
	6. Multi-Modal Service Quality (Level of Service: LOS)	Mode-specific and blended LOS measures of pedestrian and bicycle accommodation and comfort, transit availability and reliability, and auto travel efficiency. <sup>(1)</sup>
Health and Safety	7. Multi-Modal Safety	Collision rate and severity by travel mode and facility, compared to statewide averages for each user group and facility type.
	8. Design and Speed Suitability	Conformance with guidance identifying suitable design elements and traffic speed with respect to mix of modes and adjoining land uses and area character. <sup>(2)</sup>
	9. Pedestrian & Bicycle Mode Share	Percentage of trips within a corridor or region occurring by walking or cycling.
Environmental Stewardship	10. Climate and Energy Conservation	VMT per capita by speed range relative to State and regional targets. <sup>(3)</sup>
	11. Emissions Reduction	Quantities of criteria pollutants and GHGs
Social Equity	12. Equitable Distribution of Impacts	Impact of investments on low-income, minority, disabled, youth and elderly populations relative to impacts on population as a whole.
	13. Equitable Distribution of Access and Mobility	Comparative travel times and costs by income groups and by minority and non-minority groups for work/school and other trips.
Robust Economy	14. Congestion effects on Productivity	Time lost to congestion by trips that are economically productive and/or sustaining of essential mobility, measured as vehicle hours of delay (VHD).
	15. Efficient Use of System Resources	Additional VMT that are associated with economic productivity and/or sustaining of essential mobility compared with system expansion cost and impact.
	16. Network Performance Optimization	VHD per capita, per lane mile, per private vehicle mile, per freight vehicle mile, per transit revenue mile, and in total.
	17. Return on Investment	Person miles and revenue per lane mile of road, per transit revenue mile and per dollar invested (from all public and private funding sources). Comparison of alternatives based on benefits per dollar invested relative to: a) system user benefits (time and expense), and b) other Smart Mobility Performance Measures.

<sup>(1)</sup> Typical resource: Transportation Research Board 2010 Highway Capacity Manual.

<sup>(2)</sup> Typical resources: Caltrans DD64 Complete Streets guidelines; ITE practices on Context Sensitive Solutions.

<sup>(3)</sup> Targets set by California Air Resources Board under SB375. Rates of GHG emissions and fuel consumption both vary by speed range or "bin."

principles and that figure in the definition of Smart Mobility presented in Chapter 2. These include:

■ **Multi-Modal Focus**—Several conventional Caltrans performance measures that presently focus on motorized transportation are extended in the Smart Mobility Framework to consider all transportation system users, regardless of travel mode. New multi-modal measures recommended to replace auto-oriented measures include multi-modal accident considerations, travel time, reliability (travel time consistency), and LOS. Implementing multi-modal metrics relies primarily on data and methods already available to Caltrans and other agencies, and on methods currently under development in other states or at the national level, including the new multi-modal LOS methods expected in the 2010 edition of the *Highway Capacity Manual* from the Transportation Research Board.

■ **Speed Suitability**—Smart Mobility strongly suggests altering the conventional use of “design speed” as a means of determining acceptable design features for highways and conventional roadways. Design speed is normally determined almost entirely based on facility type, with deviations permitted only in response to the most extreme alignment constraints. A concept more in keeping with Smart Mobility principles is “speed suitability”, which involves:

- Determining a context-sensitive target speed for a new facility or a redesign, taking into consideration the adjoining activities, land use and place type and the multi-modal users of the facility, and
- Designing the facility to enforce the target speed through physical design features and speed management techniques such as signal coordination.

Implementation of speed-suitability practices may require the development of a recommended practice and standards that expand existing design speed standards to a matrix of suitable speeds related to both facility type and context or place type.

■ **Activity Connectedness**—Location efficiency and stewardship considerations demand the integrated evaluation of the transportation system and the land use patterns

it serves. Transportation decisions that encourage or accommodate sprawling land use patterns are in conflict with Smart Mobility. Activity Connectedness is a metric that accounts for the travel distances and modal connections available among all activity centers within a region. It also addresses secondary effects that connectivity has on induced development and induced travel.

Transportation planning and design decisions generally derive from comparison of alternatives: build versus no-build, relative degrees of modal emphasis, one corridor versus another, alternative alignments and/or access provisions, greater capacity or speed versus lower. Each alternative is associated with a land use development pattern including the effects of induced public and private real estate investment. Conventional transportation network analysis tools can quantify the relative spatial separation among all land uses within a region and indicate the degree to which the physical arrangement of land use and transportation provides destination accessibility for all residents by one or more travel modes while minimizing overall VMT. The Activity Connectedness objective is to minimize the total travel miles within a region by reducing the separations between workers and jobs, shoppers and shopping places, families and schools, residents and civic or recreation or entertainment activities.

■ **Network Management**—Economic, environmental, mobility, and safety benefits all accrue from prudent management of the transportation network. Network optimization metrics are a means of measuring the degree to which a certain infrastructure investment accommodates the greatest number of travelers with the minimal of travel instability. The investment may be quantified in terms of capital and operating/maintenance cost, cost of natural resources and environmental impacts, and opportunity or land efficiency costs. Travel stability is important, as it measures the degree to which the transportation system is reliable, supports certain types of economic activity, and minimizes CO<sub>2</sub> and other emissions per VMT

The degree to which the network is optimized is a measure that takes into consideration the role of parallel and access-oriented transportation facilities and services in serving travel demand, as well as intelligent transporta-

tion systems (ITS) strategies such as signal coordination, ramp metering, and in-vehicle and roadside technology capable of reducing vehicle headways. It is also a more complete measure than the conventional metrics, such as facility capacity expressed in terms of peak-vehicle throughput on a single network link. Measuring network optimization can require relatively sophisticated analysis with corridor level simulation tools and can require collecting more complete data than is presently included in routine practice, such as modal utilization levels on all transportation facilities and services in a travel corridor, and traffic delay at existing congestion points. However, tools for performing such analysis have become state-of-practice on individual transportation studies industry-wide, and data collection methods are becoming more efficient. Much of the data needed for such analysis can be collected on an as-needed basis rather than routinely.

- **Land Use Efficiency**—The Smart Mobility principles of location efficiency and environmental quality emphasize reducing the overall development footprint of urbanized areas including transportation facilities. The land use efficiency metric is a single measure of successful minimization of the impacts of a transportation decision, whether it is a transportation plan and its accommodated land use, a corridor analysis of alternative transportation modes or context-sensitive solutions, or a project alignment design. Land use efficiency quantifies the acres of land consumed by the transportation project and associated land development in total and individually for types of sensitive land, including agricultural land, wetlands, and habitat. Several regional agencies within the state are developing sophisticated models to forecast the effects of land value, accessibility and other factors on development patterns. In other regions, land use efficiency assessments may rely on the expertise of real estate and economics experts.



Source: Ellen Greenberg

The SMPMs introduce several important departures from some of the measures currently applied by California transportation agencies. For example, one conventional mobility metric is travel speed. Although it is not ordinarily included among existing performance measures in Caltrans performance-related reports, design speed is a primary criterion in street and highway design and predicted peak-hour operating speed is a component of LOS measures used in environmental documents, congestion management and corridor systems project evaluation. Designing facilities for high travel speeds often induces greater amounts of travel, increasing vehicle miles and emissions and energy consumption. High speed highways can also increase the geographic spread of development, reducing location efficiency and producing environmental impacts on rural and protected lands that otherwise might not be deemed suitable for development. High speeds also raise health and safety concerns. Achieving high travel speed is not an aim of the Smart Mobility Framework.

Another example of a conventional performance metric that is at odds with Smart Mobility principles is traffic LOS. As

commonly applied, traffic LOS often leads to widening or increasing the flow rate on roadways and intersections in order to accommodate more traffic at lower levels of delay. However, the consequences of such capacity expansions often include compromising the comfort and safety afforded pedestrians and bicycles, and making substantial investments in infrastructure that, due to normal traffic peaking, is underutilized the majority of the time.

Other metrics commonly applied by Caltrans and partner agencies are in close agreement with Smart Mobility principles. These include, for example: transit, pedestrian and bicycle mode share, energy consumption, criteria pollutant emissions, and impacts on environmentally sensitive land. While many of the measures presented in Exhibit 11 are presently applied within one or more of Caltrans planning, operations, or project development functions, both the conventional and the newer among them are consistent with the Smart Mobility principles.

Exhibit 12 summarizes some of the cross-cutting benefits of the SMPMs.

### 4.3 Relationship to Caltrans Planning and Project Development Processes

As a group, the proposed SMPMs facilitate Caltrans' deliberate, active engagement in certain types of planning presently occurring at the regional and local level. Specific implementation activities are highlighted in the checklists in Appendix C .

- **Context-Sensitive Solutions**—Many California cities are proposing context-sensitive designs or retrofits for major routes through their communities. This involves reconsideration of transportation facilities' roles within their immediate environment, and it often leads to recon-

## Exhibit 12: Smart Mobility Performance Measures: Benefits to Safety, Mobility, Economy, Environment, and Land Development

- Ensuring that safety evaluations for all project types specifically consider impacts on safety for all travelers.
- Encouraging transportation networks that achieve system-wide functional objectives, while designing individual elements to address environmental and context objectives, safety needs and travel choices.
- Supporting State economy and personal mobility needs by promoting network efficiency and prioritizing the most productive forms of passenger travel and freight transport
- Providing environmental and economic benefits of reduced emissions and energy consumption through transportation efficiency and productivity.
- Generating mobility and social benefits through location efficiency of transportation and land use and provision of multi-modal connections to all destinations.
- Balancing emphasis on intra-urban travel with the economic value of State and Federal commercial trade routes and long distance passenger movement by highway or rail
- Stabilizing traffic flow to provide mobility while reducing excessive concentrations of traffic and resultant impacts on fuel consumption and emissions, and accounting for the benefits of an interconnected transportation network.
- Establishing a basis for system user charges by developing a nexus in the relationship between user benefits and the burden that user places on system.
- Measuring both the direct effect of land consumed by the transportation system and the indirect effect of shifting development to other sensitive or inefficient locations, by including consideration of induced development and allowing estimation of VMT increases resulting from greater geographic spread.



sideration of established design principles such as “target speed.” Target speed represents the desired upper limit of traffic speed deemed appropriate for a roadway segment based on its facility type and contextual place-type. Design features such as curvature and sight distances are then set in order to manage traffic flow at the desired target speed. The proposed Speed Suitability performance metric specifically addresses this situation, as does multi-modal LOS.

- **Regional Blueprints**—SMPMs such as support for sustainable growth and accessibility and connectivity reinforce compatible, location efficient placement of land development and transportation elements. This is consistent with regional Blueprints. A key objective in most blueprints is the minimization of per-person or per-household VMT while insuring that accessibility is maintained through the proximity or connectivity among travel origins and destinations. A related blueprint theme is land use efficiency through minimizing the footprint of development and transportation on sensitive lands.
- **RTP Sustainable Communities Strategies**—As they prepare their next RTPs, California MPOs will be required to develop sustainable communities strategies (SCS) and/or Alternative Planning Strategies (APS) in response to recent California legislation (AB 32 and SB 375). Preserving mobility through activity connectedness and convenient multi-modal travel options (modal mobility) will be essential strategies to reduce per capita VMT and to reduce rates of energy consumption, GHG emissions, air quality and climate impacts.
- **Corridor System Management Plans (CSMPs)**—As local agencies and the real estate development industry attempt to deal with dramatically changed economic and market conditions, there is growing emphasis on infill development in congested areas. This places additional emphasis on network optimization strategies rather than capacity increases to accommodate traffic volumes through system and speed management and operational efficiency, such as ITS.

- **International Trade**—Particularly in the Los Angeles region, where truck activity generated by shipping ports significantly impact the highway system, there is increasing regional emphasis on placement and sizing of infrastructure in accordance with moving international, interstate and intra-state goods and products, monetized in terms of return on investment.

The remainder of the chapter addresses the range of specific applications proposed for the SMPMs in terms of Caltrans functional areas and decision processes, and identifies the methods, tools and data needs related to applying each new metric.

Exhibit 13 lists functions and decisions that would be affected by the adoption of each new SMPM. The objective is that SMPMs would be used by all Caltrans functional units and decision-making processes. The exhibit identifies the most prominent specific examples of performance measure applications, distinguishing between planning activities, such as the corridor system management planning, versus more focused activities, such as designing interchange improvements or commenting on a local government’s CEQA documents. The table also indicates other transportation agencies that have implemented each SMPM (or a similar one) in recent years. The list is not comprehensive, but contains several representative examples for each measure. It focuses on other state DOTs, but also includes California MPOs and cities to illustrate the manner in which adopting the SMPMs will help Caltrans align its evaluation criteria with those already employed by some regional and local jurisdictions throughout the state.

Exhibit 14 identifies the primary methods, tools and data sources for accurately and consistently measuring each SMPM. Many of the tools and data are readily available, thus facilitating implementation of SMPMs in the near-term. Data and tools that are not presently available should be developed initially on an as-needed basis for plan and project-level analysis. Caltrans and other State agencies should be alert to opportunities to systematically collect input data for SMPMs, just as traffic volumes and accident data are now routinely collected statewide.

## Exhibit 13: Applications of Smart Mobility Performance Measures

Performance Measure	Applicable Activities, Functional Groups and Decisions		Precedent Use by other State DOTs and CA Agencies
	Planning	Project Development	
Support for Sustainable Growth	CTP, Blueprints, RTP, TCR, HiCOMP, SGMP, IGR, CSMP, ITSP	CEQA, NEPA, PDD, TOps, Design	FDOT, NJDOT, cities of San Francisco, San Jose, Sacramento
Transit Mode Share	CTP, Blueprints, RTP, TCR, HiCOMP, SGMP, IGR, CSMP	CEQA, NEPA, PID, PDD, IGR, TOps	MTC, SANDAG, SACOG, SCAG
Accessibility and Connectivity	CTP, Blueprints, RTP, SGMP, IGR, CSMP, ITSP	CEQA, PID, Design	MTC, SANDAG, SACOG
Multi-Modal Travel-Time Mobility	CTP, RTP, SGMP, IGR, CSMP, ITSP	CEQA, PID, TOps, Design	FDOT, NJDOT, Idaho DOT, Cities of San Francisco, Sacramento
Multi-Modal Travel-Time Consistency	CTP, Blueprints, RTP, SGMP, IGR, CSMP, ITSP	CEQA, PID, TOps, Design	MnDOT, VaDOT, FDOT, Idaho DOT
Multi-Modal Service Quality (LOS)	CTP, Blueprints, RTP, TCR, HiCOMP, SGMP, IGR, CSMP	CEQA, NEPA, PDD, TOps, Design	FDOT, NJDOT, cities of San Francisco, San Jose, Sacramento
Multi-Modal Safety	CTP, RTP, SGMP, IGR, CSMP, ITSP	CEQA, PID, TOps, Design	MnDOT, FDOT, Caltrans
Design and Speed Suitability	RTP, SGMP, IGR, CSMP, ITSP	CEQA, PID, PDD, TOps, Design	Many cities use coordinated traffic signal systems to manage speed and direct traffic
Pedestrian, Bicycle Mode Share	CTP, Blueprints, RTP, TCR, HiCOMP, SGMP, IGR, CSMP	CEQA, NEPA, PID, PDD, IGR, TOps	MTC, SANDAG, SACOG, SCAG
Climate and Energy Conservation	CTP, Blueprints, RTP, SGMP, IGR, CSMP, ITSP	CEQA, PID, Design	NY DOT; CA Regions and Cities/Counties developing Climate Action Plans
Emissions Reduction	CTP, Blueprints, RTP, SGMP, IGR, CSMP, ITSP	CEQA, NEPA, PID, TOps, Design	MTC, SANDAG, Fresno Blueprint
Equitable Distribution of Impacts	CTP, Blueprints, RTP, ITSP	CEQA, NEPA, PID, Design	MTC, SANDAG, SACOG, SCAG
Equitable Distribution of Access and Mobility	CTP, Blueprints, RTP, ITSP	CEQA, NEPA	MTC, SANDAG, SACOG, SCAG
Congestion Effects on Productivity	CTP, Blueprints, RTP, SGMP, IGR, CSMP, ITSP	CEQA, PID, TOps, Design	FDOT, MnDOT, SANDAG
Efficient Use of System Resources	CTP, Blueprints, RTP, SGMP, IGR, CSMP, ITSP	CEQA	FDOT, Idaho DOT, NJ DOT, Penn DOT, WSDOT
Network Performance Optimization	CTP, Blueprints, RTP, SGMP, IGR, CSMP, ITSP	CEQA, PID, TOps, Design	NY DOT, NJ DOT, PA DOT
Return on Investment	CTP, Blueprints, RTP, SGMP, IGR, CSMP, ITSP	CEQA, PID, TOps, Design	FDOT, MTC

### Acronym Key

CTP	California Transportation Plan	CEQA	California Environmental Quality Act	CSMP	Corridor System Management Plan
SGMP	Statewide Goods Movement Plan	IRB-CTP	Interregional Blueprint/California Transportation Plan	PID	Project Initiation Documents
RTP	Regional Transportation Plan	NEPA	National Environmental Protection Act	PDD	Project Development Documents
TCR	Transportation Concept Report	IGR	Intergovernmental Review	TOps	Traffic Operations Analysis
HiCOMP	Highway Congestion Monitoring Program			ITSP	Interregional Transportation Strategic Plan

### Exhibit 14: Methods, Tools, and Data Needs\*

Performance Measure	Guidelines and Methods	Tools Needs	Data Needs
Support for Sustainable Growth	Travel model or sketch plan methods to estimate effects of land use and transportation and travel demand management strategy scenarios on VMT generation, mobility and system performance. Quantification of acres of land consumed by the transportation project and associated land development in total and individually for types of sensitive land, including agricultural land, habitat, wetlands impacted.	Statewide or regional travel models (either 4-step or activity based), or sketch plan methods with sensitivities to TDM and land use 7Ds. GIS for sensitive land classifications.	Statewide and regional household travel surveys, VMT inventories, land use inventories at parcel or grid cell level.
Transit Mode Share	Standard calibrated travel forecasting models including Statewide and regional 4-step or activity-based models. National Transit Database.	Enhanced forecasting tools, including transit direct ridership models and activity-based models.	Statewide and regional household travel surveys. Regular transit on-board surveys.
Accessibility and Connectivity	Quantification of mode-specific aggregate travel distance among all regional trip productions and attractions. Estimation of overall vehicle miles of travel. Analysis of auto, transit, ped, bike, travel times, and mode shares.	Conventional network analysis tools quantify degree to which the physical arrangement of land use and transportation provides destination accessibility for all travel modes. Other tools: modal travel time surveys, counts by mode; GIS buffering.	Historical modal travel time data for origin/destination pairs, GIS land use inventories at parcel or grid cell level.
Multi-Modal Travel-Time Mobility	Statistical analysis of travel time by mode. Network travel times and costs between representative O/D pairs (peak, off-peak).	Includes PeMS, other real-time traffic detection, and analysis systems.	Speed data, transit routes and schedules, National Transit Database.
Multi-Modal Travel-Time Consistency	Statistical analysis of travel time variance by mode.	Real-time traffic detection and analysis systems, PeMS.	Historical travel time data for representative O/D pairs.
Multi-Modal Service Quality (LOS)	Measurement of maximum individual delay, duration of congestion, freeway volume and density, average speed as percent of posted speed, amount of freeway travel below 35 mph, queuing, queue spillback, transit vehicle delay, transit passenger delay.	Highway Capacity Manual 2010, including ped and bike LOS tools. Alternatively, other state DOT tools such as Florida DOT.	Facility geometric and signal timing data, trip counts and speed and delay counts by mode, other field data: queuing, incidents.
Multi-Modal Safety	Accident Analysis, by type, severity, and modes involved; exposure level by mode, intersection conflicts for bikes and pedestrians.	SWITRS, Bike & Ped Environmental Quality, National Transit Database Safety and Incident Modules.	Accident data; field data on ped and bike facilities.

## Exhibit 14: Methods, Tools, and Data Needs\* (continued)

Performance Measure	Guidelines and Methods	Tools Needs	Data Needs
Design and Speed Suitability	Caltrans Highway Design Manual multi-modal revision; implementation of Caltrans Complete Streets Guidelines, implementation of ITE Recommended Practice: Designing Walkable Urban Thoroughfares (publication in early 2010).	New recommended practice and standards that expand existing design speed standards to a matrix of suitable speeds related to both facility type and place type. Simulation Models.	Needed data includes average travel speed as % of target speed; design standards for target speed.
Pedestrian and Bicycle Mode Shares	Conventional travel forecast models provide limited capabilities for forecasting non-motorized mode shares. Other options: extrapolation of household travel surveys and base-year pedestrian and bicycle counts, specialized activity models based on case studies.	Enhanced continuous data gathering programs. Enhanced forecasting tools, including behavioral, direct demand and activity-based models.	Statewide and regional household travel surveys. Regular pedestrian and bicycle count programs in urban centers, special generators, schools, universities. Project-specific counts for project development and environmental documents.
Climate and Energy Conservation	VMT, taking into consideration total VMT and VMT per capita and other factors influencing GHG such as speeds, stops, layovers, fleet.	Enhanced forecasting models, including, land use and demand management and induced travel sensitivities and travel speeds.	Historical VMT by household and trip generator, by time of day and facility type.
Emissions Reduction	Quantification of criteria and CO2 emissions.	Caltrans/ARB link-grid models, EMFAC.	VMT by time of day and facility, traffic speed profile, vehicle fleet profile.
Equitable Distribution of Impacts	Environmental justice assessment of primary and secondary impacts of facility construction, service change, and induced changes to land use, land value community services, affordability and displacement by income, race, age.	Calibrated land value and household expenditure models.	Inventories of households businesses, schools, senior centers, medical facilities, ADA access surveys and transit service inventories.
Equitable Distribution of Access and Mobility	Travel accessibility methods and models capable of predicting time and cost of transportation access and use disaggregated by household and user socio-economic category.	Model enhancements to recognize the economic "fit" between housing and employment, housing and commercial.	Household and business inventories, and travel surveys. Transit service inventories and service plans. Special generator surveys of day care, senior centers, medical facilities, ADA access surveys.

## Exhibit 14: Methods, Tools, and Data Needs\* (continued)

Performance Measure	Guidelines and Methods	Tools Needs	Data Needs
Congestion Effects on Productivity	Caltrans Delay Index with different value of time by trip purpose and vehicle type, Lost lanes due to congestion, VMT by speed-range “bin”, vehicle hours of travel, vehicle hours of delay (VHD), person hours of delay (PHD), user cost per mile.	Calibrated model with freight and other commercial modes.	Historical OD data by trip purpose, including freight and commercial.
Efficient Use of Transportation Resources	Statewide and regional surveys of travel generation and VMT by “productive” activities and household “sustaining” and “induced” travel. Models capable of forecasting these distinct categories of travel. Standard cost estimating and impact assessment methods, including quantification of acres of land consumed by the transportation project and associated land development in total and individually for types of sensitive land, including agricultural land, habitat, wetlands impacted.	Continuous improvement of travel demand forecasting models, including market transaction models and activity based passenger travel models. Proven ability to estimate induced travel. GIS for sensitive land classes.	Statewide and regional goods movement and household travel surveys. Land use inventories. Data on full costs, including collateral impacts of facility construction, land consumption, energy consumption and emissions.
Network Performance Optimization	Analysis of persons served, saturation flow rate, vehicle and person throughput, bottleneck volume/capacity, % of demand served, speed as % of target speed, queue lengths.	Real-time traffic detection and analysis systems; simulation models.	Historical travel time/capacity analysis data.
Return on Investment	Benefit/cost analysis by person miles and revenue per lane mile or transit vehicle mi, annual travel cost per household, life cycle capital and operating cost analysis.	Enhanced forecasting models, including market transactions and activity based passenger travel, and induced travel.	Revenues and costs per mile by mode.

\* The Action Checklist in Appendix C identifies further actions needed to define data needs, develop tools and guidelines and other steps needed to implement Smart Mobility recommendations.

### 4.4 Applying Smart Mobility Performance Measures in Different Place Types

Prioritization of individual SMPMs should vary according to the place types described in Exhibit 7. Different place types are characterized by different user needs and physical and natural environments and demand. Place type influences the application of performance measures through two primary distinctions:

- Within certain performance measures, the degree of emphasis applied to different travel modes and user groups should vary by place type.
- The priority applied to individual performance measures and metrics should vary as a function of place type.

Which performance measures are emphasized and how they are calculated will vary by transportation facility type as well as place type. Freeways (interstate and state jurisdiction), expressways, interchanges, arterials (principal and minor), collectors, and rural highways each have different

primary functions—combining varying degrees of emphasis on access, conducting through traffic, and accommodating different degrees of use by different modes of travel. An integrated consideration of place types and facility types in Smart Mobility decisions creates a two-dimensional perspective on appropriate SMPMs for different cases.

## Modal Emphasis by Place Type

Exhibit 15 indicates the manner in which the distinctions among place types and facility types influence the degree of emphasis placed on different user groups and transportation modes within multi-modal performance measures. Multi-modal SMPMs include:

1. Support for sustainable growth,
2. Transit mode share,
3. Accessibility and connectivity
4. Multi-modal travel-time mobility,
5. Multi-modal travel-time reliability
6. Multi-modal Service Quality (Level of Service),
7. Multi-modal safety (collision rates and severity),
8. Design and speed suitability,
9. Pedestrian and bicycle mode share,
13. Equitable distribution of benefits (access and mobility).

The primary distinction in applying these multi-modal measures on different facilities in different place types is:

- **Freeways**—Weighting of modes within performance measures should be oriented toward truck and automobile modes and express buses, with primary emphasis on traffic flow efficiency, regardless of place type.
- **Expressways and Interchanges**—Performance measures should be oriented toward an equivalent prioritization of autos, trucks, and buses, while prioritizing basic safety, comfort and convenience for non-motorized modes.

- **Arterials and Conventional Rural Highways**—In urban centers, close-in community centers, compact communities, rural towns, and suburban centers, performance measure should emphasize safety, comfort, and convenience for non-motorized modes and local transit, with lower emphasis on efficiency for autos and trucks. In corridors and dedicated use areas, performance measures should be oriented toward an equivalent prioritization of autos, trucks, and buses, while preserving and enhancing basic safety comfort and convenience for non-motorized modes.

- **Collectors**—In almost all place types, performance measure should emphasize safety, comfort, and convenience for non-motorized modes and local transit, with lower emphasis on efficiency for autos and trucks.

Additional guidelines on choosing which performance measures to apply for different facility types located in different place types are provided below.

For example:

- A. Regardless of place type, freeway analysis would employ performance measures weighted toward truck and automobile modes and express buses, with primary emphasis on traffic flow efficiency, as denoted by the ▲ symbol in Exhibit 15.
- B. A planning study for an arterial located in a “suburban corridor” place type (varied, low intensity land uses) would use performance measures that prioritize autos, trucks, and buses at an equivalent level, while preserving basic safety, comfort, and convenience for non-motorized modes, as denoted by the ■ symbol in the exhibit.
- C. An arterial segment through a “suburban center” (small downtown or activity centers) would emphasize safety, comfort, and convenience for non-motorized modes and local transit, with lower emphasis on efficiency for autos and trucks, as noted by the ● symbol.

## Exhibit 15: Framework for Integrating Place Type and Facility Type in Weighing Modal Priorities in Planning and Project Evaluation Criteria

▲ Weighting of modes within performance measures oriented toward truck and automobile modes and express buses, with primary emphasis on traffic flow efficiency.

■ Performance measures oriented toward equivalent prioritization of autos, trucks, and buses, while prioritizing basic safety comfort and convenience for non-motorized modes.

● Performance measure emphasis placed on safety, comfort and convenience for non-motorized modes and local transit. Lower emphasis on efficiency for autos and trucks.

Place Type		Freeway	Expressway	Arterial	Collector	Rural Hwy
Urban Centers	Urban Cores	▲	■	●	●	-
	Urban Centers	▲	■	●	●	-
Close-in Compact Communities	Centers	▲	■	●	●	-
	Corridors	▲	■	■	●	-
	Neighborhoods	▲	■	●	●	-
Compact Communities	▲	■	●	●	●	
Suburban Communities	Centers	▲	■	●	●	●
	Corridors	▲	■	■	●	▲
	Dedicated Use Areas	▲	■	■	●	■
	Neighborhoods	▲	■	●	●	■
Rural	Towns	▲	■	●	●	●
	Settlements/Ag	▲	■	●	●	■
Protected Lands	▲	▲	●	●	●	
Special Use Areas	▲	▲	▲	■	▲	

## Performance Measure Relative Priority by Facility and Place Type

Many of the performance measures have applicability in transportation planning, traffic operations and project development in most place types; the difference is one of emphasis.

Performance measures that should receive relatively high priority for all place types include modal collision rates, speed suitability, and travel time consistency. The importance of the collision rates performance measure for all facility types in all place types reflects the fact that accidents not only have high individual impacts and high public social and direct costs, but are also a major cause of delay and the productivity losses that are a consequence of delay. Speed suitability, by definition, should take into consideration the roadway context and function. While travel times may vary from one place type to another, providing consistency is important for all places to prevent unintended consequences such as traffic re-routing through sensitive neighborhoods.

Return on investment is an example of a measure whose importance may vary by facility. It could rank lower than

other priorities on arterials, and higher on freeways and rural highways. Compared with freeways, arterial improvements are frequently less capital intensive and can be implemented incrementally. Rural highway costs tend to be high relative to their level of use, so it is imperative to maximize the productivity of such investment.

Network performance optimization and speed management rank higher for arterials and urban freeways than for rural freeways and highways. Arterials with more points of access and more traffic controls have greater need and opportunities for real time traffic management to keep flows at optimal levels and to ensure predictable travel times. Similarly, urban freeways benefit from ramp metering and other forms of access management and from spot efficiency improvements such as auxiliary lanes.

Place type considerations may also elevate the priority of certain performance measures relative to others. For example, in urban and suburban areas, freeways tend to be congested during peak periods; thus network optimization become a priority performance measure for freeways in urban cores, urban centers and close-in compact centers and corridors.

Ventura, California





Multi-modal LOS is another priority measure for arterial evaluations in urban and suburban centers, reflecting that in these environments arterials support other modes beyond private and commercial vehicles, including pedestrians, bicycles, and local transit with frequent stops.

Accessibility and connectivity are important for arterial evaluations in most urban and suburban place types. Design and speed suitability are especially important in areas where land costs are high and opportunities to make short and non-motorized trips are great—in all urban and suburban place types, with the possible exception of corridors. In corridors, productivity lost to congestion emerges as a key performance measure, reflecting the need to efficiently serve through movement of high-value traffic such as freight and, to a lesser extent, commute traffic. Climate and energy conservation are important considerations in suburban place types, since VMT per capita tends to be higher in suburban areas compared to regional averages, and is likely to be influenced by a concerted program of demand management, multi-modal transportation connectivity and sustainable community planning.

Performance analysis should consistently address equity considerations, comparing the benefits/impacts across socio-economic, ethnic and age groups for all place types and facility types.

While these criteria and priorities do not represent strict standards, and should be applied in conjunction with reasonable professional judgment. Consistent use will enable Caltrans and its partner agencies to integrate the Smart Mobility principles into future planning and project development decisions.

## 4.5 Relationship to Mobility Pyramid

The SMPMs described above are consistent with and fully supportive of the Caltrans “mobility pyramid” as presented in the California Transportation Plan.

Exhibit 16 depicts this relationship by indicating the alignment between each of the SMPMs and the elements of the mobility pyramid (see California Transportation Plan 2030, Figure 10). As illustrated in the pyramid, the foundational element is System Monitoring and Evaluation, which also provides the informational foundation of the Smart Mobility Framework performance measures. System monitoring and evaluation supplies essential data for the measurement of thirteen SMPMs, including accidents, speeds, travel-time mobility and consistency, vehicle miles traveled and other performance indicators.

The other elements of the pyramid represent outcomes of Caltrans strategic planning and system operations activities. As shown in Exhibit 16, Caltrans success in each of these areas is captured in at least 3 and as many as all 17 of the SMPMs. System Completion and Expansion, the top tier in the pyramid, is correlated with all 17 of the Smart Mobility measures in one of the following ways.

- Twelve of the SMPMs, including accident rates, are used to evaluate the benefits and costs and potentially to justify system completion and expansion projects.
- The remaining five SMPMs, including energy consumption and emissions, are used to assess the impacts of potential system completion and expansion projects.

## Exhibit 16: Relationship between Smart Mobility Performance Measures and Caltrans Mobility Pyramid\*

Performance Measure	Smart Mobility Measure	Strategic Growth Plan Framework							
		System Monitoring + Evaluation	Prevention + Safety	Maintenance + Preservation	TDM + Value Pricing	Smart Land Use	ITS + Incident Management	Operational Improvements	System Completion + Expansion
Location Efficiency	Sustainable Growth				■	■		■	△
	Transit Mode Share	□			■	■	■		▲
	Accessibility, Connectivity					■		■	▲
Reliable Mobility	Modal Travel-Time Mobility	□				■	■	■	▲
	Modal Time Consistency	□	■				■	■	▲
	Multi-Modal LOS	□			■	■	■	■	▲
Health and Safety	Multi-Modal Safety	□	■				■	■	▲
	Design, Speed Suitability	□	■				■	■	▲
	Ped and Bike Mode Share		■		■	■		■	▲
Environmental Stewardship	Climate, Energy Conservation	□		■	■	■	■	■	△
	Emissions,	□			■	■	■	■	△
Social Equity	Equitable Impacts				■	■		■	△
	Equitable Benefits	□		■	■	■		■	▲

## Exhibit 16: Relationship between Smart Mobility Performance Measures and Caltrans Mobility Pyramid\* (continued)

Performance Measure	Smart Mobility Measure	Strategic Growth Plan Framework							
		System Monitoring + Evaluation	Prevention + Safety	Maintenance + Preservation	TDM + Value Pricing	Smart Land Use	ITS + Incident Management	Operational Improvements	System Completion + Expansion
Robust Economy	Productivity Lost to Congestion	□			■	■	■	■	▲
	Efficient Use of Resources	□	■	■	■	■	■	■	△
	Network Optimization	□			■		■	■	▲
	Return on Investment	□			■	■	■	■	▲

\* Note: the Mobility Pyramid is Figure 10 in the California Transportation Plan 2030.

- Legend**
- System Management and Evaluation provides data used to evaluate Smart Mobility performance
  - Performance Measure is used to evaluate attainment of Strategic Growth Plan objective
  - ▲ Performance Measure is used for project justification and design
  - △ Performance Measure is used to measure project impacts

### 4.6 Concluding Comments

The foregoing discussion of the 17 SMPMs illustrates how these measures collectively compile data and present evidence that can be used by decision-makers both within Caltrans and beyond. Properly chosen and analyzed, they will permit comprehensive evaluation of transportation projects for all facility types in all the varied place types served by State highway systems as well as for the regional and local networks that the State system interconnects.

Using the recommended performance measures will ensure that larger economic, social, and environmental considerations are addressed. Consistent use of the performance measures at all stages of planning and project development means that projects will be analyzed comprehensively and continuously from the time of concept development through project design. Impacts will be avoided rather than mitigated, as projects will be conceived and designed to respond to the natural environment in which they are placed and the human environment they serve.

# 5 Conclusions: Putting Smart Mobility to Work



Embarcadero Station, San Francisco, California

This Call to Action presents concepts, tools, techniques, and references that all fit under the banner of “Smart Mobility,” accompanied by an Action Plan listing implementation activities (Appendix C). To achieve the benefits that can be made possible by a Smart Mobility approach, Smart Mobility tools and techniques must be consistently and comprehensively put to work. Recognizing the many challenges of “mainstreaming” them into the work of many partner agencies at different levels of government as well as into Caltrans’ functional divisions and districts, the Action plan prioritizes specific implementation activities to be undertaken subsequently by state, regional, and local agencies.

Some of the far-reaching implications of the Smart Mobility Framework include:

- **Shifts in transportation agencies’ roles.** The need for several significant shifts in the role of the Department and other transportation agencies is signaled by the Smart Mobility Framework. The Framework is supported by ARB’s AB32 Scoping Plan, which specifically references the Smart Mobility Framework and emphasizes that changes to personal vehicle use must accompany changes in fuels and vehicles.

Shifts to a Smart Mobility approach will include:

- Directing activities to support lower personal vehicle use, while meeting objectives for accessibility, social equity, environmental quality and economic growth.
- Incorporating into transportation agencies’ core missions the creation of secure funding sources for both transit capital improvements and operations, in light of the extremely significant role of transit in a Smart Mobility future.
- Aligning investments and programs with Smart Mobility Place Types, which means:
  - Using Smart Mobility Place Types as a basis for context sensitive solutions broadly and for context sensitive facility design specifically.
  - Participating in integrated land use and transportation planning activities, such as blueprints, RTP sustainable communities strategies, and general plan

updates as a partner seeking advancement of community design and regional accessibility factors consistent with place type planning.

- Refining planning, programming, and evaluation activities so they systematically use the SMPMs.
- Possible revisions to the Caltrans Highway Design Manual to advance location efficiency factors as appropriate for different contexts.
- Consistent application of SMPMs and elimination of the use of performance measures that will work against Smart Mobility outcomes.

- **Interregional network role.** Caltrans has responsibility for developing, maintaining, and operating a multi-modal transportation network that has a high-level function with respect to goods movement, inter-regional, interstate, and cross-border travel. To establish a basis for integrating the interregional system into the Smart Mobility Framework, and to deliver support for economic stewardship, connectivity, and the reliability that is valued by freight shippers and carriers, the Department will create an Interregional Blueprint as part of the update of the California Transportation Plan. The Interregional Blueprint will synthesize the Blueprint Planning work by regional agencies while focusing on the interregional system that is Caltrans’ responsibility.

Using the Smart Mobility Framework in an interregional context will require careful selection and prioritization of SMPMs on the basis of facility type and place type, as discussed in Chapter 4. For example, Network Performance, Return on Investment, and minimizing Congestion Effects on Productivity will be primary performance measures for rural highways, interstates, and other freeways within rural, protected, and special use places and other interregional settings.

- **An emphasis on integrated transportation and land use planning.** Planning is an essential tool in the Smart Mobility Framework. Through the Blueprint planning program, Caltrans has already demonstrated its commitment to supporting planning activities with a Smart Mobility focus. Through the modeling improvement program, better tools and information will allow more

informed decision making, leading to better integration between transportation and land uses. However, using the Smart Mobility Place Types requires a higher commitment to planning and a more specific planning mission that will involve public agencies, non-governmental organizations, and a wide range of community stakeholders.

A starting point for these planning activities is the identification of places through the “lens” of Smart Mobility Places Types. The Guidance for place types included in Section 3.3 will assist communities in identifying those places that will undergo transitions in place type. These designations are critical and will need to be aligned in activities from local government through regional planning. After place types are designated and long-term objectives expressed, specific Smart Mobility applications can be selected.

■ **Respecting unique, locally-based approaches to Smart Mobility.** Some regional and local agencies have already established their commitment to Smart Mobility. Their work has provided inspiration and information for this Call to Action. A Smart Mobility approach does not require that all partner agencies use the precise tools and methods that are presented in this publication but rather that partner agencies pursue the same outcomes with compatible approaches. The innovation and unique local perspective reflected in the work of different agencies is a great benefit to the development and implementation of the Smart Mobility Framework.

■ **Positioning to respond to emerging requirements for sustainable communities planning.** As is noted in the introduction, this material is introduced to serve as a resource for Caltrans and partner agencies. Although implementation of the Smart Mobility Framework is optional for partner agencies, Caltrans fully intends to proceed with implementing this Call to Action. Work on developing the framework has been undertaken concurrent with work to define implementing activities associated with SB 375 of 2008 relating to sustainable communities planning. The Smart Mobility Framework is available as a basis for program requirements should they arise in connection with SB 375 implementation or climate change intervention programs. It further positions

agencies to be successful and consistent with new Federal initiatives regarding sustainable communities.

■ **Continued innovation with respect to sustainability and Smart Mobility practices.** A wide variety of evolving interests will continue to influence transportation policy and planning in California. At the Federal level, the Department of Transportation, the Environmental Protection Agency, and the Department of Housing and Urban Development in 2009 announced a partnership to promote “Livable Communities” with objectives that parallel the Smart Mobility Framework. Demographic trends and real estate market economics will continue to place emphasis on location efficiency and cost-effective mobility. Rising environmental and climate concerns will place greater importance on green building practices such as ecological street design incorporating natural stormwater drainage systems, and transportation system management. New technology for energy generation and vehicle fleets will change the design requirements of the street and highway system, and new information and communications technology will improve facility and vehicle management practices. The Smart Mobility Framework will support efforts to continue to evolve, innovate, and reinvent transportation as new opportunities for planning, designing, and operation of the State’s transportation system emerge over time.

The success of Smart Mobility depends on strong relationships between Caltrans and other State agencies as well as regional and local organizations, including the private sector. Caltrans is the primary sponsor of this publication, but Smart Mobility’s effectiveness will be determined in part by its reach beyond the Department. Attaining Smart Mobility benefits will require public support and the committed and coordinated actions of all levels of government and private sector partnership.



# 6 Resources





## 6.1 Resources for Smart Mobility Place Types

### Resources for Specific Place Types

#### Urban Centers

A more detailed approach to place types focusing on Transit Oriented Development:

- *Station Area Planning* by the Center for Transit Oriented Development.

New design guidance for major city streets:

- Recommended Practice: *Walkable Urban Thoroughfares: A Context Sensitive Solutions Approach* (forthcoming, published as an ITE Proposed Recommended Practice as *Context Sensitive Solutions for Designing Major Urban Thoroughfares in Walkable Communities*).

#### Close in Compact Communities

A rating system for neighborhood development oriented to environmental and energy efficient design.

- LEED for Neighborhood Development (LEED-ND) pilot program, available at <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=148>.

#### Rural and Agricultural Lands

An investigation of the ties between the Sacramento region's urban and agricultural places, shedding light on a number of key issues with relevance to other areas of the State:

- SACOG Rural Urban Connections Strategy, online at: <http://www.sacog.org/rucs/>.

Performance measures for the following seven main performance categories: safety, system preservation, mobility, accessibility, reliability, productivity, and return on investment:

- Caltrans Performance Measures for Rural Transportation Systems, Caltrans, 2006, online at: [www.dot.ca.gov/perf/RSPMGuidebook.pdf](http://www.dot.ca.gov/perf/RSPMGuidebook.pdf)

There is considerable overlap with the Smart Mobility approach, though the overall focus of the 2006 document is narrower, and the level of technical detail deeper than is provided here. An online technical supplement to the publication is also available.

Data for decision makers for use in assessing present status, reviewing trends, and planning for the future of the state's agricultural land resources.

- The California Farmland Mapping and Monitoring Program (FMMP) including Important Farmland Maps, which combine resource quality (soils) and land use information. Data are also released in statistical formats in program reports. See: <http://www.conservation.ca.gov/dlrp/fmmp/Pages/Index.aspx>.

#### Protected Lands

Best Practices highlighted at "Building Conservation into Infrastructure Planning," a California Agency Leaders' Briefing held in June, 2008:

- From California, the Regional Advanced Mitigation Planning Working Group, the Delta Risk Management Strategy for Levee Repair and San Diego's Transnet Environmental Mitigation Program.
- From Florida, the State's Efficient Transportation Decision Making Program.
- From North Carolina, Ecosystem Enhancement Program jointly established by the Department of Transportation and Partner agencies.

Understanding of the impact of roads on natural landscapes and human communities from the new field or Road Ecology.

- The UC Davis Road Ecology program, online at: <http://roadecology.ucdavis.edu>.

The Federal Highway Administration's publication: *Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects* is the product of an inter-disciplinary effort that began with a shared vision of an enhanced and sustainable natural environment, combined with the

view that necessary infrastructure can be developed in ways that are more sensitive to terrestrial and aquatic habitats.

■ [http://www.environment.fhwa.dot.gov/ecological/eco\\_index.asp](http://www.environment.fhwa.dot.gov/ecological/eco_index.asp).

## General Resources for Place-Based Approaches to Planning and Design

### The Urban Transect

The urban transect is a highly-developed place classification system which is described in detail in the “Smart Code,” a model design code for regulating land development, street design and other public realm components. The transect is the basis for the context zones used in the proposed ITE Recommended Practice: “Walkable Urban Thoroughfares.” The Smart Code introduces six transect zones, designated T-1 through T-6, that focus on community design and represent a continuum of urbanism, with T-1 including protected lands and T-6 including urban centers. The transect largely fails to address the quality of regional accessibility which is critically important to location efficiency. For that reason, and because this effort has a goal of crafting a place type system specifically for application in California, the Smart Mobility Place Types do not directly apply the urban transect.

To highlight the usefulness of available material relating to application of the transect in addressing location-efficient community design elements. Exhibit shows how the Smart Mobility Place Types relate to the urban transect categories.

Most localities using a transect-based approach do so through form-based zoning. Resources include:

■ **Smart Code.** The smart code is a model land development ordinance that uses the transect as the basis for form-based coding that is tailored to the specific location where it is applied. The focus of the Smart Code is on community design and site design features, which are important components of a Smart Mobility

## Exhibit 17: Relationship of Smart Mobility Place Types to Transect Zones

Place Type	Smart Code Transect Zones
<b>1. Urban Centers</b>	
1a. Urban Core	T5, T6
1b. Urban Centers	T4, T5
<b>2. Close-in Compact Communities</b>	
2a. Close-in centers	T4, T5
2b. Close-in corridors	T4, T5
<b>3. Compact Communities</b>	T3, T4, T5
<b>4. Suburban</b>	See note below
<b>5. Rural and Agricultural Lands</b>	
5a. Rural Towns	T3, T4
5b. Rural settlements and Agricultural Lands	T1, T2
<b>6. Protected Lands</b>	T1
<b>7. Special Use Areas</b>	n/a, Districts

**Note regarding relevance of the transect to suburban place types:** The transect zones represent place types that have the characteristics of traditional urbanism, so places that lack location-efficient Community Design elements are not recognized by any of the transect zones.

approach but which omit reference to regional accessibility. The Smart Code is available for download at [www.smartcodecentral.com](http://www.smartcodecentral.com).

- **Form-Based Codes.** Form-based codes typically are organized through a system of place types that are customized for the area being regulated. SACOG has produced a downloadable Form-Based Codes Handbook to assist cities and counties in the Sacramento region that may want to develop form based codes. It provides background information on what a form-based code is, when to use it, and a guide on how to create one, along with regional case studies that provide different community prototypes with alternative approaches to developing a form-based code. The SACOG handbook is available for download at <http://www.sacog.org/projects/form-based-codes.cfm>.
- Extensive examples as well as guidance on preparing form-based codes are included in the book *Form Based Codes* by Paul Crawford, Dan Parolek, and Karen Parolek (John Wiley & Sons, 2008). The book's authors are associated with The Form-Based Codes Institute, which provides training and resources for practitioners, as well as a website, [www.formbasedcodes.org](http://www.formbasedcodes.org).

## Other Place-Based Applications

- Examples of smart growth strategies from the full range of transect zones are featured in “This is Smart Growth” from the Smart Growth Network, which can be downloaded from <http://www.smartgrowth.org/library/articles.asp?art=2367&res=1024>.
- The States of New Jersey and Pennsylvania, in the jointly-produced *Smart Transportation Guidebook*, present 10 themes for Smart Transportation. Two of these: “Build towns not sprawl” and “Understand the context; plan and design within the context” are particularly supportive of a place-based approach. The Guidebook introduces seven

context areas, describing them according to quantitative characteristics and illustrating compatible thoroughfare types for the different contexts. The focus of the context area presentation is on thoroughfare design. The guidebook is online at <http://www.smart-transportation.com/guidebook.html>.

- Use of place types in regional planning exercises is common, and has been incorporated in various ways into a number of the Blueprint planning activities. In addition to the SACOG Blueprint, both the SCAG Compass Blueprint and SANDAG's Regional Comprehensive Plan (RCP) use place-based approaches for some part of their efforts. SANDAG's RCP includes a Smart Growth Concept Map that features seven smart growth “categories” that have considerable overlap with the Smart Mobility Place Types presented here. The map and related information are online at <http://www.sandag.ca.us/index.asp?projectid=296&fuseaction=projects.detail>.
- Place-based VMT Analysis. SACOG staff has conducted an analysis that establishes four different categories of places based on VMT per capita. Accompanying the information on VMT is information about the characteristics of the areas with respect to activities, community design, circulation network, transit proximity and bike/walk mode share. The analysis, which was presented at the February 2009 meeting of the Regional Targets Advisory Committee, is particularly valuable because it provides evidence of the Smart Mobility benefits associated with both of the characteristics that are proposed here as the focus of the place types: regional accessibility and community design. Consistent with the Smart Mobility Framework, the SACOG work suggests that areas be identified that can change their performance through land use, urban design, and transportation system change over time.

## 6.2 Evidence Supporting Location Efficiency Benefits

### Selected Evidence on VMT, Mode Share and Urban Development

The results of over 80 research and scenario testing projects are synthesized in three recent studies that support the Smart Mobility Framework's emphasis on location efficiency as part of a comprehensive Smart Mobility Framework. Readers should consult the full documents for complete information about analysis methods and findings. Highlights are included here.

**Source:** Ewing, Reid et al. *Growing Cooler: The Evidence on Urban Development and Climate Change: Executive Summary*, Urban Land Institute, Washington D.C., 2008.

- **Based on:** Review of prior research on the relationship between urban development, travel and CO<sub>2</sub> emissions from motor vehicles, focusing on benefits that can be gained from compact development.
- **Take away quote:** “Regardless of the (analysis) approach, researchers have found significant potential for compact development to reduce the miles that residents drive.”
- **Key Findings:**
  - **Compact Development vs. sprawl:** An analysis of many studies finds that households living in developments with twice the density, diversity of uses, accessible destinations, and interconnected streets when compared to low-density sprawl drive about 33 percent less.
  - **Public Health Effects:** “Studies show that residents of communities designed to be walkable both drive fewer miles and also take more trips by foot and bicycle, which improves individual health.”
  - **Total Estimated VMT Impact:** Smart growth could, with land use changes alone, reduce total transporta-

tion-related CO<sub>2</sub> emissions from current trends by 7 to 10 percent as of 2050. Complementary measures, such as higher fuel prices and carbon taxes, would further decrease VMT.

- **Demographic change and housing demand:** Changing demographics, shrinking households, rising gas prices, and lengthening commutes are contributing to increased consumer demand for smaller homes and lots, townhouses, and condominiums near jobs and other activities.

**Source:** Rodier, Carolyn, “A Review of the International Modeling Literature: Transit, Land Use, and Auto Pricing Strategies to Reduce Vehicle Miles Traveled and Greenhouse Gas Emissions.” August 1, 2008 submission to the Transportation Research Board Annual Meeting.

- **Based On:** 24 studies, 16 of which are in the US.
- **Take-away quote:** “Even improved calibrated travel models are likely to underestimate VKT (vehicle kilometers of travel) reductions from land use, transit, and pricing policies.”
- **Key Findings:**
  - **Benefits of Land Use Strategies Over Time:** The results of land use and transit strategies are fully realized over the course of several decades. Their use is a challenge when regulations emphasize near-term compliance.
  - **Comprehensive Approaches:** “Combined scenarios” involving land use, transit and pricing strategies consistently result in greater vehicle kilometers traveled (VKT) reductions than do single-strategy scenarios, in both the short and longer term.
  - **Range of Benefits Expected:** “Land use and transit scenarios may reduce VKT by 2% to 6% during a 10-year time horizon, and these figures may increase by approximately 2 to 5 percentage points at each future 10-year increment.”

**Source:** Ewing, Reid. "Travel and the Built Environment—A Meta-Analysis," US EPA Smart Growth Office, 2008.

- **Based on:** 52 prior studies, all from 1996 or later.
- **Take-away quote:** "Almost any development in a central location is likely to generate less automobile travel than the best-designed, dense, mixed-use development in a remote location."
- **Key Findings:**
  - **Importance of Regional Accessibility:** The dominant effect on VMT is destination accessibility
  - **Importance of Density:** Density is the single most powerful element of location-efficient community design among those influencing trip making, mode choice and vehicle miles traveled
  - **Walk trips:** The number and likelihood of walk trips is about equally influenced by diversity, design, and destination accessibility
  - **Transit Trips:** The number and likelihood of transit trips is most strongly influenced by destination accessibility, then transit access, and then design
  - **Comparison of Compact vs. Conventional (suburban) neighborhoods:** The studies surveyed consistently find that compact, walkable neighborhood characteristics result in significantly lower VMT than conventional neighborhoods.

## Evidence on Mixed Use and Transit Oriented Development

Two new studies that together examine the performance of over 250 locations focus on specific development types that aim to create location efficient places: mixed use development and transit oriented development. Results of both support the Smart Mobility Framework's emphasis on location efficiency as an important part of the Smart Mobility

Framework. Readers should consult the full documents for complete information about analysis methods and findings. Highlights are included here.

**Source:** Ewing, Reid et al. "Traffic Generated by Mixed-Use Development: A Six-Region Study Using Consistent Built Environmental Measures," Paper presented at the 2009 Annual Meeting of the Transportation Research Board.

- **Based On:** Travel and land use data from 239 mixed use development sites in six U.S. regions, and travel diary data from those regions.
- **Take-Away Quote:** "on average, a total of 29% of the total trip ends generated by mixed-use developments put no strain on the external street network, generate very few vehicle miles traveled, and should be deducted from ITE trip rates for stand-alone developments."
- **Key Findings:**
  - **Location Efficiency Factors:** The primary factors affecting the reduction in automobile travel associated with large mixed use development projects are:
    - The total amount of population and employment on the site.
    - The jobs/housing balance within the site.
    - The density of development on the site (floor area ratio).
    - The size of households and their auto ownership characteristics.
    - The amount of employment within walking distance of the site.
    - The pedestrian-friendliness of the site (small blocks and sidewalks).
    - The density of bus stops within the mixed use development, presence or absence of an internal rail station.

- Regional transit accessibility measured in terms of jobs reachable within a 30 minute transit ride of the site.
- **Importance of Regional Accessibility:** For vehicle trips, better regional accessibility to jobs shortens average vehicle trips. This effect is as significant as the effects associated with internal capture of trips with mixed-use developments, and conversion of some external trips from auto to alternate modes.
- **Walking Factors:** Among variables studied, the strongest influences on walking are intersection density, and jobs within one mile of the project boundary. [Intersection density can be classified as a community design element, while job proximity is a measure of regional accessibility.]

**Source:** PB Placemaking, Robert Cervero, Center for Transit Oriented Development and Urban Land Institute, “Effects of TOD on Housing, Parking and Travel,” TCRP Report 128, Final Draft, August 1, 2008.

- **Based on:** Data on 17 TOD projects in 4 regions, and literature review.
- **Take-Away Quote:** “This study reports that commuters living in transit oriented developments typically use transit 2 to 5 times more than other commuters in their regions, with TOD transit mode share varying from 5% to near 50%.”
- **Key Findings:**
  - **Quality of Transit Service:** Transit ridership is heavily influenced by travel times which vary markedly across the regions studied. Connectivity is also a key ridership factor.

- **Regional Accessibility:** As the transit network links to more job centers, educational opportunities and cultural facilities, transit use increases.
- **Importance of Density in TOD:** The most effective strategy for increasing TOD ridership is to increasing development densities in close proximity to transit.
- **TOD and Parking:** The research confirms that the ITE’s published trip generation and parking generation rates underestimate automobile trip reduction for TOD housing. Findings are that “Over a typical weekday period, the 17 surveyed TOD-housing projects averaged 44% fewer vehicle trips than that estimated by the ITE manual.
- **TOD and Car Ownership:** Households living in TOD are almost twice as likely as other households to not own a car, and own almost half the number of cars of other households. There are two reasons for these differences: TOD households are relatively small households, and they may choose not to own “extra” cars due to transit’s proximity.

## 6.3 Best Practices for Smart Mobility

This section summarizes examples from other agencies relevant to Smart Mobility. Exhibit 18 lists the documents referenced in this section as well as elsewhere in this document, and identifies the relevance of each document to Smart Mobility applications and principles.

## Exhibit 18: Master List of Reference Documents

Best Practices Reference	Source	Reference	Smart Mobility Applications			
			Planning and Programming	Standards and Guidelines	Decision Support	Performance Measures
Compass Blueprint	SCAG	Exhibit 2	■		■	
Sacramento Regional Blueprint	SACOG	Exhibit 2	■		■	
Regional Comprehensive Plan	SANDAG	Exhibit 2; 6.1	■		■	
San Joaquin Valley Blueprint	SJV COGs	Exhibit 2	■		■	
FOCUS	Bay Area Regional Livability Footprint Project	Exhibit 2	■		■	
Walkable Urban Thoroughfares: A Context Sensitive Solutions Approach	Institute of Transportation Engineers	6.1		■	■	
LEED for Neighborhood Development	US GBC	6.1		■	■	
Rural Urban Connections Study	SCOG	6.1		■	■	
Performance Measures for Rural Transportation Systems	Caltrans	6.1				■
California Farmland Mapping and Monitoring Program	CA Dept. of Conservation	6.1	■		■	
Eco-Logical Program	FHWA	6.1	■		■	
Smart Code	Smart Code Central	6.1	■	■		
Form-based Codes Handbook	SACOG	6.1	■	■		
Form-Based Codes	John Wiley & Sons (book)	6.1	■	■		
This is Smart Growth	Smart Growth Network	6.1	■			
A Guide to Achieving Flexibility in Highway Design	AASHTO	6.3	■	■	■	
Smart Transportation Guidebook	NJ DOT and PennDOT	6.1, 6.3	■	■	■	

## Exhibit 18: Master List of Reference Documents (continued)

Best Practices Reference	Source	Reference	Smart Mobility Applications			
			Planning and Programming	Standards and Guidelines	Decision Support	Performance Measures
Place-based VMT analysis	SACOG	6.1			■	
State Highway Access Code	Colorado DOT	6.3	■	■		
Strategic Investment Tool	Florida DOT	6.3	■		■	■
Efficient Transportation Decision Making	Florida DOT	6.3			■	
Multi-Modal Quality/Level of Service Tool	Florida DOT	6.3		■	■	■
Socio-Cultural Effects Evaluation	Florida DOT	6.3			■	
2030 Transportation Plan	Idaho Transportation Agency	6.3	■		■	
2003 Statewide Transportation Plan	Minnesota DOT	6.3	■		■	■
Environmental Sustainability Rating Scorecard (Green Lites Program)	New York DOT	6.3		■	■	
Climate Change/Energy Efficiency Team	New York DOT	6.3	■		■	
Equity Analysis	SF Bay Area MTC	6.3				
Main Street: When A Highway Runs Through It	Oregon DOT	6.3	■		■	
Sustainability Program	Oregon DOT	6.3	■			
When Main Street Is a State Highway	Maryland DOT		■		■	
New Jersey Future in Transportation	New Jersey DOT	6.3	■		■	
Transportation Project Mitigation Cost Screening Matrix	Washington DOT	6.3			■	
Integrating Land Use and Transportation Investment Decision-Making	Washington DOT	6.3			■	



## Exhibit 18: Master List of Reference Documents (continued)

Best Practices Reference	Source	Reference	Smart Mobility Applications			
			Planning and Programming	Standards and Guidelines	Decision Support	Performance Measures
Climate Action Team	Washington DOT	6.3	■		■	
Transportation Improvement Program 2008-2013	Denver Regional COG	6.3	■			■
Destination 2030 and Vision 2040	Puget Sound Regional Council	6.3	■			■
Commonwealth Capital Policy	Mass. Office of Commonwealth Development	6.3			■	
Transit Supportive Land Use Criteria	Federal Transit Administration	6.3	■		■	
Secondary Street Acceptance Requirements	Virginia DOT	6.3		■		
Multi-Modal Level of Service Analysis for Urban Streets	NCHRP Project Report 616	6.3				■
Affordability Index	Brookings Institute	6.3	■		■	■
TOD 101 and TOD 202 publications	Center for Transit Oriented Development	6.1, 6.3			■	
US EPA Compilation of Smart Growth Scorecards	Various	6.3	■		■	■
Smart Growth Scorecards	New Jersey Futures	6.3	■		■	■

## AASHTO

### *A Guide for Achieving Flexibility in Highway Design, 1<sup>st</sup> Edition (May 2004)*

This publication promotes incorporation of community and environmental concerns into highway facility design, consistent with a context-sensitive solutions approach. The book addresses geometric design for context-sensitive solutions, legal liability issues, the project development process, and community involvement. In addressing speed as a design control, the Guide recognizes that “there are many situations in urban areas in which attempting to produce or design for lower speeds is appropriate”, and that “Context-sensitive solutions for the urban environment often involve creating a safe roadway environment in which the driver is encouraged by the roadway’s features and the surrounding area to operate at low speeds.”

**Link** (for ordering information): [https://bookstore.transportation.org/Item\\_details.aspx?id=103](https://bookstore.transportation.org/Item_details.aspx?id=103).

## Colorado DOT

### *State Highway Access Code*

This permitting program has allowed the State to implement its access management program through a formalized process. It groups state roads into eight classification categories based on volume and speed. Each category has requirements that include minimum distances between access points. This enables access to be evaluated on a system network level rather than on a driveway by driveway basis. Since localities require state highway access permits prior to development approval, the standards are a mechanism for coordination of local land use with transportation system management.

**Link:** <http://www.dot.state.co.us/AccessPermits/index.htm>.

## Florida Department of Transportation

### *Strategic Investment Tool*

This Strategic Investment Tool encompasses 25 performance measures. The tool was used initially to determine priorities for the Strategic Intermodal System plan.<sup>5</sup> The

<sup>5</sup> The first plan was submitted to the Florida legislature in 2005.

SIS is a set of highway, aviation, port and rail projects associated with designated *Transportation Hubs or Interregional Corridors*. The measures are also used to identify emerging SIS priorities. The SIS concept grew out of the Economic Competitiveness goal in the 2020 Florida Transportation Plan.

There are five prioritization criteria, each corresponding to the appropriate SIS goal.

- Safety (more secure system for residents, businesses and visitors).
- Preservation (management of transportation facilities).
- Mobility (people and freight).
- Economic (competitiveness and diversification).
- Community and Environment (enriched quality of life and responsible environmental stewardship).

The 4 growth management criteria are an aspect of the SIS that is particularly relevant to the concept of Smart Mobility:<sup>6</sup>

- Consistent, to the maximum extent feasible, with respective adopted local government comprehensive plans (all modes).
- Projects listed as backlogged in local government comprehensive plan and/or concurrency management system (highway).
- If applicable, project supports mobility within designated infill areas, redevelopment areas, downtown revitalization areas, or multi-modal districts (all modes).
- Remove significant truck traffic from downtowns, historic districts or residential areas (highway and rail).

**Link:** <http://www.dot.state.fl.us/planning/SIS/default.htm>.

### *Efficient Transportation Decision Making (ETDM)*

The initiative was originally conceived as a response to the Environmental Streamlining provisions in the TEA-21 reauthorization bill. The framework is deployed in all

<sup>6</sup> <http://www.dot.state.fl.us/planning/systems/mspi/pdf/GMPres081205.pdf>

three major phases of Planning, Programming and Project Development. The key innovative element of this process is the *Environmental Screening Tool*—an Internet-accessible interactive database and mapping tool.

**Link:** <http://www.dot.state.fl.us/emo/ETDM.htm>.

### *Multi-modal Quality/Level of Service Tool*

There are two primary implementation mechanisms for this program. The unique aspects of this effort are threefold:

1. A free tool based on the Highway Capacity Manual that produces LOS measures for bike, pedestrian, transit and road traffic performance in an integrated manner.
2. Bike and pedestrian measures validated with field research on user perception of the safety and comfort of facilities. This is more meaningful than measures of crowding on a sidewalk or in a bike lane that were previously available.
3. It's connected to Florida's statewide minimum LOS standards and guidance on Multi-Modal Planning Districts.

**Link:** <http://www.dot.state.fl.us/planning/systems/sm/los/>.

### *Socio-cultural Effects Evaluation*

This is an analytical method for evaluating the impact of potential transportation investments on quality of life in nearby communities. It provides a framework for bringing together both qualitative and quantitative measures—information gathered through public meetings, formal public surveys, GIS analysis of local amenities, etc. The analysis is tailored to each project and issues are selected from 54 key policy questions grouped into six categories: Social, Economic, Land Use, Mobility, Aesthetics, and Relocation. The evaluation is embedded within the ETDM process mentioned above and Environmental Screening Tool is a key tool employed in the analysis.

**Link:** <http://www.dot.state.fl.us/emo/pubs/sce/sce.htm>.

## Idaho Transportation Agency

### *2030 Transportation Plan*

Innovative long range planning process that used a scenario evaluation tool (MetroQuest) to help stakeholders explore the implications of a variety of future investment strategies. Another unique aspect was the use of an executive “Vision Management Team” to guide the process.

**Link:** [http://itd.idaho.gov/planning/futuretravel/ITD\\_Vision/Vision\\_Complete.pdf](http://itd.idaho.gov/planning/futuretravel/ITD_Vision/Vision_Complete.pdf).

## Minnesota DOT

### *2003 Statewide Transportation Plan*

A good example of comprehensive performance measures integrated into long-range planning. The measures for the State Plan were spread across 10 policy areas and included: ride quality, physical condition of infrastructure, travel time reliability, travel and flow management, travel speed, duration and extent of congestion, crash rate, fatalities, air quality, water quality, and land management. Each district level plan evaluated their investment plans against targets in each of these areas.

**Link:** <http://www.oim.dot.state.mn.us/StatePlan/index.html>.

## New York DOT

### *Environmental Sustainability Rating Scorecard (Green Lites Program)*

An evaluation tool for use by the DOT in evaluating its own project proposals against a “slate” of criteria relating to sustainability and environmental protection. The criteria are grouped into five categories, as follows: sustainable sites, water quality, materials and resources, energy and atmosphere, and innovation. No differentiation in relation to travel modes or community context is made.

**Link:** <https://www.nysdot.gov/programs/greenlites>.

### *Climate Change/Energy Efficiency Team*

This initiative was established in September, 2007. It is structured around five working groups charged with crafting recommendations to improve energy efficiency and reduce GHGs. Of particular relevance is the working group charged with:

“Changing the way the department designs, constructs, rehabilitates, maintains and operates the transportation infrastructure under its control to reduce the amount of greenhouse gases produced by transportation. This includes explicitly considering climate change and energy efficiency when transportation plans are prepared, the capital program is developed and project alternatives are selected.”

The effort is led by the Deputy Commissioner. A broad group of state agency and private sector stakeholder are included in this collaborative effort.

**Link:** <https://www.nysdot.gov/portal/page/portal/news/press-releases/2008/2008-04-21>.

## **San Francisco Bay Area Metropolitan Transportation Commission**

### *MTC Equity Analysis*

MTC used accessibility measures to evaluate the equity implications of its Transportation 2030 Plan. Travel time by car and transit to key locations (schools, jobs, health services, etc.) were key measures. The analysis also attempted to quantify out of pocket savings associated with key investments and specifically tracked changes in VMT through low income and minority communities.

**Link:** [http://www.mtc.ca.gov/planning/2030\\_plan/equity.htm](http://www.mtc.ca.gov/planning/2030_plan/equity.htm).

## **Oregon DOT**

### *Main Street: When A Highway Runs Through It*

This DOT publication addresses the special considerations involved in design and management of state highways that function as main streets in smaller communities. It describes a process for designating main streets as “Special Transportation Areas” in order to establish that the DOT will operate it’s facility as a main street. The publication highlights speed management as part of proper Main Street design, noting that traffic can be slowed “through physical and psychological means.” Concerns about potential liability associated with introducing traffic calming onto a highway are also addressed.

**Link:** <http://www.oregon.gov/ODOT/HWY/BIKEPED/docs/mainstreet.pdf>.

### *Sustainability Program*

A Department-wide Sustainability Plan based on 3 goals—Improve Safety, Move People and Goods Efficiently, Improve Livability and Economic Prosperity. These goals and the specific performance measures with each broad objective were applied to the: Oregon Transportation Investment Act III Bridge Replacement Program, ODOT Maintenance Environmental Management System, and Oregon Transportation Plan update.

**Link:** <http://www.oregon.gov/ODOT/SUS/index.shtml>.

## **Maryland DOT**

### *When Main Street is a State Highway*

This guide emphasizes that when state highways function as main street they must be shared by many users and activities, noting that “this basic condition shapes the visual and physical character of every local road and nearly all concerns stem from it.” The guide recognizes that reducing vehicle speed is a common objective for main streets, and that achieving that objective requires a variety of physical solutions, many of which are identified in the publication.

**Link:** <http://www.marylandroads.com/index.aspx?PagelD=244>.

## New Jersey DOT, Pennsylvania DOT, Delaware Valley Regional Planning Commission

### *Smart Transportation Guidebook*

This jointly produced document provides planning and design guidelines. It covers all aspects of the road network other than limited access highways. Six principles of Smart Transportation are identified:

1. Tailor solutions to the context
2. Tailor the approach
3. Plan all projects in collaboration with the community
4. Plan for alternative transportation modes
5. Use sound professional judgment
6. Scale the solution to the size of the problem

Link: <http://www.smart-transportation.com/guidebook.html>.

## New Jersey Department of Transportation

### *New Jersey Future in Transportation (FIT)*

This initiative is a partnership between NJ DOT and the State Office of Smart Growth. It seeks to “integrate road building and community building.” The central implementation mechanism of NJ FIT is toolbox of techniques that include “traditional capacity improvements and innovative techniques, with a focus on education and communication.”

Link: <http://www.state.nj.us/transportation/works/njfit>.

## Washington DOT

### *Transportation Project Mitigation Cost Screening Matrix*

The tool is part of the Agency’s Watershed Management Program. It incorporates a wide range of data (e.g. urbanization patterns, flood maps, topography, soil type, parks and cultural resources) to identify projects that would benefit from mitigation planning at the watershed level.

The core output of the tool is a Mitigation Risk Index score that “estimates the percentage of land area within the project limits that will likely experience logistical difficulties or elevated costs for in right-of-way environmental mitigation.”

Link: <http://www.wsdot.wa.gov/Environment/Watershed/screeningtool.htm>.

### *Implementing Transportation-Efficient Development: A Local Overview (Phase I)*

The report examined “relationships between local regulations and approved project proposals were examined in 19 study areas along two major state highway corridors in the central Puget Sound region.”

Link: <http://www.wsdot.wa.gov/Research/Reports/500/549.1.htm>.

### *Strategies and Tools to Implement Transportation-Efficient Development: A Reference Manual (Phase II)*

Link: <http://www.wsdot.wa.gov/Research/Reports/500/574.1.htm>.

### *Transportation-Efficient Land Use Mapping—TELUMI (Phase III)*

The tool provides a streamlined methodology for examining the complex relationship between land use and travel behavior. The TELUMI is a set of maps that depicts how the region’s urban form affects overall transportation system efficiency.

Link: <http://www.wsdot.wa.gov/Research/Reports/600/620.1.htm>.

### *Climate Action Team Implementation Working Group for Transportation*

The group was set up to identify actions to reduce transportation related GHG emissions. It recommended specific steps to achieve the VMT reduction goals established by the legislature under HB 2815.

Link: [http://www.ecy.wa.gov/climatechange/2008CAT\\_iwg\\_tran.htm](http://www.ecy.wa.gov/climatechange/2008CAT_iwg_tran.htm).

## Denver Regional Council of Governments

### *Transportation Improvement Program (FY 2008-2013)*

Projects in the TIP were evaluated by a scoring system tailored to project type. The categories included: Current congestion, Safety, Cost-effectiveness, Condition of major structures, Long range plan score, Transportation system management, Multi-modal connectivity, Matching funds, Project-related Metro Vision implementation and strategic corridor focus, Sponsor-related Metro Vision implementation.

**Link:** [http://www.drcog.org/index.cfm?page=TransportationImprovementProgram\(TIP\)](http://www.drcog.org/index.cfm?page=TransportationImprovementProgram(TIP)).

## Puget Sound Regional Council

### *Destination 2030 and Vision 2040*

A wide range of performance measures were incorporated into these two complimentary long range plans (transportation and regional land use). The breadth of the performance measures is significant: mobility, safety, land use, environment, etc. PSRC's implementation of a monitoring system related to these measures is one of the most innovative aspects of this example.

**Link:** <http://psrc.org/projects/mtp/d2030plan.htm>.

## Massachusetts Office of Commonwealth Development

### *Commonwealth Capital Policy*

The Commonwealth Capital Policy provides financial incentives to communities that apply smart growth principles. Fourteen state funding programs are guided by the policy and the Commonwealth Capital Scores that emerge from OCD's smart growth scorecard. To date, nearly 300 communities have participated.

**Link:** [www.mass.gov/Agov3/docs/smart\\_growth/Commonwealth%20Capital%20Summary%2009.rtf](http://www.mass.gov/Agov3/docs/smart_growth/Commonwealth%20Capital%20Summary%2009.rtf).

## Federal Transit Administration

### *Transit Supportive Land Use Criteria*

A comprehensive model for transit project evaluation that explicitly incorporates Smart Mobility Principles. There are three major rating categories, each with supporting factors scored with qualitative criteria—High/Medium/Low. Scores are averaged to produce an overall “Transit Supportive Land Use” rating for transit capital projects. This rating, in turn, is combined with the cost effectiveness rating to evaluate proposed capital projects.

**Link:** [http://www.fta.dot.gov/planning/newstarts/planning\\_environment\\_2620.html](http://www.fta.dot.gov/planning/newstarts/planning_environment_2620.html).

## Commonwealth of Virginia

### *Secondary Street Acceptance Requirements*

The requirements establish new criteria for developer-built streets that are to be maintained by the Commonwealth of Virginia.

In a significant departure from previous policy, developers are now required to build streets that connect with the surrounding transportation network “in a manner that enhances the capacity of the overall transportation network and accommodates pedestrians, while also minimizing the environmental impacts of stormwater runoff by reducing the street widths and allowing the use of low impact development techniques.”

**Link:** <http://virginiadot.org/projects/ssar>.

## National Cooperative Highway Research Program

### *NCHRP Report 616: Multi-modal Level of Service Analysis for Urban Streets*

The Report presents the final recommended LOS models and draft Urban Streets chapter on urban street LOS for the 2010 Highway Capacity Model. Separate models are presented for auto, transit, bike and pedestrian LOS. These are combined in an integrated framework. The four modal LOS models are integrated in that they share the same rating system, share much of the same input data, and reflect intermodal effects of one mode on the perceived LOS of the other.

The related Web-Only User's Guide (Document 128) explores procedures for predicting traveler perceptions of quality of service and performance measures for urban streets.

**Link:** [http://trb.org/news/blurp\\_detail.asp?id=9186](http://trb.org/news/blurp_detail.asp?id=9186).

## Brookings Institute Urban Markets Initiative

### *The Affordability Index*

A new information tool developed by the Urban Markets Initiative to quantify the impact of transportation costs on the affordability of housing choices. The second phase of the Brookings project models neighborhood-level data for 52 different metropolitan areas with results available through an interactive mapping website: [http://htaindex.cnt.org/map\\_tool](http://htaindex.cnt.org/map_tool).

**Link:** [www.brookings.edu/~media/Files/rc/reports/2006/01\\_affordability\\_index/20060127\\_affindex.pdf](http://www.brookings.edu/~media/Files/rc/reports/2006/01_affordability_index/20060127_affindex.pdf).

## Center for Transit Oriented Development

### *TOD 101 and TOD 202 Series*

The Center for Transit Oriented Development (TOD) offers a variety of best practices references that is continually updated. These include illustrated introductions to key topics relating to TOD in the TOD 101 and TOD 202 series, as well as publications that explore in greater depth detailed topics such as value capture and fostering mixed income housing near transit.

**Link:** <http://reconnectingamerica.org/public/practices>.

## US EPA Smart Growth Office: Smart Growth Scorecards

To help share the available resources for rating and analyzing policies and regulations that determine community development patterns, the Development, Community, and Environment Division at the U.S. Environmental Protection Agency (Smart Growth Office) has collected and categorized an extensive set of sample scorecards and

checklists and made them available on an easily-navigated website. The scorecards were created for a range of applications. They are presented with summary descriptions in three categories: municipal level, project-specific, and component scorecards. The collection of component scorecards includes bikeability and walkability scorecards from the Pedestrian and Bicycling Information Center

**Link:** <http://www.epa.gov/smartgrowth/scorecards>.

## New Jersey Future Smart Growth Scorecards

The non-profit organization New Jersey Future has created two Smart Growth Scorecards designed to help citizens and local officials identify smart growth strengths and weaknesses in proposed developments and local planning and growth.

The **Proposed Developments Scorecard** is for evaluating the potential benefits and drawbacks of development proposals relative to smart growth principles. It is most suitable for applying to larger projects, which tend to have larger implications for smart growth.

The **Municipal Planning Scorecard** is intended to help citizens and local officials evaluate whether or not a municipality is "growing smart," and whether or not the right tools are in place to do so.

Online at: <http://www.njfuture.org/index.cfm?fuseaction=user.contentsubcat1&ContentCat=3&ContentSubCat1=17&ContentCatName=Scorecards>

## Active Neighborhood Checklist

This tool for evaluating the suitability of neighborhoods for Active Living was created with the support of the Robert Wood Johnson's Active Living By Design program. Researchers collaborated with community members to develop the checklist, which addresses community design factors including land use pattern, public transportation availability, and walking and biking conditions.

Online at: <http://prc.slu.edu/iafc.html>.

# Appendix A: Glossary of Terms and Abbreviations

<b>7D's</b>	A set of location-efficient land use and development pattern factors that have been shown to have statistically significant correlation with vehicle trip making and vehicle trip length. The 7D's are design (described principally as circulation network intersection density and sidewalk connectivity), diversity (mix of employment and housing), density (amount of housing and employment per unit of land area), destinations (regional accessibility to employment), demographics, distance to transit, and demand management.
<b>AASHTO</b>	American Association of State Highway and Transportation Officials
<b>AB 32</b>	California Assembly Bill 32, the California Global Warming Solutions Act of 2006. See: <a href="http://www.arb.ca.gov/cc/ab32/ab32.htm">www.arb.ca.gov/cc/ab32/ab32.htm</a>
<b>AB 32 Scoping Plan</b>	The AB 32 Scoping Plan contains the main strategies California will use to reduce the greenhouse gases that cause climate change. Available at: <a href="http://www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm">www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm</a>
<b>Accessibility</b>	The ease of reaching goods, services and destinations.
<b>ADA</b>	Americans with Disabilities Act
<b>APS</b>	Alternative Planning Strategy
<b>ARB</b>	California Air Resources Board
<b>Blueprint Program</b>	<p>A Caltrans-funded Program that provides funds for regional collaborative decision-making and adoption of plans that will achieve performance outcomes to foster more efficient land use patterns that:</p> <ul style="list-style-type: none"><li>• Support improved mobility and reduced dependency on single-occupant vehicle trips.</li><li>• Accommodate an adequate supply of housing for all incomes.</li><li>• Reduce impacts on valuable habitat, productive farmland, and air quality.</li><li>• Increase resource use efficiency.</li><li>• Promote a prosperous economy.</li><li>• Result in safe and vibrant neighborhoods.</li></ul> <p>From Caltrans FY 2007/08 Blueprint Grant Application</p>
<b>CTC</b>	California Transportation Commission
<b>CEQA</b>	California Environmental Quality Act
<b>CSMP</b>	Corridor System Management Plan



<b>CTP</b>	California Transportation Plan. A statewide, long-range transportation plan for meeting our future mobility needs. The CTP defines goals, policies, and strategies for California’s future transportation system, but does not specify transportation investments or programs. This plan, with a minimum 20-year planning horizon, is prepared in response to federal and State requirements and is updated every five years. The California Transportation Plan 2030 is being updated for a 2035 planning horizon, and is being further expanded to become a statewide Interregional Blueprint in response to new state legislation that requires the CTP to be both multi-modal and integrated between all modes and land uses.
<b>Complete Neighborhoods</b>	Areas that are predominantly housing with a mix of other uses and design characteristics that contribute to supporting convenience, non-motorized travel, and efficient vehicle trips.
<b>Complete Streets</b>	Streets designed and operated to enable safe access for all users so that pedestrians, bicyclists, motorists, and transit riders of all ages and abilities are able to safely move along and across the street.  <i>Based on definition of Complete Streets from <a href="http://www.completethestreets.org">www.completethestreets.org</a></i>
<b>EMFAC</b>	The California Air Resources Board’s motor vehicle emission factor model
<b>GHG</b>	Greenhouse gas(es)
<b>HCD</b>	California Department of Housing and Community Development
<b>High capacity transit</b>	High capacity transit vehicles make fewer stops, travel at higher speeds, have more frequent service, and carry more people than local service transit such as typical bus lines. High capacity transit includes options such as light rail, commuter rail, and bus rapid transit.  <i>Based on Portland Metro definition from <a href="http://www.oregonmetro.gov/index.cfm/go/by.web/id=28462">www.oregonmetro.gov/index.cfm/go/by.web/id=28462</a></i>
<b>HOV</b>	High Occupancy Vehicle
<b>IGR</b>	Intergovernmental review
<b>Induced development</b>	Real-estate investment and development that occurs in a transportation corridor as a result of transportation investment that improves travel capacity or efficiency within the corridor. The land development may be residential, commercial, industrial or activity center, may occur as a result of or in anticipation of the transportation project, and may be in response to any type of major transportation investment, including freeway extension or widening, new interchange or bridge, or rail station.

<b>Induced travel</b>	<p>Travel that occurs as a result of a decrease in the generalized cost of travel, including both travel-time and out-of-pocket costs. Induced travel may be a result of changes to one or more of the following traveler choices: new trip generation, longer trips, trips to different destinations, reduced trip consolidation or “chaining,” use of different modes, different travel routes, or travel at different times of day. Induced vehicle travel may occur as a result of roadway expansion. Induced transit travel may occur as a result of transit system or service expansion.</p> <p><i>Based on Federal Highway Administration Definition from <a href="http://www.fhwa.dot.gov/Planning/itfaq.htm#q1">www.fhwa.dot.gov/Planning/itfaq.htm#q1</a></i></p>
<b>ITE</b>	Institute of Transportation Engineers
<b>ITS</b>	Intelligent transportation systems
<b>Livability</b>	<p>Environmental and social quality of an area as perceived by residents, employees, customers and visitors. This includes safety and health (traffic safety, personal security, public health), local environmental conditions (cleanliness, noise, dust, air quality, water quality), the quality of social interactions (neighborliness, fairness, respect, community identity and pride), opportunities for recreation and entertainment, aesthetics, and existence of unique cultural and environmental resources (e.g., historic structures, mature trees, traditional architectural styles).</p> <p><i>Based on definition of community livability from VTPI online TDM encyclopedia, <a href="http://www.vtpi.org/tdm/tdm97.htm">www.vtpi.org/tdm/tdm97.htm</a></i></p>
<b>Location Efficiency</b>	The fit between the physical environment and the transportation system that can lead to Smart Mobility benefits. Two factors in achieving location efficiency are regional accessibility and community design. These can be complemented for stronger results by transportation demand management and pricing mechanisms.
<b>Location-Efficient Community Design</b>	Characteristics of development use, form, and location that combine with the multi-modal transportation system to support convenience, non-motorized travel, and efficient vehicle trips at the neighborhood and area scale.
<b>Location-Efficient Regional Accessibility</b>	Characteristics of development use, form, and location that combine with the multi-modal transportation system to make destinations available through non-SOV travel and efficient vehicle trips at the regional, interstate, and international scales.
<b>LOS</b>	Level of Service
<b>MPO</b>	Metropolitan planning organization
<b>MTC</b>	San Francisco Bay Area Metropolitan Transportation Commission
<b>OPR</b>	California Governor's Office of Planning and Research
<b>Parking Management</b>	Strategies aimed at making better use of parking supply through altering the amount, location and design, regulation, pricing, and management of on- and/or off-street parking.

<b>PeMS</b>	Freeway Performance Measurement System. A source of historical and real-time data from freeways in the State of California in order to compute freeway performance measures.
<b>Productive Travel</b>	Travel essential to the State and regional economy, including interregional and international commerce (ports, freight movements and deliveries if consolidated), commute trips, tourist travel, a portion of government travel (e.g. to maintain infrastructure and the peace, military travel) and a portion of the travel related to the business of business (such as strategic resource activities including bio/solar/wind energy areas, agriculture, lumber, oil, mining, logistics)
<b>Public Realm</b>	The shared space of urbanized areas, often referred to as “the space between buildings,” that includes the public right of way, open spaces including parks and plazas, and building facades.
<b>RTP</b>	Regional Transportation Plan. RTP Guidelines are available at: <a href="http://www.dot.ca.gov/hq/tpp/offices/orip/rtp/index.html">www.dot.ca.gov/hq/tpp/offices/orip/rtp/index.html</a>
<b>RTPA</b>	Regional Transportation Planning Agency
<b>Road Diet</b>	Reallocation of roadway space to reduce the number of through-travel lanes for motorized vehicles while maintaining the overall area. Space made available through reduction of motorized vehicle lanes is typically converted to bicycle lanes, sidewalks, and/or on-street parking.  Based on “Summary Report: Evaluation of Lane Reduction “Road Diet” Measures and Their Effects on Crashes and Injuries FHWA-HRT-04-082
<b>ROI</b>	Return on Investment
<b>SACOG</b>	Sacramento Area Council of Governments
<b>SANDAG</b>	San Diego Area Association of Governments
<b>SB 375</b>	California Senate Bill 375 of 2008 Senate Bill 375 (Steinberg) requires the California Air Resources Board to develop regional greenhouse gas emission reduction targets to be achieved from the automobile and light truck sectors for 2020 and 2035. The 18 MPOs in California will prepare a “sustainable communities strategy” to reduce the amount of vehicle miles traveled in their respective regions and demonstrate the ability for the region to attain ARB’s targets. For bill text, see: <a href="http://leginfo.ca.gov/cgi-bin/postquery?bill_number=sb_375&amp;sess=CUR&amp;house=B&amp;author=steinberg">http://leginfo.ca.gov/cgi-bin/postquery?bill_number=sb_375&amp;sess=CUR&amp;house=B&amp;author=steinberg</a>
<b>SCAG</b>	Southern California Association of Governments
<b>SCS</b>	Sustainable Communities Strategy
<b>SHSP</b>	Strategic Highway Safety Plan

<b>Smart Growth</b>	<p>A planning, conservation, and development approach that is summarized in the following ten principles:</p> <ol style="list-style-type: none"> <li>1. Mix land uses</li> <li>2. Take advantage of compact building design</li> <li>3. Create a range of housing opportunities and choices</li> <li>4. Create walkable neighborhoods</li> <li>5. Foster distinctive, attractive communities with a strong sense of place</li> <li>6. Preserve open space, farmland, natural beauty, and critical environmental areas</li> <li>7. Strengthen and direct development towards existing communities</li> <li>8. Provide a variety of transportation choices</li> <li>9. Make development decisions predictable, fair, and cost effective</li> <li>10. Encourage community and stakeholder collaboration in development decisions</li> </ol> <p><i>U.S. EPA Smart Growth Principles from <a href="http://www.epa.gov/piedpage/about_sg.htm">www.epa.gov/piedpage/about_sg.htm</a>.</i></p>
<b>SMPM</b>	Smart Mobility performance measures
<b>SOV</b>	Single-occupant vehicle
<b>Stewardship</b>	In the context of the Smart Mobility Framework, shared responsibility for essential assets and activities.
<b>Sustainability</b>	Defined globally as meeting the needs of the present population without compromising the ability of future generations to meet their own needs. Sustainability in the context of the California Transportation Plan and many other policy documents is articulated relative to the 3 Es of equity, environment and economy.
<b>Sustaining Travel</b>	Essential household travel for all purposes (work, school, shopping etc) that occurs even in areas with the best land use place making and transit and TDM programs
<b>SWITRS</b>	Statewide Integrated Traffic Records System. A source of data on reported fatal and injury collisions which occurred on California's state highways and all other roadways, maintained by the California Highway Patrol.
<b>TDM</b>	Transportation demand management
<b>TOD</b>	Transit Oriented Development
<b>Urban</b>	As used in the Smart Mobility, developed areas characterized by relatively great intensity of residential, commercial, and institutional uses. The urban Smart Mobility Place Types are: urban centers, close-in compact communities, compact communities, suburban communities, and some special use areas.
<b>Urbanized</b>	Developed areas with a concentration of residential, commercial or institutional uses at any intensity.
<b>VKT</b>	Vehicle kilometers of travel

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**VHD**

Vehicle hours of delay

**VMT**

Vehicle miles of travel

**Walkability**

The extent to which the built environment supports and encourages pedestrian movement by providing for pedestrian comfort and safety, connecting people with varied destinations within a reasonable amount of time and effort, and offering visual interest in journeys throughout the network.

*Based on definition in "Designing the Walkable City" by Michael Southworth, in Journal of Urban Planning and Development, December 2005.*

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# Appendix B: Using Smart Mobility Performance Measures— Hypothetical Examples

This appendix contains three case studies that illustrate how the Smart Mobility performance measures described in Chapter 4 of this would address three different types of study conducted by Caltrans or its partner agencies. The three types of evaluation are:

1. Regional Transportation Plan/  
Sustainable Communities Strategy
2. Context Sensitive Design of a  
Arterial State Highway
3. Corridor Systems Management Plan

Each example is hypothetical.

Individually and as a group the examples demonstrate that the application of SMPMs produces study conclusions that are more consistent with Smart Mobility principles than would conventional performance measures.

## Example 1: Regional Transportation Plan

### Overview

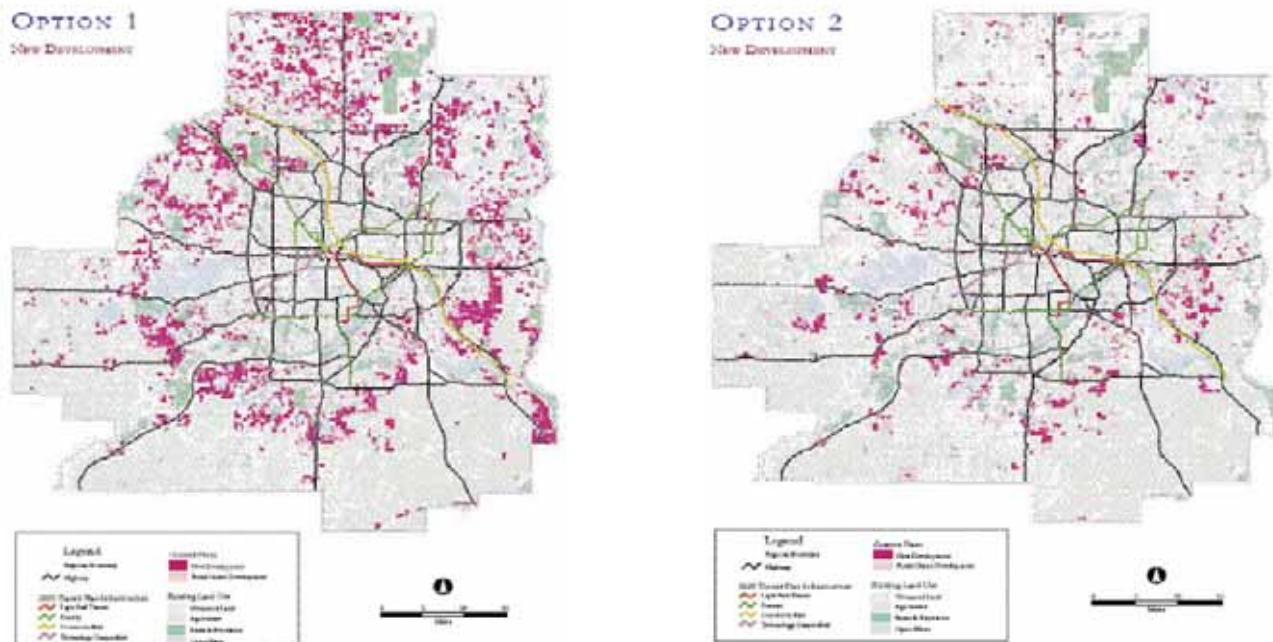
#### Problem Statement

Region is anticipating high levels of growth, stretching into undeveloped areas underserved by available transportation capacity. The trend-line growth would probably require significant additional investment in extending transportation networks and services and would be likely to result in limited reinvestment in central areas. The trend would also generate environmental impacts to rural areas and remote open space and increased emissions and energy consumption.

#### Planning Objective

Coordinate land use and transportation policies in a manner acceptable to local and regional governments that sustains acceptable levels of travel accessibility and regional economic vitality, supports cost-effective infrastructure investments, and minimizes environmental impacts related to land development and induced travel. Translate the policies into an integrated regional transportation plan (RTP) and sustainable communities strategy (SCS) conforming with California climate laws AB32 and SB375.

### Exhibit 19: Integrated Land Use and Transportation Management Strategies



## Exhibit 20: Coordinated Land Use and Transit Growth

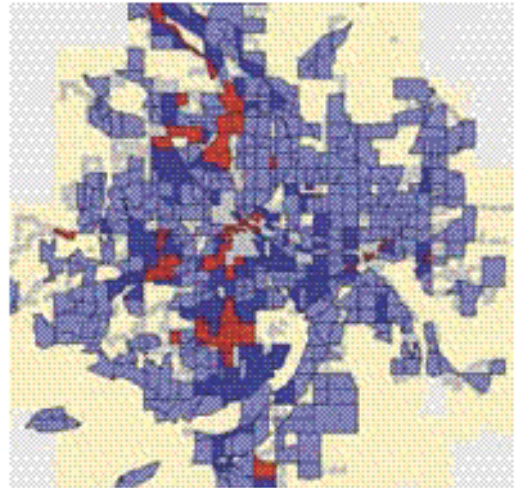
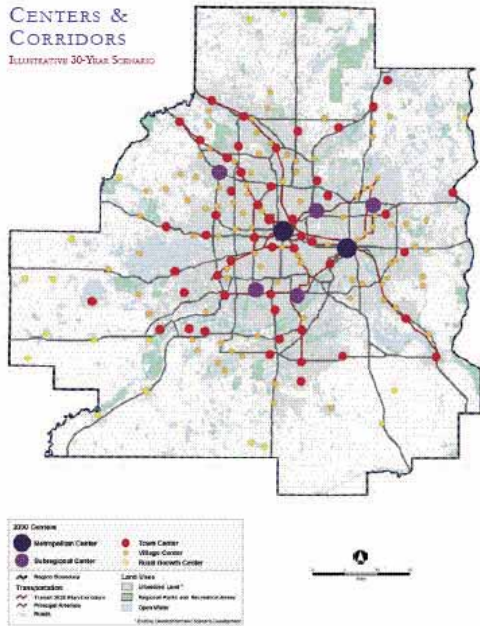


Figure 3: Transit service level variations



## Planning Scenarios

Two planning scenarios under consideration are summarized below.

	<b>Option 1: Trend-Line Regional Land Use and Transportation Plan</b>	<b>Option 2: Sustainable Communities Strategy for Transportation and Land Use</b>
<b>Description</b>	<ul style="list-style-type: none"> <li>• Preserves business-as-usual growth pattern with limited infill and transit-oriented development</li> <li>• Almost all growth occurs in suburban and rural areas as separated uses rather than mixed-use development sites</li> <li>• Attempts to add highway capacity and systems management to keep pace with development trend</li> <li>• Maintains current levels of transit funding</li> <li>• Mitigates impacts to natural environment and air quality through often-expensive remedial actions</li> </ul>	<ul style="list-style-type: none"> <li>• Engages local jurisdictions and interest groups in judicious “blueprint” scenario planning, finding an alternate growth scenario with less sprawl.</li> <li>• Tailors growth plan to take advantage of existing transportation system and opportunity sites for infill, transit-oriented and mixed use development.</li> <li>• Tailors transportation plan with multi-modal services providing accessibility to planned growth areas</li> <li>• Emphasizes travel demand management (TDM) strategies and minimization of induced travel.</li> <li>• Attempts to prevent impacts to natural environment and air quality.</li> </ul>
<b>Advantages</b>	<ul style="list-style-type: none"> <li>• Accommodates many of the developer and local government planning practices of recent decades</li> <li>• Responds to market-forces experienced during periods of low fuel prices and little concern about sustainability</li> <li>• Investment reduces highway congestion to the benefit of goods movement and essential forms of personal mobility</li> </ul>	<ul style="list-style-type: none"> <li>• Reduces VMT per capita and greenhouse emissions as required under AB32 and SB375</li> <li>• Economic investment in central areas and brownfield and grayfield sites with potential benefits to environment and social equity</li> <li>• Responds to sustainability objectives increasingly embraced by local jurisdictions.</li> <li>• Responds to demographic shifts toward empty-nester, green and young urban professional markets.</li> </ul>
<b>Disadvantages</b>	<ul style="list-style-type: none"> <li>• Increases VMT per capita and emissions</li> <li>• Induces travel beyond levels necessary for economic well being</li> <li>• Impacts the natural and built environment</li> <li>• Capital intensive</li> </ul>	<ul style="list-style-type: none"> <li>• Potential impacts to goods movement economy.</li> <li>• Unless system management and demand management measures are successful, congestion may increase greenhouse emissions per VMT</li> </ul>

## Performance Measures

The following table compares performance measures that would be used to evaluate potential improvements under conventional Caltrans practice and under the Smart Mobility Framework.

## Exhibit 21: Comparison of Performance Measures, Example 1

Conventional Performance Measure	Smart Mobility Performance Measure
Highway Travel-Time Mobility	Multi-Modal Travel-Time Mobility
Automobile Accessibility	Accessibility and Connectivity
Transit Mode Share	Walking, Bicycling and Transit Mode Share
Time Lost to Congestion (VHD)	Productivity Lost to Congestion
Return on Investment (ROI)	Return on Investment, Benefit by Mode
Vehicle Miles Traveled (VMT) and Emissions	Climate and Energy Conservation
Reductions in ag. land, habitat	Support for Sustainable Growth

### Illustrative Evaluation of Alternatives

The following checklists illustrate how the respective sets of performance measures would rate the two planning scenarios. This simple format suggests that, under conventional measures, the trend-line scenario (Option 1) would perform significantly better than the RTP/SCS scenario (Option 2). Conversely, Option 2 would perform significantly better when the two are compared using SMPMs.

Conventional Measure	Acceptable Performance?	
	Option A	Option B
Highway Travel-Time Mobility	■	
General Accessibility	■	
Transit Mode Share		■
Time Lost to Congestion (VHD)	■	
Return on Investment (ROI)	■	
Vehicle Miles Traveled (VMT) and Emissions	■	■
Reductions in ag. land, habitat		■
<b>Percent Checked</b>	<b>71%</b>	<b>43%</b>

### Conclusion

SMPMs would support the conclusion that Option 2, the sustainable communities strategy, would promote a more favorable regional transportation solution than Option 1, trend-line growth. Conventional performance measures would reach the opposite conclusion. Option 2 is generally more consistent with the principles of Smart Mobility, including location efficiency and environmental stewardship.

Smart Mobility Measure	Acceptable Performance?	
	Option A	Option B
Modal Travel-Time Mobility		■
Access, Connectivity		■
Walking, Bicycling and Transit Mode Share		■
Productivity Lost to Congestion	■	■
Return on Investment	■	■
GHG Emissions and Energy Conservation		■
Support for Sustainable Growth		■
<b>Percent Checked</b>	<b>28%</b>	<b>100%</b>

## Example 2—Context-Sensitive Design of an Arterial

### Overview

### Problem Statement

Congested arterial State Route through a stable close-in compact community creates a community barrier, separating downtown from nearby neighborhoods, homes from schools and parks, transit hubs from transit users, and reducing economic vitality of adjoining business uses. Route description:

- Heavily congested with very high traffic volumes (50,000 vehicles/day), with low levels of service (LOS) for vehicles, including LOS F during midday and commute hours at several intersections
- 6-lanes wide, creating long crossing distances for pedestrians
- No bike lanes, minimal sidewalk widths, widening is constrained by existing development
- Signals spaced close together along some segments, allowing pedestrian crossings but contributing to high congestion

- On other segments, signals are spaced far apart, reducing congestion but limiting pedestrian crossing opportunities, and resulting in accident rates above statewide average
- Traffic lanes are standard highway width (12 feet), and road is straight, resulting in high traffic speeds (45 mph) during times of low congestion
- Route carries numerous local and regional bus lines, including BRT, and is a designated truck route

### Design Objective and Improvement Alternatives

Improve safety, comfort and convenience for all affected by the corridor, including those traveling along the route and those within the immediate affected community, supporting economic development of the corridor. Two alternatives are under consideration.



	<b>Alternative A: Conventional Re-Design</b>	<b>Alternative B: Context Sensitive Design</b>
<b>Description</b>	<ul style="list-style-type: none"> <li>• Add lanes at intersections as needed to improve traffic LOS</li> <li>• Time traffic signals to accommodate 45 mph speeds with minimal stops and delays</li> </ul>	<ul style="list-style-type: none"> <li>• Narrow traffic lanes to reallocate space to bike lanes or wider sidewalks and landscaping</li> <li>• Redesign for 30 mph through alignment curvatures and traffic signals timing</li> </ul>
<b>Advantages</b>	<ul style="list-style-type: none"> <li>• Improves travel time mobility</li> <li>• Improves bus on-time performance</li> <li>• Reduces emissions</li> </ul>	<ul style="list-style-type: none"> <li>• Traffic speeds more compatible with adjoining land uses and modes</li> <li>• Improves pedestrian environment and economic vitality of neighborhood</li> <li>• Reduces pedestrian crossing distances</li> <li>• Reduces emissions</li> </ul>
<b>Disadvantages</b>	<ul style="list-style-type: none"> <li>• Retains incompatibility of traffic speeds with adjoining land uses and modes</li> <li>• Widening impacts adjoining buildings natural environment</li> <li>• Increases pedestrian crossing distances and vulnerability</li> </ul>	<ul style="list-style-type: none"> <li>• Requires driver education and awareness campaign</li> <li>• May increase bus travel times but improves bus stops and walk access</li> <li>• May require measures to protect adjoining neighborhoods from traffic diversion</li> </ul>



## Performance Measures

The following table compares performance measures that would be used to evaluate potential improvements under conventional Caltrans practice and under the Smart Mobility Framework.

## Exhibit 22: Comparison of Performance Measures, Example 2

Current Performance Measure	Smart Mobility Performance Measure
Design Speed	Design and Speed Suitability
Mobility (Minimize traffic travel time)	Multi-Modal Travel Time Mobility:
—	Pedestrian & Bike Mode Share:
Capacity, Volume/Capacity	Network Performance
Emissions (Minimize criteria pollutants)	Climate and Energy Conservation
—	Emissions Reductions
—	Land Use Efficiency:
Level of Service	Multi-Modal LOS

### Illustrative Evaluation of Alternatives

The following checklists illustrate how the respective sets of performance measures would rate the two improvement options, indicating in simple form, that the conventional re-design (Alt A) would perform significantly better than the context-sensitive design (Alt B) under conventional measures and that Alt B would perform significantly better under Smart Mobility measures.

### Conclusion

SMPMs would be likely to lead to the conclusion that Option B, the context sensitive design, would promote a more favorable community transportation solution than Option A, the conventional re-design. Conventional performance measures would reach the opposite conclusion.

Conventional Measure	Acceptable Performance?	
	Option A	Option B
Design Speed	■	
Traffic Mobility	■	
—	—	—
Volume/Capacity	■	
Emissions	■	■
—	—	—
Level of Service	■	
<b>Percent Checked</b>	<b>100%</b>	<b>20%</b>

Smart Mobility Measure	Acceptable Performance?	
	Option A	Option B
Design and Speed Suitability		■
Multi-Modal Travel Mobility		■
Ped and Bike Mode Share		■
Network Performance Optimization	■	■
Climate and Energy Conservation	■	■
Emissions Reduction	■	■
Land Use Efficiency		■
Multi-Modal Level of Service		■
<b>Percent Checked</b>	<b>28%</b>	<b>100%</b>

## Example 3—Corridor System Management Plan

### Overview

#### Problem statement

A 50-mile transportation corridor including a freeway, parallel roads, transit services, and bike routes, which exhibits the following problems:

- Traffic congestion
- Lack of parallel roadway capacity
- Transit facilities approaching ridership capacity
- Inadequate transit capital and operations funding
- Incomplete HOV network
- Gaps and barriers within the bicycle network along the corridor
- Obstructed bicycle and pedestrian access to transit.

A Corridor Systems Management Plan (CSMP) is being prepared to identify capital and operational improvements actions for the corridor across modes and jurisdictional boundaries. CSMP's are conducted in a manner consistent with the goals and objectives of the Governor's *Strategic Growth Plan*, including public accountability for bond funded projects.

#### Proposed Solution

Based on technical analysis and stakeholder participation process already completed for the CSMP, the recommended improvements strategy for the corridor includes the following elements:

- Multi agency corridor management team responsible for corridor system oversight.
- Comprehensive multi-modal traffic monitoring and detection, traffic operations, and travel information.
- Addition of HOV lanes along 10 miles of freeway bottlenecked regional bus/carpool lane network, including direct freeway-to-freeway connections.
- Expanded transit options.
- Closure of gaps on key bicycle routes and improved freeway ramp intersections on bike routes.
- New infill interchange.

### Exhibit 23: Corridor Bottleneck and Congestion Locations





### Performance Measures

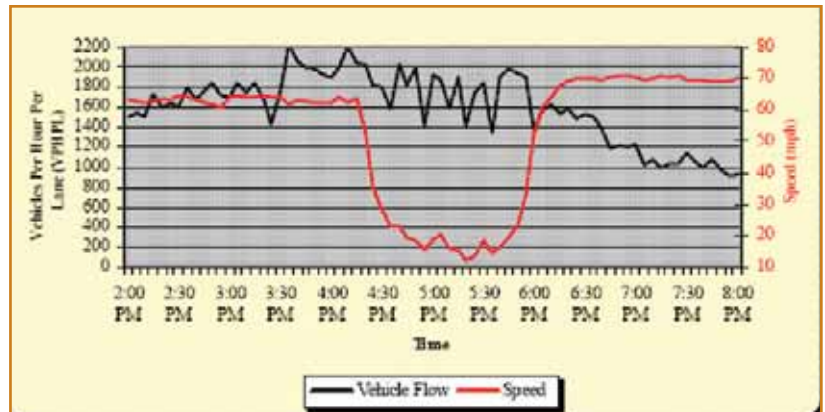
The following table compares performance measures used in the CSMP with those recommended under the Smart Mobility Framework.

### Exhibit 24: Comparison of Performance Measures, Example 3

Performance Measures Applied in CSMP	Smart Mobility Performance Measures
Vehicle Level of Service	Multi-Modal Level of Service
Vehicle Hours of Delay (VHD), and Person Delay	Multi-Modal Travel Mobility
Vehicle Travel Time, Traffic Operations Analysis	Multi-Modal Travel Reliability
	Network Performance Optimization
Vehicle Collision Rate	Multi-Modal Safety
Availability of Transit Capacity	Transit Mode Share
Traffic Lane Utilization	Congestion effects on Productivity
	Accessibility and Connectivity
	Climate and Energy Conservation
	Support for Sustainable Growth

### Vehicle Throughput and Speed

A key difference between the CSMP and Smart Mobility performance measures is the greater Smart Mobility emphasis on safety and service for all modes of travel and the attention within the Smart Mobility measures to growth and travel inducement impacts of highway capacity increases and resulting growth in emissions relative to climate law.



## Evaluation

### Conventional Measures

Performance measures used in the CSMP to identify corridor improvement needs include: vehicle LOS, vehicle hours of delay and person minutes of delay, minutes of delay per vehicle and per person, vehicle travel time, distressed pavement, collision rate, and the LOS on parallel routes and the available transit capacity.

Based on these criteria, the CSMP recommends a set of multi-modal projects, including operational strategies and capital projects to improve safety and reduce the severity and duration of congestion and a wider array of mobility options offered in the corridor. These include the following network-wide corridor management strategies:

- Designation of a multi agency corridor management team responsible for corridor system management oversight;
- Development and use of micro-simulation traffic modeling;
- Implementation of a comprehensive multi-modal traffic monitoring and detection, traffic operations, and traveler information;
- Completion of the regional bus/carpool lane network, including direct freeway-to-freeway
- Bus/carpool lane connectors;
- Expanded transit options;
- Closure of gaps on key bicycle routes; and

- Improve freeway ramp intersections on bicycle routes to provide bicyclist and pedestrian friendly design.
- Implementation of HOV lanes in the corridor.

### Smart Mobility Measures

Within the study corridor, the route is almost entirely a freeway facility. Over its length, it travels through a range of Smart Mobility Place Types: from the urban center, through close-in compact communities, suburban centers and suburban residential communities.

Based on the dominant facility class and place types served, the SMPMs for the corridor would be:

- Modal accident rates and severity
- Return on Investment
- Speed and network management
- Modal travel-time consistency
- Emissions, including CO2
- Multi-modal LOS.

Several additional performance measures are relevant based on the corridor place types:

- Land use efficiency
- Productivity lost to congestion
- Accessibility and connectivity.

The Smart Mobility Framework proposes all of the performance measures employed in the CSMP, and several that were not. The only CSMP measure not included in the list



of highest priority Smart Mobility measures above is distressed pavement. This difference relates to the fact that the Smart Mobility Framework focuses on planning rather than operations and maintenance functions.

The following Smart Mobility measures were not explicitly identified as performance measures in the CSMP:

- Modal travel-time consistency
- Network optimization
- Speed management.

However, although network optimization and operations management were not explicitly applied as performance measures, the CSMP did rely on traffic operations analysis and did recommend further micro-simulation traffic modeling and implementation of a comprehensive multi-modal traffic monitoring and detection, traffic operations, and traveler information.

### Differences between Conventional CSMP and Smart Mobility

The CSMP included LOS, collision rates, travel time consistency, but with an emphasis only on trucks and autos, not transit, pedestrians and cyclists. While the auto emphasis is appropriate for the freeway elements of the CSMP, an assessment that is fully responsive to Smart Mobility principles would also include an assessment of transit service levels for travel through and within the corridor, and would include consideration of pedestrian and bicycle safety and circulation along parallel and intersecting routes and interchanges. The CSMP recommends improved freeway ramp intersections on bicycle routes to provide bicyclist and pedestrian friendly design.

The CSMP did not specifically address CO<sub>2</sub> or other emissions. Subsequent project development and environmental studies on the recommended HOV improvements and roadway widening would be expected to evaluate and mitigate these impacts.

The CSMP evaluates return on investment (ROI) and productivity through a measure of traffic lane utilization. Smart Mobility principles would suggest that, in addition to lane utilization, future studies identify the user groups benefited

by the proposed corridor improvements and the respective utilization levels and reductions in lost-time attributable to recommended traffic and transit improvements, taking into consideration the potential for induced travel.

The potential for induced travel among different user groups and different trip purposes should also be considered in the assessment of the effects of recommended improvements in subsequent project development and environmental studies and compared with SMPMs related to support of sustainable growth and accessibility/connectivity.

### Conclusion

While the performance measures cited in the CSMP do not specifically include about ten of the performance measures that would be recommended under the Smart Mobility Framework, the CSMP does consider many of those measures in the analysis performed to support the study and in the recommendations produced. Others of the Smart Mobility measures are likely to be included in subsequent project development studies and environmental studies related to the specific projects recommended by the CSMP. The primary respects in which the SMPMs would affect studies of this type would be to: 1) make a greater number of the mobility and service assessments multi-modal rather than vehicle oriented, 2) consider individual user groups and the equity and economic utility of the travel served by different strategies, and 3) consider alternatives that would emphasize location efficiency and accessibility and connectivity to potentially minimize induced travel and unnecessary impacts on energy use and emissions.

The Smart Mobility Framework performance measures appear to address the objectives of multi-modal focus, speed suitability, activity connectedness, network management, land use efficiency, economic productivity and climate and energy sustainability than do the conventional performance measures. In doing so, they also appear more effective than the conventional measures in supporting the Smart Mobility principles of location efficiency, reliable mobility, health and safety, environmental quality, social equity, and robust economy.

# Appendix C: Implementation Checklist

Theme	Smart Mobility Framework (SMF) Activities	State / Regional / Local	Participants	Initiation Time Frame	Relevant Handbook Sections	Relevant Activities and Resources
<b>1. Impact and Effectiveness of Smart Mobility Framework</b>						
Increase impact and effectiveness of SMF [1.1 - 1.2]	1.1 Establish multi-agency work group to promote and launch the SMF, provide further review opportunities, monitor progress and make needed refinements	S / R / L	Caltrans, HCD, OPR, RTPAs, MPOs, Sales tax authorities, local governments, LCC	0-2 yrs	All	SMF TAC (effort ongoing), interdepartmental and interdepartment outreach by Caltrans Community Planning staff, SMF participation by partners at HCD and OPR
	1.2 Publish and widely disseminate SMF Resources	S/R	Caltrans, OPR, HCD, ARB, LCC	0-2 yrs	All	ARB Cool California website, local government toolkit, Institute for Local Government website of available tools and resources
<b>2. Blueprint Planning</b>						
Support an expanded Interregional Blueprint Planning Program that advances SMF principles, concepts and methods [2.1 - 2.2]	2.1 Prepare a Statewide Inter-Regional Blueprint Plan incorporating SMF, summarizing state modal plans, and synthesizing the Regional Blueprint efforts	S	Caltrans lead, Regional Agencies, Affected Local Governments	0-2 yrs	All	California Transportation Plan (CTP) update, Regional Blueprint activities, ITSP, System Planning Activities
	2.2 Support continuing Regional Blueprint efforts consistent with SMF principles	S, R	Caltrans, Regional Agencies, Local Governments	0-2 yrs	All	Ongoing Blueprint Planning activities throughout the state, Regional Progress Report, Sustainable Communities Strategies, ongoing modeling and data improvement activities

Theme	Smart Mobility Framework (SMF) Activities	State / Regional / Local	Participants	Initiation Time Frame	Relevant Handbook Sections	Relevant Activities and Resources
<b>3. Unified Caltrans Policy and Practice</b>						
Integrate SMF consistently into policy and practice [3.1 - 3.3]	3.1 Develop specific action plans to mainstream SMF into all Departmental Activities across districts and functional areas	S	All Caltrans divisions and districts	0-2 yrs	All	Complete Streets Implementation Action Plan, CTP update, updates of various manuals and guidelines
	3.2 Incorporate SMF principles, performance measures, concepts and tools into policy and planning documents	S	All Caltrans divisions and districts	0-2 yrs	All	Phase I SMF work products prepared under EPA Smart Growth Technical Assistance Grant (2008) that identified policy conflicts & consistency issues
	3.3 Institute a consistent approach to performance measurement using SMF performance measures as appropriate in forecasting and monitoring activities. [see Activity 5.4]	S	All Caltrans divisions and districts	0-2 yrs	Chapter 4, Section 6.3, Appendix B	Phase I SMF work products prepared under EPA Smart Growth Technical Assistance Grant (2008) that scanned various sets of performance measures currently in use
<b>4. Policy and Practice Integrated with Other Agencies and Departments</b>						
Integrate SMF into Strategic Growth Council activities	4.1 Review of all State agency and Department Strategic Plans to identify complementary and competing goals and objectives, identify implementation activities	S	Strategic Growth Council; Caltrans, OPR, HCD, ARB, DPH, & other state departments	0-2 yrs	All	EPA Smart Growth Implementation Assistance Grant to support Strategic Growth Council, 2009-2010

Theme	Smart Mobility Framework (SMF) Activities	State / Regional / Local	Participants	Initiation Time Frame	Relevant Handbook Sections	Relevant Activities and Resources
Integrate SMF into SB 375 Implementation Activities	4.2 Use SMF concepts and tools to support Sustainable Communities Strategies (SCSs) and Alternative Planning Strategies (APSS)	S, R	Caltrans, Air Resources Board, Regional Agencies preparing SCSs and APSS	0-2 yrs	All	Recommendations of the Regional Targets Advisory Committee Pursuant to SB 375, RTP guidelines and RTP updates
<b>5. Data and Tools</b>						
Collect, develop and use data and tools needed to implement SMF including performance measures [5.1 - 5.5]	5.1 Update data collection and analysis methods to provide basis for use of smart mobility performance measures	S, R	Caltrans, Regional Agencies	0-2 yrs	Section 4.3	Statewide modeling and data improvement program, SGC-funded MPO modeling improvement program
	5.2 Support development and application of travel demand modeling applications and post-processing methods that are sensitive to location-efficient community design elements	S, R	Caltrans	0-2 yrs	Section 4.3	Modelling application improvements in connection with SB 375 activities and regional blueprints (see 5.1)
	5.3 Use travel demand modeling applications or post-processing adjustment procedures sensitive to community design factors	S, R, L	Caltrans, Regional Agencies, Local Governments	0-2 yrs	Section 4.3, Appendix C	Modelling application improvements in connection with SB 375 activities and regional blueprints (see 5.1), Caltrans' Assessment of Local Models and Tools for Analyzing Smart Growth Strategies

Theme	Smart Mobility Framework (SMF) Activities	State / Regional / Local	Participants	Initiation Time Frame	Relevant Handbook Sections	Relevant Activities and Resources
Collect, develop and use data and tools needed to implement SMF including performance measures [5.1 - 5.5]	5.4 Create a comprehensive list of performance measures that adds to the 17 SMF performance measures with indicators reflecting environmental progress with respect to natural resource impacts, asset management and other established considerations not included in the 17 SMF measures.	S, R	Caltrans, CTC, Regional Agencies	0-2 yrs	Chapter 4, Sections 6.1, 6.3	Caltrans' PMs for Rural Transportation Systems, Caltrans TSI PMs, Caltrans Strategic Plan PMs, CTP PMs, Performance Measures System (PeMS), Trade Corridors Improvement Program (TCIF) screening and evaluation criteria, Blueprint Performance Goals, MPO performance measures, California Regional Progress Report
	5.5 Prepare supplementary SMF material including references to specific thresholds (such as development density) needed to achieve smart mobility benefits	S, R	Caltrans, CTC, Regional Agencies	2 - 5 yrs	Chapter 3, Chapter 6	ARB Cool California website & local government toolkit, Institute for Local Government website of available tools and resources
<b>6. Programming and Planning Procedures</b>						
Revise programming and planning procedures to reflect SMF [6.1 - 6.7]	6.1 Incorporate SMF principles, performance measures, concepts and tools into STIP Guidelines	S	Caltrans, CTC, Regional Agencies	0-2 yrs	All	2010 STIP Guidelines review
	6.2 Prepare Transportation Analysis Report (TAR) Guidance to include context-appropriate multmodal data collection and analysis	S	Caltrans	0-2 yrs	All	TAR guidelines (project underway)

Theme	Smart Mobility Framework (SMF) Activities	State / Regional / Local	Participants	Initiation Time Frame	Relevant Handbook Sections	Relevant Activities and Resources
Revise programming and planning procedures to reflect SMF [6.1 - 6.7]	6.3 Establish funding and technical assistance criteria that reward regional and local agencies making land use and transportation decisions that advance SMF implementation	S, R	Caltrans, CTC, MPOs/RTPAs, SGC, other state departments	0-2 yrs	All	All Caltrans planning grants and planning funding programs, Caltrans local assistance programs, SGC grant programs
	6.4 Revised RTP guidelines and procedures consistent with AB 32 and SB 375	S, R	Caltrans, CTC, Regional Agencies	0-2 yrs	All	RTP Guidelines revision
	6.5 Revise Local Assistance program to facilitate low-cost projects that will gain smart mobility benefits	S	Caltrans HQ and districts	0-2 yrs	3.3.5	Complete Streets Implementation Action Plan
	6.6 Revised criteria and scoring for housing and commercial development finance and incentive programs reflecting SMF principles, place type guidance and performance measures	S	HCD, Strategic Growth Council	0-2 yrs	Chapter 3, Chapter 4	Prop 1C bond program, SGC grant programs,
	6.7 Revise all Department System Planning Guidelines to incorporate SMF Principles, place types and Performance Measures	S	Caltrans HQ and districts	2-5 yrs	All	Current System Planning guidelines

Theme	Smart Mobility Framework (SMF) Activities	State / Regional / Local	Participants	Initiation Time Frame	Relevant Handbook Sections	Relevant Activities and Resources
<b>7. Design Standards and Processes</b>						
Revise design standards and procedures to reflect SMF	7.1 Modify Highway Design Manual standards and the design exception process to incorporate SMF including standards based on place type and incorporating speed suitability	S	Caltrans Division of Design	0-2 yrs	Chapter 3, Chapter 4, Chapter 6	HDM revisions underway; DD 64 Complete Streets, Complete Streets Implementation Action Plan, Federal Highways Flexibility in Highway Design, AASHTO 's Achieving Flexibility in Highway Design, ITE (forthcoming) Recommended Practice on Walkable Urban Thoroughfares: A Context Sensitive Approach
	7.2 Streamlined design exception process to reflect SMF principles and performance measures	S	Caltrans Division of Design	2-5 yrs		
<b>8. Major Cross-Functional Initiatives</b>						
Insure strong presence of location efficiency factors in newly-developing areas	8.1 Identify and implement specific steps needed to create strong presence of location efficiency factors in new developments. These may include initiatives related to access management, transportation network capacity, blueprint planning, city and county general plans and development regulations, farmland and open space preservation, and funding support to establish and implement these activities.	S, R, L	City and county governments, Caltrans, all transportation infrastructure and service providers, Regional Agencies	0-2 yrs	Chapter 2, Chapter 3, Chapter 6	Caltrans Access Management guide (project underway), Blueprint Planning activities, local planning activities, Federal Sustainable Communities Partnership between US DOT, US HUD and US EPA.

Theme	Smart Mobility Framework (SMF) Activities	State / Regional / Local	Participants	Initiation Time Frame	Relevant Handbook Sections	Relevant Activities and Resources
Support Smart Mobility with rich array of transit and rail services	8.2 Identify and implement specific steps needed to create dependable long-term funding sources for transit and rail capital and operating programs.	S, R, L, Federal	Legislature, sales tax authorities, regional agencies, transit operators, local governments	0-2 yrs	All	Recommendations of the Regional Targets Advisory Committee Pursuant to Senate Bill 375, Federal Transportation Bill Re-authorization
Implement Speed Suitability comprehensively	8.3 Identify and implement specific steps needed to implement speed suitability consistent with SMF. These may include initiatives related to design, operations, enforcement and State statute.	S, L	Legislature, Caltrans, Local Governments	2-5 yrs	Chapter 2, Chapter 4, Appendix C	Caltrans' Main Streets: Flexibility in Design and Operations, HDM update, DP 22, FHWA Flexibility in Design, Strategic Highway Safety Plan
Address the role of aviation in the SMF	8.4 Prepare material consistent with SMF that addresses airport needs and roles within the state system of airports. This may include preparation of performance measures specific to aviation and airport environments.	S	Caltrans Divisions of Transportation Planning and Aeronautics	2-5 years	Chapter 2, Chapter 4, Appendix C	Airport land use commission procedures and guidelines
<b>9. Local Government Planning and Implementation</b>						
Integrate the SMF into local government transportation and land use planning and implementation activities [9.1 - 9.3]	9.1 Incorporate place type guidance and smart mobility performance measures into General Plan Guidelines	S	Office of Planning and Research	0-2 yrs	Chapter 2, Chapter 3, Chapter 4, Section 6.1	Resources for place types referenced in Section 6.1
	9.2 Incorporate place type guidance and smart mobility performance measures into General Plans and Specific Plans	L	Local Governments	0-2 yrs		
	9.3 Create land development regulations (zoning and subdivision standards) emphasizing Location Efficiency factors and Place Type character	L	City and County Governments	0-2 yrs	Chapter 2, Chapter 3, Chapter 6	Form Based code resources, place type resources referenced in Section 6.1



Theme	Smart Mobility Framework (SMF) Activities	State / Regional / Local	Participants	Initiation Time Frame	Relevant Handbook Sections	Relevant Activities and Resources
<b>10. Local Government Assessment Activities</b>						
Encourage local government SMF Implementation analysis and evaluation activities [10.1 - 10.5]	10.1 Advance the use of multi-modal level of service while de-emphasizing the use of vehicle-only level of service standards.	S, L	Local Governments, OPR, Caltrans	0-2 yrs	Chapter 4, Section 6.3	OPR revision of General Plan and CEQA Guidelines, 2010 Highway Capacity Manual, Florida DOT Multi-modal Level of Service
	10.2 Evaluate presence of location-efficient regional accessibility and location-efficient community design elements as part of staff reports on all development proposals	S, L	Local governments planning and public works staffs, Caltrans LD-IGR	0-2 yrs	Section 2.5, Chapter 3, Chapter 6	See materials referenced in Chapter 6.
	10.3 Support and recommend mitigation measures consistent with SMF	S	Caltrans LD-IGR	0-2 yrs	All	DD 25-R1 Local Development - Intergovernmental Review
	10.4 Streamline environmental review of location-efficient development with impact fees and mitigations sensitive to Smart Mobility benefits	S, L	OPR, all lead agencies, Caltrans	2-5 yrs	All	
	10.5 Revise Traffic Impact Study Guide (TISG) & procedures to reflect SMF performance measures and most up-to-date trip generation data	S, L	Local Governments, Caltrans	2-5 yrs	All	Current Caltrans TISG procedures, Infill Trip rate generation research, 2010 Highway Capacity Manual

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