MEETING NOTICE
AND AGENDA

CITIES/COUNTY TRANSPORTATION ADVISORY COMMITTEE (CTAC)
The CTAC may take action on any item appearing on this agenda.

Thursday, April 3, 2014
9:30 to 11 a.m.

SANDAG, 7th Floor Conference Room
401 B Street, Suite 800
San Diego, CA 92101-4231

Chair: Mario Sanchez, City of El Cajon
Vice Chair: Frank Rivera, City of Chula Vista

Staff Contact: Alex Estrella
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AGENDA HIGHLIGHTS
• DISCUSSION ON TIMING FOR UPCOMING TransNet GRANT PROGRAMS
• COMPLETE STREETS DISCUSSION PAPER
• EMERGING TECHNOLOGY WHITE PAPER REVIEW

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CITIES/COUNTY TRANSPORTATION ADVISORY COMMITTEE
Thursday, April 3, 2014

ITEM NO.       RECOMMENDATION

1. WELCOME AND INTRODUCTIONS

2. PUBLIC COMMENTS

Members of the public shall have the opportunity to address the Cities/County Transportation Advisory Committee (CTAC) on any issue within the jurisdiction of SANDAG that is not on this agenda. Anyone desiring to speak shall reserve time by completing a “Request to Speak” form and giving it to the meeting coordinator prior to speaking. Public speakers should notify the meeting coordinator if they have a handout for distribution to working group members. Public speakers are limited to three minutes or less per person. CTAC members also may provide information and announcements under this agenda item.

CTAC members were informed that Maryam Babaki (City of San Marcos) had accepted the position of Public Works/Development Services Director with the City of Commerce and no longer will be serving on the CTAC as the City of San Marcos representative effective March 24. CTAC members expressed their gratitude of working with Mrs. Babaki and noted that her contributions and support over the past years has made CTAC a key venue for discussing regional level initiatives.

+3. APPROVAL OF MEETING MINUTES  APPROVE

The CTAC is asked to review and approve the minutes from its March 6, 2014, meeting.

CONSENT

4. SAN DIEGO FORWARD: THE REGIONAL PLAN: DRAFT WHITE PAPERS  INFORMATION
   (Carolina Gregor)

Based on input provided on the white paper outlines and from feedback from the public workshops, draft white papers on the topics of Economic Prosperity, Climate Change Mitigation and Adaptation, and Emerging Technologies will be available for a 45-day public review period from April 4 to May 19, 2014, at www.sdforward.com. These white papers will support and provide background information to the development of San Diego Forward: The Regional Plan. Following the public review period, the white papers would be updated and reposted to the website.

REPORTS (5 through 8)

+5. COMPLETE STREETS DISCUSSION PAPER (Stephan Vance)  DISCUSSION

SANDAG has prepared a discussion paper to help inform the process of developing the regional complete streets policy that was a commitment made in the 2050 Regional Transportation Plan. Feedback from the Working Group based on the information in the report will be used to help develop a draft policy.
6. **DISCUSSION ON TIMING FOR UPCOMING TransNet GRANT PROGRAMS** (Carolina Gregor)  

   SANDAG anticipates releasing a call for projects for the TransNet Smart Growth Incentive Program and Active Transportation Grant Program this fall. Staff is seeking input from CTAC on the timing for these grant programs. Staff also will seek input from the Regional Planning Technical Working Group at its April meeting.

7. **EMERGING TECHNOLOGY WHITE PAPER REVIEW (SANDAG Staff)**  

   As part of the Regional Plan, SANDAG has drafted an Emerging Technology White Paper. Staff will give an overview of the draft white paper and ask for input.

8. **CALIFORNIA DEPARTMENT OF TRANSPORTATION UPDATES (Caltrans Staff)**  

   Caltrans will provide an update on various local programs, funding program deadlines, and announcements regarding upcoming conferences.

9. **ADJOURNMENT AND NEXT MEETING**  

   The next CTAC meeting is scheduled for Thursday, May 1, 2014.

+ next to an agenda item indicates an attachment
ACTION REQUESTED: APPROVE

APPROVAL OF MEETING MINUTES

Agenda Item 1: Welcome and Introductions

CTAC Chair, Mario Sanchez (City of El Cajon) called the meeting to order at 9:30 a.m. All members in attendance were captured under Item No. 3 (Approval of Meeting Minutes).

Agenda Item 2: Public Comments

Members of the public had the opportunity to address the CTAC on any issue. There were no public comments.

Agenda Item 3: Approval of Meeting Minutes

Review and approval of February 6, 2014, meeting minutes.

Action: Upon a motion by Mohammad Sammak (City of Solana Beach), and a second by Paul Vo (City of San Marcos), the meeting minutes of the February 6, 2014, CTAC meeting were approved.

Yes: Bill Valle (City of Chula Vista), Ed Walton (City of Coronado), Mario Sanchez (City of El Cajon), Ed Deane (City of Encinitas), Julie Procopio (City of Escondido), Hank Levien (City of Imperial Beach), Dirk Epperson (City of La Mesa), Gary Chui (City of San Diego), Paul Vo (City of San Marcos), Minjie Mei (City of Santee), and Mohammad Sammak (City of Solana Beach).

No: None

Abstain: None

Agenda Item 4 (Consent): TransNet Regional Transportation Congestion Improvement Program Fee Adjustment and Annual Submittal of Funding Programs by Local Jurisdictions

At the request of CTAC Chair, Ariana zur Nieden (SANDAG) briefly announced that the SANDAG Board of Directors approved a 2 percent Regional Transportation Congestion Improvement Program (RTCIP) fee adjustment beginning July 1, 2014. The TransNet Ordinance requires SANDAG to adjust the RTCIP fee amount on July 1 of each year based upon the construction cost index. The minimum adjustment fee is 2 percent. In accordance with the TransNet Extension Ordinance, each local agency must submit its RTCIP funding program by April 1 of each year to the Independent Taxpayer Oversight Committee (ITOC) in order to remain eligible for TransNet local street and roads funding.
Agenda Item 5: Update of Smart Growth Concept Map and Board Policy No. 033 Data

Carolina Gregor (SANDAG) discussed the preparation of a Smart Growth Concept Map Technical Update and a Board Policy No. 033 Data Update for the upcoming call for projects for the Smart Growth Incentive Program and Active Transportation Grant Program. These two items must be updated to reflect the land use inputs in the Series 13 Regional Growth Forecast and Housing Element Annual Progress Reports, and are expected to be completed in the summer. Project areas must be in the Smart Growth Concept Map in order to qualify for the grant program. The call for projects is anticipated to be issued in the fall.

Agenda Item 6: TransNet Local Street and Road Program, TransNet Ordinance and Expenditure Plan Implementation Guidelines Update

SANDAG provided an update to CTAC members regarding the discussion at the December 2013, CTAC meeting to revise the TransNet Ordinance and Expenditure Plan Implementation Guidelines to allow for greater flexibility in implementing projects with Local Street and Roads Program funds. Staff indicated that no changes will be made to the TransNet Ordinance and Expenditure Plan Implementation Guidelines at this time. However, staff acknowledges and understands the benefits of providing greater flexibility under the Implementation Guidelines and staff offered to work with individual agencies on a case-by-case basis for smart growth projects while assuring compliance with the implementation guidelines.

In a related note, staff reminded local agencies who have not submitted the ITOC Local Street and Roads Program annual report form to submit it as soon as possible.

Agenda Item 7: Caltrans Updates

There were no updates from Caltrans.

Agenda Item 8: Adjournment and Next Meeting

The next CTAC meeting is scheduled for Thursday, April 3, 2014.
Introduction

The 2050 Regional Transportation Plan and its Sustainable Communities Strategy (2050 RTP), adopted by SANDAG in October 2011, calls for the development of a comprehensive regional Complete Streets policy. In preparation to the development of a draft policy, the attached discussion paper on Complete Streets has been prepared with the assistance of the consulting firm Fehr and Peers, and with input from interested members from the Cities/County Transportation Advisory Committee (CTAC), Regional Planning Technical Working Group (TWG), San Diego Regional Traffic Engineers Council (SANTEC), and the Active Transportation Working Group (ATWG). The purpose of this report is to provide an overview of Complete Streets principles and practice and to initiate a discussion on potential elements of a regional policy for SANDAG.

Discussion

Development of the Regional Complete Streets Policy is occurring within a transportation planning context that increasingly emphasizes multimodal transportation and sustainability. Cities and counties within California are incorporating Complete Streets principles into their general plans as required by the Complete Streets Act of 2008. Transportation planning agencies in California are supporting a broad range of transportation choices in their regional transportation plans as one of the strategies that can help meet the greenhouse gas reductions goals established by Senate Bill 375 (Steinberg, 2008). At the national level, the National Complete Streets Coalition has documented the adoption of over 600 Complete Streets policies. The Complete Streets Discussion Paper was developed to better understand and take advantage of this expanding experience with the Complete Streets policies.

The Complete Streets Discussion Paper includes four main sections briefly summarized below.

Defining Complete Streets

This section describes Complete Streets as a planning process and details the elements of a comprehensive Complete Streets policy. It also discusses the potential benefits and costs of implementing Complete Streets.

Context and Need

The section on context and need provides a brief summary of the regional planning policy context established by the 2050 RTP. It describes existing and emerging Complete Streets policies and practices by local jurisdictions within the San Diego region, and the legal requirements for
Complete Streets planning. State and federal statutes and policies related to Complete Streets are discussed, as is the role SANDAG plays in supporting Complete Streets planning and project development through its funding and technical assistance programs. Finally, this section discusses the barriers to Complete Streets implementation that might result from existing policy, design requirements, or funding limitations.

**Best Practices**

The Best Practices section describes Complete Streets efforts by regional planning agencies around the country. These efforts include existing policies, technical support, project development practices, funding and project selection processes, and reporting and monitoring systems.

**Implementation**

The final section draws upon the best practices section to identify a range of options for what the Complete Streets policy could address in the San Diego region. It includes ways that SANDAG can both support and influence local Complete Streets practices, and ways the policy can inform the project development process at SANDAG. A broad range of implementation options are presented in the interest of stimulating a robust discussion amongst stakeholders and policymakers about what the regional policy could accomplish.

**Next Steps**

Throughout the month of April, the Complete Streets Discussion Paper will be discussed at the TWG, ATWG, SANTEC, and Public Health Stakeholders Group. In May, the discussion paper will be presented to the Transportation Committee and Regional Planning Committee for their input into the regional policy. The paper also will be presented to the SANDAG Board of Directors at its policy meeting on May 9. At that meeting, the Board will receive a presentation on this topic by former Arlington Virginia County Commissioner Chris Zimmerman. Mr. Zimmerman’s presentation is made possible through technical assistance provided by the National Complete Streets Coalition. This technical assistance is provided under the Community Transformation Grant that the County of San Diego Health and Human Services Agency received from the Centers for Disease Control and Prevention.

Based on the input received from the working groups, policy committees, and Board of Directors, staff will prepare a draft recommendation for how SANDAG should address Complete Streets in policy and practice. That draft will be brought back to the working groups and policy committees for a recommendation to the Board of Directors this summer.

Attachment: 1. Regional Complete Streets Discussion Paper

Key Staff Contact: Stephan Vance, (619) 699-1924, stephan.vance@sandag.org
POLICY IN BRIEF

Regional planning at SANDAG is guided by a policy framework based on the principles of smart growth and sustainability. Under this framework, much of the region’s future development will occur within the existing urbanized area in more compact, mixed-use neighborhoods that provide a variety of housing and transportation choices. Complete Streets is an important planning concept in this policy framework because it is a process for ensuring the transportation system is useful and attractive for all users of the transportation network – motorists, pedestrians, bicyclists, and transit users alike. The commitment that SANDAG made in the 2050 Regional Transportation Plan and its Sustainable Communities Strategy (2050 RTP/SCS) to develop a Complete Streets policy was made in recognition of this role that the policy could play.

To be effective, a regional Complete Streets policy should be grounded in the existing policies and requirements established at the local, regional, state, and federal levels. It also should recognize that, with limited exceptions, SANDAG does not own or operate the elements of the region’s transportation system and cannot make policy for the local or state agencies that do. However, SANDAG is responsible for programming a significant portion of the region’s transportation funds, and for regional transit system development. In this context, SANDAG typically approaches implementation of regional policies through a combination of financial incentives based on policy-driven funding criteria, and by providing a policy framework and guidance to local agencies and regional partners through plans and programs. An effective regional Complete Streets policy will be built from this approach.

There are several potential benefits to developing an effective regional Complete Streets policy. As described in this white paper, Complete Streets can improve mobility, sustainability, and health. There are national and state requirements to incorporate a Complete Streets framework into planning documents and environmental review. Beyond these requirements, by including accommodations for all modes of travel within a transportation network, residents can be afforded travel options and more easily incorporate active transportation (e.g. walking and biking) into their daily lives.

Because Complete Streets remains a relatively new concept, some existing plans and procedures do not fully align with some of the newer design and policy ideas. There also is considerable variation in how local agencies operationalize Complete Streets concepts and policies. As agencies continue to set local and regional Complete Streets goals and visions, they can work to modify some existing practices or find similarity between newer concepts and adopted and accepted protocol. While this has been seen at the local level, in cities like San Marcos, which developed a new street typology as part of its General Plan update, an opportunity exists for SANDAG to provide overarching guidance at the regional level to assist local jurisdictions as they update local plans.

SANDAG currently offers several technical and funding resources for smart growth, active transportation accommodations, and mixed-use development, which are discussed in this white paper. In further discussions between member agencies and SANDAG, the region can help define SANDAG’s role and level of involvement in establishing a series of Complete Streets policies and programs to guide its own work and to support complete streets programs by local agencies.
This white paper is presented in four sections:

1. Defining Complete Streets
2. Context and Need
3. Best Practices
4. Implementation Options

First, Complete Streets are defined, including an overview of what Complete Streets are, costs and benefits, and the elements of a Complete Streets policy. Next, the context and need is discussed. In this section, an overview of how Complete Streets are taking shape at a local, regional, state, and national level is discussed. The current practices at SANDAG are highlighted in this section. Best practices for Complete Streets policies and programs are provided in the third section of this paper. Regional planning organizations who have established programs and policies are discussed, as are areas where SANDAG could consider incorporating some of these. The fourth and final chapter presents a spectrum of implementation choices for SANDAG, including both policy development and program implementation aspects relevant to the region. The intent of this white paper is to inform member agencies and facilitate discussion around how SANDAG can support Complete Streets implementation across the San Diego region.

DEFINING COMPLETE STREETS

What it is, What it is Not

Complete Streets are streets for everyone. People of all ages and abilities are able to safely and comfortably travel along and across them, whether they are walking, bicycling, taking public transportation, or driving a car or truck. California’s Complete Streets Act of 2008 (AB 1358) defines Complete Streets as “a balanced, multimodal transportation network that meets the needs of all users of streets, roads, and highways [including bicyclists, children, persons with disabilities, motorists, movers of commercial goods, pedestrians, public transportation, and seniors] for safe and convenient travel in a manner that is suitable to the rural, suburban, or urban context.” This landmark legislation cited previously adopted greenhouse gas emissions targets, high percentages of household trips that are one mile or less, and a desire to shift travel to healthier lower cost modes like walking and bicycling.

Design Prescription versus Planning

Implementing Complete Streets ensures that the entire right-of-way is planned, designed, constructed, operated, and maintained to provide safe access for all users. Under this paradigm, transportation agencies change their approach to local streets and roads so that the default outcome is a transportation network that balances the needs of all users. Each transportation project begins with an understanding of the current and planned community character and associated multimodal transportation needs. Through continued and incremental changes in capital projects that meet community-supported design guidelines, and through regular maintenance and operations work, a community’s street network gradually becomes better and safer for people driving, taking transit, walking, and bicycling, improving the quality of life for all residents.

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As communities have different needs, characteristics, and users, Complete Streets is a flexible, comprehensive planning and design approach to transportation. There is no singular design prescription or outcome; each street is unique and its design responds to the community and network context, while still providing necessary and appropriate infrastructure for the various modes. Agencies that implement Complete Streets successfully consider each project within the overall transportation system. Some street segments will be prioritized for walking, others for transit, and others for bicycling. Low speed streets can also be identified to ensure a connected network for neighborhood electric vehicles. Some streets will have extensive facilities for all modes; many will not, but all will still allow for safe travel. Current best practices as embodied in broadly accepted design guidance are encouraged. The Complete Streets design toolbox may include: sidewalks, several types of bike facilities, accessible curb ramps, special bus lanes, comfortable and accessible public transportation stops, frequent and safe crossing opportunities, median islands, accessible pedestrian signals, curb extensions, traffic calming devices, narrower travel lanes, roundabouts and well-timed traffic lights that encourage an orderly flow of traffic at safe speeds. The street environment also can be enhanced with pedestrian wayfinding signs, street furniture and landscaping.

The emerging field of Intelligent Transportation Systems may enhance safety with improvements like pedestrian/bicycle advance warning systems at intersections and crosswalks; as well as connected vehicle technologies that provide on-board systems to alert drivers for collision avoidance with pedestrians, and lane departure warnings which can reduce vehicle-bicycle collisions. Parking management systems, especially in smart growth settings, could reduce vehicle traffic by encouraging park once and walk trips, and use of mobility services, like bike share can be incorporated to provide more mobility options.

While a relatively new term, Complete Streets is rooted in the growing national and statewide move toward inclusive transportation projects. Over 600 agencies nationally have adopted a formal Complete Streets policy. The U.S. Department of Transportation has promoted increased emphasis on multimodal projects and improving the safety of people walking and bicycling. Research on transportation safety in urbanized areas increasingly shows that community streets are safer when they are not designed using one-size-fits-all highway standards. Streets designed for lower vehicular speeds are more effective in reducing collisions and protecting the most vulnerable people using the street by reducing both frequency and severity of collisions. When lower operating speeds are combined with multiple modes and transportation demand management programs, and reflect the desired land use context, Complete Streets can support broader livability and active transportation goals.

In addition to the state requirement for California counties and cities to modify their general plans to support Complete Streets, Caltrans has embraced the Complete Streets concept with its adoption and implementation of Deputy Directive 64. These state-level policies support successful implementation of SANDAG’s regional transportation plans (see subsequent section for more on the state level).

Adopting Complete Streets policies at local and regional levels can help achieve the goals and visions outlined in adopted general plans and other plans and programs. Complete Streets can help achieve the region’s safety, accessibility, land use, economic development, and environmental goals, such as the greenhouse gas reduction goals set forth in the California Global Warming Solutions Act of 2006 (AB32) as well as the 2050 RTP/SCS, developed in accordance with the Sustainable Communities and Climate Protection Act of 2008 (SB375). With the recent passage of SB743, which substantially diminishes the

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2 W.A. Leaf and D.F. Preusser, Literature Review on Vehicle Travel Speeds and Pedestrian Injuries, NHTSA, DOT HS 809 021 October 1999
3 Available at [http://www.dot.ca.gov/hq/tpp/offices/ocp/complete_streets.html](http://www.dot.ca.gov/hq/tpp/offices/ocp/complete_streets.html) along with the implementation plan
importance of vehicular level of service in environmental impact reports for projects in “infill opportunity zones” and potentially elsewhere, resolution of conflicts or tradeoffs between community goals, active transportation projects, and vehicular delay will be an increasingly local and regional matter.

Implementation Process

Complete Streets can be achieved with a variety of policies, including ordinances and resolutions; rewrites of design manuals; inclusion in community and general plans; internal memos from directors of transportation agencies; policies adopted by city and county councils; and executive orders from elected officials. An effective Complete Streets policy, however, requires three main components: that it is developed with the perspectives of a broad group of stakeholders, sets a clear policy direction, and creates a path for implementation.

A Complete Streets policy sets the high-level direction to change the everyday decision-making processes and procedures, so that transportation professionals consistently approach any changes to the right-of-way as opportunities to accommodate all anticipated users. The most effective policies are those that become part of institutional culture. Taking a Complete Streets policy from paper into practice is not a simple process, but providing specific implementation steps and goals in an adopted policy is an effective approach.

10 Elements of a Complete Streets Policy

Based on previous research and practices, the National Complete Streets Coalition has identified ten key elements to include in a Complete Streets policy:

1. Includes a vision for how and why the community wants to complete its streets
2. Specifies that ‘all users’ includes pedestrians, bicyclists and transit passengers of all ages and abilities, as well as trucks, buses and automobiles.
3. Applies to both new and retrofit projects, including design, planning, maintenance, and operations, for the entire right-of-way.
4. Makes any exceptions specific and sets a clear procedure that requires high-level approval of exceptions.
5. Encourages street connectivity and aims to create a comprehensive, integrated, connected network for all modes.
6. Is adoptable by all agencies to cover all roads.
7. Directs the use of the latest and best design criteria and guidelines while recognizing the need for flexibility in balancing user needs.
8. Directs that Complete Streets solutions will complement the context of the community.
10. Includes specific next steps for implementation of the policy.

Policy Elements

For more detail on each element, visit www.smartgrowthamerica.org/complete-streets/changing-policy/policy-elements.
Benefits and Costs

Benefits of Complete Streets

Complete Streets can offer many benefits to a community, regardless of size or location. They can add lasting value by supporting multiple categories of benefits, including economic development, safety, mobility and access, and environmental benefits including health. These benefits are described below.

From an economic development perspective, a balanced transportation system that includes Complete Streets can bolster economic growth and stability. A complete streets network can improve placemaking and create an environment that attracts more people to the street.\(^4\) A balanced transportation system can bolster economic development by providing accessible and efficient connections.\(^5\) A commercial area that is accessible and attractive for all modes of travel is vital for strategies to create jobs, spur private investment, increase tax revenue, and encourage new businesses. For example, the Lancaster, CA plan to remake downtown’s Lancaster Boulevard from an auto-centric thoroughfare to a place where people felt comfortable traveling by foot and bicycle as well as car, spurred a reported $125 million in private investment.

There are fiscal savings to building a complete streets network within a jurisdiction. In the travelway, Complete Streets facilities can cost less to build and maintain, as roadways require less asphalt and tend to have a longer design life, thus reducing the cost of road paving. Complete Streets also create more value because they serve non-motorists as well as motorists.\(^6\)

Multimodal projects are job-creators in themselves, too. Projects that in some way incorporate bicycling and walking facilities can create more jobs than road-only projects.\(^7\) The investment in Complete Streets through transit infrastructure creates jobs, fostering local economies—more jobs means more money getting inserted into local economies.\(^8\)

Complete Streets improve transportation safety by encouraging slower speeds through good design and the construction of proven safety countermeasures. A Federal Highway Administration (FHWA) review of the effectiveness of a wide variety of measures to improve pedestrian safety found that simply painting crosswalks on wide high-speed roads does not reduce pedestrian crashes. Measures, however, that design the street with pedestrians in mind—sidewalks, raised medians, better bus stop placement, traffic-calming measures, and treatments for travelers with disabilities—all improve pedestrian safety. Because Complete Streets can reduce speeds on roadways, the severity of injuries on these roadways decreases compared to high-speed roads.\(^9\) In the San Diego region, 1/3 of residents in low-income neighborhoods lack access to a car. Complete Streets can provide safety benefits to these neighborhoods, which are very dependent on walking, cycling, and transit.\(^10\)


\(^5\) National Complete Streets Coalition “Benefits of Complete Streets” Available at: [http://www.smartgrowthamerica.org/complete-streets/complete-streets-fundamentals/benefits-of-complete-streets/](http://www.smartgrowthamerica.org/complete-streets/complete-streets-fundamentals/benefits-of-complete-streets/)

\(^6\) Walk San Diego/American Planning Association, 12

\(^7\) Garrett-Peltier, Heidi. University of Massachusetts Political Economy Research Institute. (2011) Pedestrian and Bicycle Infrastructure: A National Study of Employment Impacts. Retrieved from: [http://www.peri.umass.edu/236/hash/64a34bab6a183a2fc06fd2712875a3ad/publication/467/](http://www.peri.umass.edu/236/hash/64a34bab6a183a2fc06fd2712875a3ad/publication/467/)


\(^9\) Walk San Diego/American Planning Association, 16.

\(^10\) Ibid, 14.
Public health efforts get a boost from Complete Streets, too. Incorporating features that promote regular walking, cycling and transit use provide opportunities for regular physical activity as part of daily travels—and increased physical activity can prevent chronic diseases. In San Diego County, the top four chronic diseases are cancer, heart disease and stroke, type 2 diabetes, and pulmonary disease such as asthma. According to the San Diego County Department of Health and Human Services, sedentary behavior is one of the main causes contributing to these diseases.\textsuperscript{11} By supporting transportation networks that encourage physical activity, San Diego helps improve its residents’ physical health. The California Department of Public Health forecasts that a shift in active transportation to 15\% of all daily miles traveled in the Bay Area would save $1.4 to 2.2 billion in annual health costs and add 9.5 months of life expectancy.\textsuperscript{12}

Complete Streets also improve access to public transportation and the effectiveness of a public transportation system. Simple changes such as providing crosswalks and sidewalks near stops and stations safely connect transit users to their destinations. Improving access to transit also reduces dependence on more costly alternatives, such as paratransit or private transportation services, and can catalyze further economic development. Complete Streets policies help guide the collaborative planning process with transit agencies to ensure the needs of the transit system are addressed.

Although Complete Streets reduce vehicular travel speed, the vehicle throughput on many roadways is maintained.\textsuperscript{13} Local evaluations of road diets, such as the La Costa Avenue road diet in Carlsbad, have identified that the roadways can handle the same vehicular volumes. Traffic controls such as roundabouts can also enhance vehicle throughput. Additionally, emergency response times can remain consistent with complete streets countermeasures, as reported in Carlsbad. Effective implementation of complete streets requires a multimodal approach to performance evaluation. When the goal is providing access for all modes, the measurement tools that evaluate system performance should address these broader objectives.

There are environmental benefits, including noise reduction, green streets opportunities, and greenhouse gas emissions reductions. As roadways operate at lower speed, the noise pollution can decrease.\textsuperscript{14} During Complete Streets building or retrofitting, there is the opportunity to explore green streets. Complete Streets have the opportunity to introduce ground cover techniques that reduce heat load and pollution, and capture and treat stormwater on-site.\textsuperscript{15} Additionally, complete streets offer the opportunity for lower total energy use when coupled with compact, mixed-use development.\textsuperscript{16} By changing some trips from vehicular to active transportation, greenhouse gas and carbon dioxide emissions can be reduced.\textsuperscript{17}

For more information, please see: \url{http://www.smartgrowthamerica.org/completestreets/complete-streets-fundamentals/benefits-of-complete-streets/}

\textsuperscript{11} Ibid, 12.
\textsuperscript{12} Ibid, 14.
\textsuperscript{13} Ibid, 15.
\textsuperscript{14} Ibid, 16.
\textsuperscript{15} Ibid, 15.
\textsuperscript{16} Ibid, 19.
\textsuperscript{17} Ibid.
**Costs of Complete Streets**

**Expected Savings**

Jurisdictions implementing a Complete Streets policy have experienced little to no added expense to their transportation budgets. Complete Streets are often more cost effective than the alternative—streets made only for cars—when considering person throughput and the many potential community benefits discussed above.

In some cases, Complete Streets can even help jurisdictions save money. By integrating sidewalks, bike lanes, transit amenities, and safe crossings into the initial design of a project, a Complete Streets approach eliminates the expense of retrofits later or of construction delays caused by later demands to change the project scope so that it includes all users. Costs also are avoided by right-sizing projects. As part of their Complete Streets implementation process, Lee County, FL staff re-examined their list of road projects approved in the Metropolitan Planning Organization’s 2035 Long Range Transportation Plan (LRTP). When they applied a Complete Streets analysis to the projects, staff determined that five road projects slated for widening from two to four lanes were unnecessary. Instead, the projects were proposed as two-lane divided roadways with medians and turn lanes. The county asked for amendments to the 2035 LRTP to reflect these changes in roadway plans. The changes are estimated to reduce the cost of these five projects by $58.5 million, a significant savings for the county and its taxpayers that will also create streets that are better for all users.

Many of the tools for building Complete Streets are low-cost, fast to implement, and high-impact. The San Diego region has already experienced the benefits of these low-cost Complete Streets solutions. The addition of a midblock crossing on Adams Avenue in University Heights cost only $20,000, but it provided residents in a lower-income neighborhood safe access to their only park. Another low-cost solution was a project at the 50th and University Avenue intersection that enhanced safety and calmed traffic with the application of paint and the installation of bollards. The project cost $4,500 and provided a safer, high-visibility pedestrian crossing of University Avenue.\(^\text{18}\)

In addition, multimodal planning and design can be an opportunity rather than a cost constraint. Complete Streets projects can open up funding streams and garner public support. National, state, and local polls show consistent support for ensuring that transportation projects include all modes. Popular support can translate into financial support when funding measures come up either for a general vote or for consideration in the legislature or city council.

For more information, please see: [http://www.smartgrowthamerica.org/complete-streets/implementation/cost-concerns](http://www.smartgrowthamerica.org/complete-streets/implementation/cost-concerns)

**Expected Increases**

While the incorporation of Complete Streets does not necessarily lead to increased costs, there may be some upfront implementation costs.

Initially, there is a planning cost associated with implementing Complete Streets. Because Complete Streets projects can be a change from “business as usual,” staff would need to invest time to research appropriate facilities, design improvements, develop community consensus for the change, and develop methods of evaluation. Baseline analyses, such as an existing conditions reconnaissance, are also

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generally necessary to implement Complete Streets projects. These are one-time non-capital costs for a jurisdiction that is developing a Complete Streets approach or plan. Once the initial framework is in place, however, these costs are greatly reduced.

On the capital side, investing in retrofitting an existing street would entail a new cost. While these costs may typically have been assumed by roadway expansion projects in the past, some cities are using Complete Streets policies to establish the nexus to capital investments in active transportation projects as mitigation measures that can be required of new development. Capital costs can also be reduced by planning for Complete Streets in tandem with operations and maintenance projects and including complete streets elements on new roads.19

On a roadway, the cost per mode varies between a traditional roadway and a complete streets roadway. In some contexts, the cost of developing a complete street could be higher, but in other cases it could be lower. For example, a four-lane roadway with minimal sidewalk width would have lower landscaping and concrete expenses than a complete street with two travel lanes, wide sidewalks, and a landscaped buffer between the sidewalk and roadway. Conversely, the complete street would have lower asphalt costs. Over time, both roadway types may have similar operations and maintenance costs, but the costs would be allocated to different portions of the street. It is important to note, however, that complete streets do not have to be particularly elaborate to function. Although there is a return on investment for placemaking, having a network of complete streets of varying levels of enhancement can be very functional and cost-effective.

Grants from the SANDAG Smart Growth Incentive Program, Active Transportation Program and others are available to support pilot complete streets projects, but as planning for multiple modes becomes the “status quo” for a local jurisdiction, the upfront planning and research costs will decrease. Non-motorized facilities are generally less expensive to maintain than motorized facilities, as the design life for motorized pavement is shorter than for sidewalks and non-motorized facilities. A retrofit planned in tandem with other roadway improvements can reduce the cost of introducing Complete Streets to a given facility, and technical support assistance and regional, state, and national grant opportunities can offset some non-capital costs.

**CONTEXT AND NEED**

Complete Streets policies have been addressed to varying degrees at the local, regional, state, and national levels. Developing a regional policy that supports local policies and programs can ensure SANDAG projects are consistent with local projects and it can aid member agencies in implementing Complete Streets practices in their jurisdictions. This can be done by providing technical resources, model documents, and upfront research to alleviate some concerns of cost and time for implementing these changes. Examples of how Complete Streets have been evolving at each level are described in this section.

This section provides an overview of existing legislation and programs at the regional, local, state and national levels that could be considered by SANDAG and its member agencies.

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**Regional Context**

The 2050 RTP/SCS was adopted in October 2011.\(^{20}\) It presents a shared regional vision for 2050, which includes a “transportation system [that] should promote environmental sustainability and foster efficient development patterns that optimize travel, housing, and employment choices.”\(^{21}\)

The 2050 RTP/SCS also provides mobility and social equity goals and policies relating to complete streets and multimodal transportation. These include a mobility goal to provide convenient travel choices along multiple modes of travel and policy objectives to increase use of non-automotive travel.\(^{22}\) Goals also include providing equitable transportation for all segments of the population, and environmentally sustainable development patterns which would support non-automotive travel.\(^{23}\)^{24}\)

The 2050 RTP/SCS calls for reducing Greenhouse Gas Emissions (GHG) in accordance with SB 375. The plan guides the region toward meeting the GHG reduction targets of 7% by 2020 and 13% by 2035. In accordance with SB375, main building blocks of the 2050 RTP SCS include a land use pattern accommodating future employment and housing needs, a multimodal transportation network, transportation demand management systems, and other policies and measures to reduce peak period traffic.\(^{25}\)

Among these building blocks, three (those referring to land use, a balanced transportation network, and transportation system management) relate directly to Complete Streets. In developing a network where all modes of travel are attractive, users have transportation choices that can result in fewer automobile trips and, in turn, lower vehicle miles traveled and GHG.

The 2050 RTP/SCS states that investments that promote bicycling and walking are an important part of the transportation network.

Another impetus for complete streets within the region is the, TransNet Extension Ordinance. Section 4(E)(3) of the ordinance requires all TransNet funded projects to accommodate bicyclists and pedestrians unless special circumstances make doing so unreasonable.\(^{26}\) Implementation of this provision is guided by policies adopted by the SANDAG Board of Directors (Board Policy 31, Rule 21.) Also supporting implementation at the regional level is the SANDAG Regional Transit Oriented Design strategy currently under development.

**Local Jurisdiction Context**

Among the 19 jurisdictions in the San Diego region, eight have addressed Complete Streets from a policy perspective, primarily as part of a comprehensive general plan update. In many of these cases, the complete streets goals and policies produced by the city has been incorporated into the City’s General Plan. Some highlights of the local goals and policies regarding Complete Streets are described below.

The City of Carlsbad has been undergoing its General Plan update in conjunction with a Livable Streets Assessment and Active Transportation Strategy. The General Plan introduces a multimodal level of service

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2 Ibid., 2-3.

3 Ibid., 2-6.

4 Ibid.

5 Ibid.

6 Ibid., 3-4.

7 Ibid, 6-52.
for evaluating Carlsbad’s transportation infrastructure. Additionally, the document rethinks the traditional functional classification of roadways and instead applies a street typology to the transportation system, prioritizing different modes along different types of roadways to more directly account for land use context. The City completed a Livable Streets Assessment in 2013, which identified livable streets best practices, and evaluated how the City was doing in implementing livable streets policy, design, funding, and operations. The City is now preparing an Active Transportation Strategy, which will be used to guide Carlsbad to get livable streets projects on the ground.

The City of Escondido has a complete streets vision and supporting policies in its Mobility & Infrastructure Element, adopted in May 2012.

Complete Streets Vision: Consistently design and plan all transportation and land use projects in Escondido with all users of all ages and abilities in mind. Provide a balanced multimodal transportation network with context sensitive solutions throughout the city and promote non-vehicular facilities, walkability, active living, transit usage, and Transportation Demand Management (TDM) measures in downtown and mixed use villages.

The Complete Streets policies presented in the Escondido Mobility Element highlight the importance of integration, connectivity, and systems. The policies do not focus on preparing a certain type of facility, but rather that activity centers and transportation systems are connected such that a user has the ability to choose their mode of transportation.

The City of Imperial Beach General Plan, published in 2010, presents a goal of “balanced circulation,” stating that “the quality of life and economic vitality of Imperial Beach is dependent upon a safe and efficiently operating circulation system that provides for pedestrians, bicycles, trucks, automobiles, and public transportation.” Subsequent policies refer to the balance but without specific mention of Complete Streets.

The City of La Mesa General Plan was adopted in 2013 with a certified EIR, and includes Complete Streets policies. The policies presented in La Mesa’s plan include more implementation language, although Complete Streets is not wholly defined in the policies. Policy CE-1.1.3 states that the City should “require new developments to provide for on- and off-street improvements directly related to the project, found to be needed to meet the City’s policies regarding street function, design, and safety and that advance the City’s “Complete Streets” objectives.” Furthermore, Policy CE-1.1.8 notes that the City should “apply a “Complete Streets” approach to future transportation infrastructure projects.”

The City of Lemon Grove is currently in the process of developing a Health and Wellness element to be adopted as part of their General Plan, one of the optional plan elements. As an outgrowth of the Health and Wellness Element, the city is exploring Complete Streets policies to enhance the safety, access, convenience and comfort of all users in all transportation choices. These principles will guide the planning, design, construction and maintenance of the City’s transportation improvements.

27 City of Escondido General Plan. Mobility and Infrastructure. Available at: http://www.escondido.org/Data/Sites/1/media/PDFs/Planning/GPLUpdate/GeneralPlanChapterIII.pdf
The City of **National City** has developed “Community Corridors” throughout their City, which are Complete Streets Avenues. They have updated their procedures for mitigations on Community Corridors, which prohibit these roadways from being widened.\(^{30}\)

The City of **Oceanside**, like Escondido, presents policies that focus on serving “all users of streets, roads, and highways, regardless of their age or ability.”\(^{31}\) A unique policy included in the City’s General Plan states that Oceanside will “strive to stay up-to-date with legislation and emerging technologies as it relates to complete streets and multimodal analysis.” The City’s Circulation Element includes a Complete Streets Checklist, which presents complete streets policies (provided in AB1358) and identifies those that are most applicable to Oceanside.

The City of **San Marcos’** General Plan includes a complete streets guide, with prioritized and non-prioritized modes for different street typologies, similar to that being prepared by the City of Carlsbad. The City also provides a policy that they will strive to make streets complete, where feasible, and that “appropriate new local streets and Main Streets will prioritize pedestrian and bicycle users through the corridor.”\(^{32}\) The City’s general plan also includes multimodal level of service standards based on the street typology, rather than solely for automobile travel. As a result, the San Marcos Boulevard Complete Street project was undertaken, representing one of the first complete street retrofits on a major street in the north county. Planning and construction of projects like this can be supported through a variety of funding sources such as Caltrans Community-Based Planning Grants and the SANDAG Active Transportation Program and Smart Growth Incentive Program grants.

The Mobility Element of the City of **San Diego** General Plan emphasizes the need for a balanced, multi-modal transportation network to ensure the safety of all roadway users including pedestrians, bicyclists, transit users, the disabled, elderly, motorists, freight providers, and emergency responders. These policies ensure that the entire right of way is routinely designed and operated to enable safe access for all users. With these policies and the guidance of the City’s Street Design Manual, all transportation improvements (new and retrofit) are viewed as opportunities to improve safety, access and mobility for all travelers. This advances transportation choices in support of the General Plan’s City of Villages land use vision, and helps achieve healthy and sustainable communities. The Street Design Manual also states that the traffic volumes should not be used as the sole factor in determining the appropriate street classification, since other factors play an important role in shaping the operating conditions on a facility. Based on this approach, the City has lowered its LOS requirements from D to E in the downtown core, thus allowing for roadways and intersections that may not prioritize the automobile\(^{33}\)

The City of **Vista’s** complete streets policies are located in the Land Use and Community Identity (LUCI) Element and Circulation Element of its General Plan. The policies presented mirror those of Escondido. Additionally, the plan requires the City to “develop policies and tools to improve Complete Streets practices. These could include place-based street typologies, a Complete Streets checklist for all new development/redevelopment projects, multi-modal analysis software, and revisions to the City’s street design guidelines to ensure the inclusion of infrastructure that benefits all roadway users.”

A number of other cities in the region are also moving in this direction, including both **Santee** and **Solana Beach**, where Complete Streets policies are under development in the context of General Plan updates.

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\(^{32}\) City of San Marcos, Policy M-1.7

\(^{33}\) Walk San Diego, pp. 30.
**Statewide Context**

At the state level, Assembly Bill 1358, Caltrans Policy and Design Guidance, and several approaches to streamlining the California Environmental Quality Act (CEQA) are changing statutes and state policies in ways that support planning for Complete Streets in the San Diego Region.

Assembly Bill 1358 (AB1358) is the 2008 **California Complete Streets Act**. This act requires cities and counties to include Complete Streets policies as part of their general plans so that roadways are designed to accommodate all users. As of January 2011, any substantive revision of the circulation element in the general plan of a California local government is required to include Complete Streets provisions.\(^{34}\) As required by AB1358, the Governor's Office of Planning and Research issued *General Plan Guidelines: Complete Streets and the Circulation Element* to inform this process to jurisdictions and their consultants. It is intended that the jurisdictions acknowledge within the General Plan that providing for all users is a new way of doing business, not simply an add-on program that competes with other departments.\(^{35}\)

**Senate Bill 97** (SB97), adopted in 2008, directed the California Office of Planning and Research to revise its CEQA guidelines to clarify how greenhouse gas emissions and their impacts can be addressed in the CEQA Process. Some changes to the environmental checklist in response to SB97 included changing the language from focusing on just automobile impacts to all modes of travel, removing the parking provisions, and providing more detailed language on alternative mode impacts.\(^{36}\)

In 2011, the State of California passed **Senate Bill 226** (SB226), which provides for CEQA streamlining for infill projects.\(^{37}\) The State CEQA Guidelines were amended to allow for a more streamlined process for infill projects in an urban area, that would “adjoin” the urban core, or in a non-urban area that qualified as a "small walkable community."\(^{38}\) This promotes Complete Streets as projects in walkable areas can be developed in a more streamlined manner.

In September 2013, Governor Brown signed into legislation **Senate Bill 99**, creating the **Active Transportation Program** for Caltrans.\(^{39}\) The Active Transportation Program (ATP) "consolidates existing federal and state transportation programs, including the Transportation Alternatives Program (TAP), Bicycle Transportation Account (BTA), and State Safe Routes to School (SR2S), into a single program with a focus to make California a national leader in active transportation."\(^{40}\) The purpose of the ATP is to increase the use of active transportation and fulfill several goals related to Complete Streets, with regard to safety, mobility, and public health.

**Senate Bill 743**, also signed into law in 2013, made several changes to CEQA related to the analysis of transportation impacts.\(^{41}\) Notably for Complete Streets, it requires a change in how “level of service” is

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\(^{36}\) Walk San Diego/American Planning Association, 37-38.


\(^{39}\) Caltrans. Active Transportation Program (ATP). Available at: [http://www.dot.ca.gov/hq/LocalPrograms/ATP/index.html](http://www.dot.ca.gov/hq/LocalPrograms/ATP/index.html).

\(^{40}\) Ibid.

used in transportation planning and the evaluation of transportation impacts. The Office of Planning and Research (OPR) is directed to develop revisions to the CEQA Guidelines that establish new criteria for determining the significance of transportation impacts by projects in transit priority areas. OPR has the discretion to develop such criteria for projects outside transit priority areas as well, and the initial report suggests that a number of alternatives to level of service, volume-to-capacity ratio, or other measures of delay, are under consideration. The bill requires OPR to transmit the new guidance to the Secretary on or before July 1, 2014.

Caltrans also released the Deputy Directive on “Integrating the Transportation System.” (DD64-R1) The policy discusses the obligation to provide a network of Complete Streets, including the necessity to revise processes and policies to address Complete Streets. It states that “bicycle, pedestrian, and transit travel is facilitated by creating “Complete Streets” beginning early in system planning and continuing through project delivery and maintenance and operations. Developing a network of “Complete Streets” requires collaboration among all Department functional units and stakeholders to establish effective partnerships... the Department and local agencies have the duty to provide for the safety and mobility needs of all who have legal access to the transportation system... to ensure successful implementation of complete streets, manuals, guidance, and training will be updated and developed.” The Caltrans Complete Streets Implementation Action Plan, adopted in 2010, provides actions required to implement DD-64-R1, including priorities and responsible units. Categories include highest focus areas; guidance, manuals & handbooks; policies & plans; funding & project selection; raising awareness; training; and research. This document also identifies lead districts and divisions and timelines.

Caltrans also issued Directors Policy 22 on Context Sensitive Solutions. This policy provides for flexibility in the application of design standards. As cited in From Policy to Pavement, the intent of this policy is to move away from “one size fits all” road designs that ignore the context of a road segment including demand for safe and convenient walking, biking, and transit. This is accomplished by (1) incorporating the viewpoints and needs of local stakeholders in all project phases, and (2) utilizing the flexibility in design afforded by primary design documents. “The department uses “Context Sensitive Solutions” as an approach to plan, construct, maintain, and operate its transportation system. These solutions use innovative and inclusive approaches that balance community, aesthetic, historic, and environmental values with transportation safety, maintenance, and performance goals. Context sensitive solutions are reached through a collaborative, interdisciplinary approach involving all stakeholders.”

The California Transportation Commission’s Regional Transportation Plan Guidelines were amended in 2010 to read, in part:

MPOS and RTPAs should integrate Complete Streets Policies into their Regional Transportation Plans, identify the financial resources necessary to accommodate such policies, and should consider accelerating programming for projects that retrofit existing roads to provide safe and convenient travel by all users. MPOs and RTPAs should encourage all jurisdictions and agencies within the region to ensure that their circulation elements and street and road standards, including planning, design, construction, operations, and maintenance procedures, address all users of the transportation system, to the extent possible.

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43 Walk San Diego/American Planning Association, 23.
44 Ibid.
National Context

At the national level, Complete Streets is supported by various national organizations, federal agencies, and, to a certain extent, Congress. Professional organizations such as Institute of Transportation Engineers (ITE), American Planning Association (APA), and the American Society of Landscape Architects work to support their members who implement Complete Streets. The American Public Transportation Association sees Complete Streets as vital to transit customers nationwide. With increasing evidence that Americans desire walkable neighborhoods, the National Association of REALTORS® has committed to supporting local and federal Complete Streets efforts. Numerous public interest groups, including AARP, represent the traveling public as they work for Complete Streets.

As the concept catches on, an increasing number of resources have been developed for implementing agencies. Multiple national guides and manuals provide broad guidance on Complete Streets. Some of the examples include:

- National Association of City Transportation Officials’ (NACTO) Urban Street Design Guidelines, and Urban Bikeway Design Guide;
- Los Angeles County’s Model Design Manual for Living Streets;
- Active Transportation Alliance’s Complete Streets Complete Networks: A Manual for the Design of Active Transportation; and

The US Department of Transportation (US DOT) supports local agencies working to develop truly integrated transportation networks. In 2010, the agency released a policy statement on bicycle and pedestrian accommodation regulations and recommendations. It states: “The DOT policy is to incorporate safe and convenient walking and bicycling facilities into transportation projects. Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems.”45 The policy statement also encourages state and local governments to adopt similar policies and to go beyond minimum design standards to implement a Complete Streets approach.

The Federal Highway Administration (FHWA) released a memorandum in August 2013 that encourages transportation agencies at various levels to take a flexible approach to bicycle and pedestrian facility design, specifically noting the applicability of the NACTO and ITE guides mentioned above.46 FHWA includes an updated list of Complete Streets friendly design treatments that are allowed or not precluded in the 2009 version of the Manual on Uniform Traffic Control Devices (MUTCD), as well as those that may be piloted through the MUTCD experimentation process.47 In January 2014, the National Committee on Uniform Traffic Control Devices will likely approve two of such intersection treatments: bicycle boxes and

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bicycle specific signals. Support for a Complete Streets approach and design flexibility from US DOT and FHWA gives jurisdictions reassurance as they implement Complete Streets.

Support for Complete Streets exists in the current surface transportation authorization bill, Moving Ahead for Progress in the 21st Century (MAP-21). It continues a history of flexibility in federal funding, allowing to funds to be spent on walking and bicycling projects in addition to automobile projects. MAP-21 included a provision in the Highway Safety Improvement Program that provides a new, more comprehensive definition of street users that is based on Complete Streets language. The expanded definition of road users is certainly an indication of the shift towards strengthened federal support for Complete Streets.

The Role of SANDAG in Complete Streets Implementation

SANDAG currently has several resources in place for jurisdictions in the region related to Complete Streets. These include technical support, design, and policy resources.

Existing Technical Support Resources

SANDAG has produced several resources, made available through their website, on planning for livable communities. These include:

- **Planning and Designing for Pedestrians, Model Guidelines for the San Diego Region**– This document can be used as a template for cities to develop their own pedestrian design guidelines
- **Trip Generation for Smart Growth** – This report presents an overview of a mixed-use trip generation method, which can be used to improve trip generation forecasts for mixed-use developments
- **Integrating Transportation Demand Management into the Planning & Development Process** – Provides best practices of transportation demand management, policy guides, and identifies program assistance resources in the region
- **Parking Strategies for Smart Growth** – Includes a literature review and best practices for parking in smart growth environments, and seeks to establish reasonableness for lower parking rates for smart growth development
- **Designing for Smart Growth, Creating Great Places in the San Diego Region** – Provides smart growth design guidelines for the region
- **Smart Growth Photo Library** – SANDAG has a DVD available with a collection of photographs of smart growth
- **Visualization tools of smart growth and 3-D simulation projects**

SANDAG has also provided direct technical assistance to member agencies to develop complete Streets implementation plans with support from the Communities Putting Prevention to Work grant received by the County of San Diego Health and Human Services Agency from the U.S. Centers for Disease Control and Prevention.

Existing Active Transportation Project Development

SANDAG supports active transportation project development through a variety of initiatives, including a smart growth outreach program, the regional bike plan and its implementation, the Safe Routes to School Strategic Plan, Safe Routes to Transit, and the Active Transportation Implementation Strategy.
As part of the **Smart Growth Outreach Program**, SANDAG staff can visit jurisdictions to present on Smart Growth. They have also prepared written materials, as noted above, to aid member agencies in project development through applying their guidelines and simulations.

The **Regional Bicycle Plan** was developed to support the implementation of the Regional Comprehensive Plan and Regional Transportation Plan. The plan is also part of the Sustainable Community Strategy. It proposes an extensive regional bicycle system, consisting of corridors, facilities, and programs, to be implemented by year 2050. The plan includes five categories of bicycle-related programs, including education, public awareness, encouragement, enforcement, and monitoring and evaluation. In 2013, SANDAG approved the **Early Action Program (EAP)** for the Regional Bike Plan, as a preferred implementation option. The overall goal of the EAP is to implement the regional bicycle network high priority projects within 10 years, and to continue to fund local plans, programs, and projects through a competitive grant program.

In 2012, SANDAG finalized a **Safe Routes to School Strategic Plan**. The plan guides SANDAG to make walking and bicycling to school safer and more attractive. Technical assistance programs proposed as part of the Strategic Plan include planning workshops, seminars and training, and offering planning services to member agencies. The plan outlines an implementation process and the need to develop a need analysis, with some benchmarks for the first year of plan implementation.

SANDAG approved funding for the development of a **Safe Routes to Transit Regional Plan** in 2011. The purpose of the project is to provide enhanced bicycle and pedestrian access at transit stop and station areas, which will be used in the development of San Diego Forward: The Regional Plan. SANDAG will examine other regions’ Safe Routes to Transit efforts, identify potential policy options, and identify projects in the 2050 RTP/SCS transit corridor areas. As part of these efforts, SANDAG will prepare concept-level cost estimates for inclusion in the regional plan.

SANDAG is currently developing the **Active Transportation Implementation Strategy**. This strategy will incorporate the various active transportation efforts, including the Regional Bicycle Plan, Safe Routes to School and Safe Routes to Transit. It will be used to develop a comprehensive Active Transportation Program for the region, and identify active transportation projects and programs associated with the RTP and SCS for consideration in San Diego Forward: The Regional Plan. The strategy will also identify performance measures for active transportation for ongoing monitoring and program evaluation.

Beyond the technical support, and design and policy resources, SANDAG has a role in supporting Complete Streets through its transit project implementation process. Coordinating project development with local smart growth and active transportation plans can ensure the region’s transit projects are serving all roadway users’ needs. Through its role a **TransNet** program administrator, SANDAG also works closely

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with Caltrans on highway development projects. This provides an opportunity to encourage Complete Streets design concepts where state highways are, or intersect with local circulation roads.

**Existing Active Transportation Funding**

SANDAG administers multiple funding programs that support Complete Streets and Active Transportation, including the TransNet Local Systems Improvements program, which includes the TransNet Smart Growth Incentive Program, and the Active Transportation Grant Program.

The **TransNet Local Systems Improvements** program represents a substantial and ongoing funding source for local jurisdictions. The focus of the program is to reduce traffic congestion but these projects often include provisions that also support active transportation. The funds may be used for any purpose eligible under the overall program, including transit and smart growth-supportive projects.

Under the TransNet Ordinance, 2% of the funds are allocated to a competitive grant program known as **TransNet Smart Growth Incentive Program**. These grants are available to improve streetscapes, provide for bicycle and pedestrian access, improving access to transit, and other improvements that would support mixed-use Transit-Oriented Development. Up to 20 percent of the funds may be allocated to support smart growth planning, which could lay the groundwork for Complete Streets projects.

SANDAG also administers an **Active Transportation Grant Program**, funded by the TransNet Ordinance and the state Transportation Development Act (TDA). The majority of these funds currently are dedicated to implementing the high priority bicycle projects in the Regional Bike Plan. For the remaining funds, member agencies can apply for funding to develop active transportation plans, to implement supporting education and encouragement programs, and to design and construct active transportation infrastructure.

**Barriers to Implementation**

Barriers to implementing Complete Streets in the San Diego Region include policy, design, liability concerns, and funding.

**Policy**

The main policy barriers include conflicts with existing plans and policies and conformance to CEQA guidelines. Each agency has an adopted General Plan, which includes a Circulation Element. Some Circulation Elements developed before the Complete Streets Act primarily focus on mobility for automotive travel. They generally include a Level of Service Policy, which also focuses on automotive travel. Member agencies may also have additional plans and policies – such as growth management policies or traffic study guidelines – that dictate a threshold of significance or provision for a particular vehicular Level of Service. These guidelines then feed into CEQA, as the policies of the lead agency are used to determine whether or not an impact is significant. Some local agencies, such as San Marcos, have recently introduced Multimodal Level of Service, which complements Complete Streets. However, jurisdictions with transportation policies focusing predominantly on the automobile may find these policies conflict with a Complete Streets policy.
Design

There are several flexible design resources available, and local, national, and international guidance on Complete Streets design. However, many of the innovative resources are not widely accepted, formally adopted or approved for use.

Caltrans’ Directors Policy 22 provides context-sensitive flexible design guidelines. Additionally, the California Highway Design Manual establishes uniform policies and procedures to carry out the State Highway Design Functions of the Department and has undergone recent and substantial updates in 2012. Even with these changes, some of the newer designs identified in other design guides are not yet incorporated. Other major design standards come from the American Association of State Highway and Transportation Officials’ *A Policy on Geometric Design of Highways and Streets* (AASHTO Green Book) and the Manual of Uniform Traffic Control Devices, which presents design standards for traffic control devices. These guidance documents already provide flexibility in design, and they are evolving toward a more Complete Streets approach. Additional publications by AASHTO specifically highlight flexibility in roadway design. In general these standards and guidelines encourage a conservative approach to design, and their processes for change are lengthy.

Local member agencies may also develop and maintain their own design standards, which can include a minimum lane width or vehicular right-of-way. The flexibility of applying local standards would also depend on the agency.

Design Exceptions and Liability Concerns

Cities and designers have broad legal protection from liability when their practices conform to the widely accepted design standards and when new treatments are documented through formal exception procedures. As noted, there are several roadway design standards and accepted or adopted resources that agencies reference in designing streets. Departure from accepted design guidance can introduce liability concerns and represent a barrier to innovation. This risk can be seen as a barrier to Complete Streets implementation. However, new and innovative design treatments that may provide safety and operational benefits and that are not yet incorporated into the accepted design manuals can still be utilized. Most design manuals, including the California Highway Design Manual, incorporate specific design exception procedures and documentation requirements that can help document due diligence by the implementing agency. Furthermore, design exceptions have an important role: When they are granted, they can be evaluated after implementation and may become standards in future.

Funding

Funding can be seen as another barrier to implementing Complete Streets. Although implementing Complete Streets can ultimately save money for the agencies, there can be upfront costs for designing and constructing Complete Streets treatments. These capital costs can be offset through grant funding, or timing the projects with other capital improvements projects.

BEST PRACTICES

This section identifies best practices from other regional agencies on policy, technical support project development, checklist examples, and funding. Each MPO described has developed programs with attributes worth considering that include developing additional technical resources, consolidating existing
policies, or creating funding strategies that encourage Complete Streets policies. These practices provide a menu of options to evaluate when developing a regional policy.

Policy

The **Metropolitan Washington Council of Governments** (MWCOG) developed the “Complete Streets Policy for the National Capital Region.” At the time of development, some MWCOG member agencies had existing Complete Streets policies and others did not, similar to the current state of the San Diego region. Thus, they prepared a consensus policy to have some common policy background between member agencies in MWCOG. In developing the Consensus Policy, they drew from highlights of existing policies. The MWCOG policy provides guidance and a template for member agencies to adopt their own Complete Streets policies.

The **Indianapolis Metropolitan Planning Organization** (IMPO) adopted a complete streets policy in March 2014 based on a vision and intent to “create a safe, balanced, and effective transportation system where every roadway user can travel safely and comfortably and where multi-modal transportation options are available to everyone.” The policy will require all projects within the urbanized area that are funded with federal Surface Transportation Program and Transportation Alternatives Program funds to support Complete Street principles. The policy includes minimum requirements for bicycle and pedestrian access, design guidance, a procedure for exceptions to the requirements, and an evaluation process that establishes performance measures.55

The **National Complete Streets Coalition**, in collaboration with the American Planning Association, developed “Complete Streets: Best Policy and Implementation Practices.” This publication provides case study examples of the best policy and implementation guidelines. It draws from 30 communities nationwide and provides a framework to build support, adopt a policy, and integrate Complete Streets concepts into plans, processes, and standards.

Technical Support

**Broward County, Florida**, developed the “Complete Streets Guidelines,” which provides design guidance for Broward County. This process was led by the Broward Regional Health Planning Council (BRHPC) as part of an award to help create healthier communities in Broward County. The County held several local outreach efforts, including Complete Streets workshops throughout the county, charrettes, and surveys, and have ongoing outreach efforts by email and phone. The resulting guidelines include an extensive chapter with prescriptive ways for agencies to reach out to public.

The **Maricopa Association of Governments (MAG)** in Arizona developed the Complete Streets Guide in 2011 that provides its own design guidelines for member jurisdictions. The guide features a unique chapter on Design Techniques and Sample Outcomes that identifies how projects can be developed with

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regard to the existing land use context and character. Outcomes for different types of land use contexts are also provided to help right-size projects. Although MAG does not develop their own complete streets, they have a process for member jurisdictions to apply to MAG to obtain design assistance for complete streets projects.

The **Regional Transportation Commission of Southern Nevada (RTCSNV)** developed the “Complete Streets Design Guidelines for Livable Communities,” published in March 2013. RTCSNV also held Complete Streets workshop for member agencies to attend. The guidelines have a focus on public outreach, and provide sections for each mode of transportation. This document provides design guidance for the region, which includes Las Vegas, Boulder City, and other cities in Clark County. RTCSNV acknowledged that most local jurisdictions’ design guidelines and policies are geared toward motor vehicle travel. The document focuses on how to implement Complete Streets at a local level, by providing a template and model manual that can be adopted to replace existing design manuals. It focuses on designing streets for health, safety, livability, and sustainability, and provides policies for Southern Nevada that align with the ten elements for Complete Streets, noted earlier. The document provides benchmarks and performance measures. The guidelines include traveled way design, intersection design, pedestrian access and crossings, bikeway design, transit accommodations, traffic calming, and streetscape ecosystem. The publication also includes information on land use and transportation integration, livable streets in suburban environments, and community engagement.

The **Association of Monterey Bay Area Governments** in northern California developed the Complete Streets Guidebook in August 2013, which also functions as a design guide. The guidebook provides guidance on how communities can meet requirements of the Complete Streets Act (AB 1358) by incorporating complete streets policies into their general plans. It contains a unique Complete Streets action plan for coordinating intra-agency tasks and context-sensitive Complete Streets types.

**Project Development**

The **Washoe County Regional Transportation Commission** in Nevada established the Pavement Preservation Program in 2004. This was conducted in conjunction with member agencies, such as the public works departments of Reno, Sparks, and Washoe County. They also partnered with a local university to do in-depth studies of road diet projects in conjunction with this project. The purpose of the program is to maintain roads in good condition and minimize long term costs, which can be done by applying the most cost effective treatments to the right pavements at the right times. RTC funds tactical roadway preservation programs while the local governments provide preservation services for non-regional roadways; they maintain data on index ratings for each regional road to assist in project selection. The program strategy relies on preventative and corrective maintenance methods to maintain roadways in good condition. Through the program, RTC has narrowed travel lanes, added bicycle lanes, and – in some cases – eliminated travel lanes. The desired effects of the program are to slow traffic to designated posted speed, reduce vehicular collisions, and provided space for non-auto users. The RTC has found that crash reductions have ranged between 25 to 45 percent.

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59 Conversation with Stefanie Seskin, NCSC, 12/12/13


Checklists

The Mid-Ohio Regional Planning Commission, which serves the Columbus, Ohio region, developed a Regional Complete Streets policy for its member agencies. One feature of the policy is that it is accompanied by a checklist, which was developed to assist project sponsors in defining and designing their projects in adherence to the policy. The checklist includes explaining existing conditions, such as routine accommodations, and how a project will improve pedestrian and bicycle safety. The checklist is a combination of narrative and “check off” items, with the applicant providing information including whether design guidance and interjurisdictional consultation has been completed. The checklist also provides information on how to conduct public outreach.

The San Francisco Bay Area’s Metropolitan Transportation Commission (MTC) also provides a checklist for livable streets projects. The checklist includes policies for routine accommodation, and provides those applying for regional funding for transportation projects the opportunity to identify trip generators near the project site for attracting bicyclists and pedestrians. The checklist also asks the applicant to supply collision information, identify local plans and policies, and note whether there are additional alternative mode accommodations.

Funding and Project Selection

The MTC OneBayArea grant program provides funding to local agencies to support the region’s Sustainable Communities Strategy. To be eligible for funds, jurisdictions need to address complete streets policies by either adopting a Complete Streets resolution or having a General Plan that is compliant with the California Complete Streets Act. This funding requirement is one of the more aggressive approaches to encourage member jurisdictions to develop and adopt policies.

The Nashville Area MPO and the Mid-American Regional Council (MARC) have similar mechanisms for project selection and funding. The Nashville Area MPO adopted its 2035 Regional Transportation Plan in 2010. The guiding principles for the plan include: livability, prosperity, sustainability, and diversity with an emphasis on public health and equity. The scoring system used to prioritize projects in the plan dedicates 50 percent of the available points to quality of life, accessibility, health, and safety. The plan has also incorporated regional health impact assessments on transportation as part of the project selection process and criteria.

MARC is the regional planning organization for the bi-state Kansas City region. Like the Nashville area, MARC drew heavily on its member agencies’ comprehensive and adopted plans in developing project selection criteria, and developed a focus on healthy living and economic activity. Similar to the Nashville

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63 Ibid.
65 Metropolitan Transportation Commission. OneBayArea Program Information. Available at: http://www.mtc.ca.gov/funding/onebayarea/
67 Nashville MPO. 2035 Regional Plan. Available at: http://www.nashvillempo.org/plans_programs/tp/2035_rtp.aspx
Area MPO, MARC developed a 100-point scoring system to prioritize projects. The result of the prioritization process was to refocus 75 percent of its financially constrained projects to support higher-intensity lane use in regional activity centers.

**Reporting and Monitoring**

The **Seattle Department of Transportation** provides a progress report of its work over a two-year period, called the “Transportation Action Agenda.” Within this report, the agency identifies new projects, recent accomplishments, and project highlights. They also present a summary of transportation work, such as the number of miles of new bicycle lanes, number of potholes filled, and bridge repairs completed. They identify the projects that were funded using the “Bridging the Gap” levy revenues, a program designed to provide the capital necessary for ongoing operations and maintenance for the department. The entire report is written for the average resident, with accessible language, concise tables, and a depth of information that informs users without overburdening them with data.70

The City of **Billings, Montana** prepared a Complete Streets Benchmark Report in 2013 to address Complete Streets performance measures and benchmarking for the city. The report is designed attractively with infographics and charts to display information, such as changes in pedestrian counts, the addition of bicycle lane miles, and major roadway projects completed. One highlight of the Billings report is that they provide charts illustrating year over year changes, and summarize the projects’ compliance with Complete Streets.71

**New York City** maintains a website, sustainablestreets.info, which maps sustainable streets projects in an interactive manner. By visiting the site, users can view Complete Streets projects by year and type, as well as streetscape and safety improvements.72 The City has also prepared a summary document presenting accomplishments and benchmarks for sustainable streets projects.

**IMPLEMENTATION**

Table 1 provides a series of Policy Implementation Options for SANDAG and member agencies consideration. For each implementation category, potential actions and potential benefits are provided. These solutions are intended to be a discussion point, both for available resources and importance of implementation in each category. In some cases, SANDAG has already invested substantial effort, so continued action may be the status quo. In other cases, SANDAG and member agencies may choose to further enhance implementation resources, or may decide that going beyond the current level of effort is unnecessary.

<table>
<thead>
<tr>
<th>Category</th>
<th>Potential Actions</th>
<th>Potential Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical</td>
<td>Expand existing technical resources to include Complete Streets best practices for design, construction, operation, and maintenance</td>
<td>Easier access to Complete Streets resources for local agency staff</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Operations and Maintenance</th>
<th>Compile and make available best practices as a checklist for incorporating Complete Streets changes into routine operation and maintenance activities</th>
<th>Facilitate low-cost Complete Streets improvements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Development Checklists</td>
<td>Develop a custom project development checklist for the San Diego region</td>
<td>Common understanding of how to develop complete streets and coordination between agencies and departments within agencies</td>
</tr>
<tr>
<td></td>
<td>Develop a checklist and procedures for use by SANDAG in its project development and oversight role.</td>
<td>Regional projects provide examples of good Complete Streets development and consistency between SANDAG projects and local complete streets efforts</td>
</tr>
<tr>
<td>Reporting and Monitoring</td>
<td>Provide member agencies with opportunities to provide periodical reports to SANDAG policy committees showcasing model complete streets projects.</td>
<td>Member agencies learn from local best practices</td>
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<td></td>
<td>Develop basic benchmarking checklist for SANDAG project</td>
<td>Improved integration of CS elements in projects linked to local priorities</td>
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<tr>
<td>Funding</td>
<td>Add “priority points” for project applications in jurisdictions that have addressed complete streets at the local level. Review selection criteria to encourage social equity for agencies with limited resources in high-need areas.</td>
<td>Increased delivery of highest value and performing projects</td>
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<td></td>
<td>Require that member agencies have Complete Streets policy language or update General Plans in order to be selected for Complete Streets funding through regional grant opportunities.</td>
<td>Encourages timely local resolution of barriers and conflicts related to policy and implementation</td>
</tr>
<tr>
<td></td>
<td>Create a new grant funding mechanism dedicated to Complete Streets projects.</td>
<td>Increased delivery of highest value and highest performing projects</td>
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<table>
<thead>
<tr>
<th>Action</th>
<th>Result</th>
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<tbody>
<tr>
<td>Provide training on using existing SANDAG guidelines for SANDAG and local projects</td>
<td>More knowledgeable planning and engineering staff</td>
</tr>
<tr>
<td>Adapt existing complete streets design best practices as templates for the San Diego region</td>
<td>Easier to adapt Complete Streets best practices to local projects</td>
</tr>
<tr>
<td>Develop complete streets design guidance for the San Diego region</td>
<td>Common and easily implemented local standards for complete streets</td>
</tr>
<tr>
<td>Support the development of updated traffic impact study guidelines</td>
<td>Updated regional guidelines that are more consistent with current state, regional and local laws and policies Added certainty in the development review process</td>
</tr>
<tr>
<td>Provide technical assistance to member agencies on the development of individual design guidelines and policies. Use model as starting point, but provide assistance in developing unique set of guidelines for particular agency.</td>
<td>Common and easily implemented local standards for complete streets</td>
</tr>
<tr>
<td>Develop checklist to incorporate routine accommodations into Operations &amp; Maintenance</td>
<td>Minimize missed opportunities for improvements</td>
</tr>
<tr>
<td>Identify opportunities in SANDAG funding programs to encourage jurisdictions to develop preventative maintenance programs that identify and implement Complete Streets enhancements in routine operation and maintenance activities.</td>
<td>Increased cost efficiency</td>
</tr>
<tr>
<td>Require agencies to prepare and submit checklist identifying all potential routine accommodations for operations &amp; maintenance projects in order to be considered for funding.</td>
<td>Increased accountability</td>
</tr>
<tr>
<td>Compile library of project development checklists.</td>
<td>Easy access to best planning and design practices for local planners and engineers</td>
</tr>
<tr>
<td>Provide assistance in developing unique checklists for member jurisdictions.</td>
<td>Improved integration of CS elements in projects linked to local priorities</td>
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managers and member agencies | elements in projects
---|---
Develop model monitoring document, which can be used by SANDAG project development staff and as template for member agencies | With improved travel monitoring, potential improved understanding of how active transportation infrastructure affects travel choices
Provide annual Complete Streets progress report on SANDAG projects to Transportation Committee | Better informed regional policies about supporting different mode choices
Require periodic reporting and monitoring of complete streets projects as condition of grant funding | Improved ability to assess return on investment and increase effectiveness over time

## Choices and Discussion

As presented in this white paper, there are several approaches that SANDAG could take to play a role in the development of a regional Complete Streets policy and program. SANDAG already offers several methods of assistance – both from a technical and financial perspective – to its member agencies. The crucial point of discussion would therefore be to decide what level of involvement SANDAG should have as it works with member agencies to incorporate Complete Streets within the general agency protocol, and how a regional Complete Streets policy should influence the project development and implementation process at SANDAG.

There is a spectrum of options, as presented in the accompanying table, for each type of assistance that could be administered by SANDAG. In some cases, SANDAG would have a greater amount of guidance as to what is required of member agencies. Key benefits of increased regional guidance may be more expedient resolution of cross jurisdictional issues, ensuring adequate minimum accommodation, and guidance for routine decision making. The challenges include having member agencies adhere to these requirements in a rapid manner while still taking the time and securing resources to develop long-term and vetted plans that align with a given agency’s local goals.

On the other hand, SANDAG could play only a supporting role, providing static technical resources to member agencies, but with little to no direct involvement in how local agencies address Complete Streets. This would allow each agency to develop policies and programs that fully align with their individual goals.

In the middle of the spectrum, SANDAG could continue to offer technical resources and funding, but continue to enhance the resources offered. Developing a series of Complete Streets resources over time can assist agencies in preparing their own documents, but with some common threads between agencies. It would be of benefit to the region to identify the key themes to address in the Complete Streets discourse, and to create a desirable list of resources for SANDAG to develop over time.
EMERGING TECHNOLOGY WHITE PAPER REVIEW

Introduction

Staff is preparing a white paper on emerging technologies for use in the development of San Diego Forward: The Regional Plan. Staff will present the draft white paper marking the opening of a 45-day comment and review period. Feedback and discussion from working groups, advisory committees, and the general public will help shape the final report.

Discussion

Emerging Technology is an exciting and ever-changing field. The white paper is now in draft form and covers three key areas: emerging vehicle technologies including a robust discussion on Connected Vehicles; emerging transportation infrastructure technologies, and other emerging technologies that are typically outside of the transportation field, yet have influence on travel demand.

The Emerging Technology white paper outline has been presented at several working groups including the Cities/County Transportation Advisory Committee, the Energy Working Group, the San Diego Regional Traffic Engineers Council, and community-based organizations working groups as well as being presented at the Regional Planning Committee. In addition, Emerging Technology round table was held at this year’s Board retreat. Staff have taken the excellent feedback from all these forums and incorporated it into the draft white paper.

SANDAG is seeking input for both the white paper as well as the region’s overall use of technology and is opening a 45-day review and comment period. Questions, comments, and general feedback should be directed to the project manager for this effort whose contact information is at the end of this report.

Attachment: 1. Draft Emerging Technologies White Paper

Key Staff Contact: James Dreisbach-Towle, (619) 699-1914, james.towle@sandag.org
Emerging Technology White Paper

Introduction

The field of Emerging Technology is exciting and ever-changing. This paper will explore the field of Emerging Technology specifically as it effects and influences transportation infrastructure. Additionally, this paper will discuss technology trends and how those trends – albeit not transportation specific, affect our everyday lives. Technology influences where we work and live, how we communicate with each other, and the personal choices we make.

Personal technology has changed the landscape in the last five to ten years and has started to significantly deliver the ability to access the ‘virtual’ office, classroom, and doctor’s office to name just a few. Today’s world of universal communication and instant access to information paints a picture of what our future holds.

These advances have the potential to reduce travel demand by reducing the need to make as many trips to work, school, or to medical appointments. Technology can help reduce single occupancy trips; however, there is also the potential that technologies such as the Autonomous Vehicle could increase trips by increasing the audience who has access to so-called self-driving cars.

This paper will explore vehicle technology, infrastructure or roadway technology, as well as personal technology all from a planning perspective to inform the public and policy makers on investments, policies, and timing so that as a regional we all can make informed choices that will shape our future.

Intelligent Transportation Systems (ITS)

Intelligent Transportation Systems or ITS is the application of technology to transportation systems including vehicles, roadways, intersections, transit, traveler information and payment systems with the goal to maximize efficiency of those services while increasing vehicle throughput, reducing congestion, and to provide quality information to the commuting public. Such information is a key factor for influencing transportation choices across all modes of travel.

SANDAG ITS Program is divided into three areas of emphasis.

- **Planning** – Both long range, and at the project level, including Performance Monitoring and Management
- **Implementation** – Stand-alone projects and as integrated into a larger capital improvement
- **Operations** – Facilitation of integrating new ITS systems into on-going operations and maintenance.
ITS Planning / Transportation System Performance Monitoring and Management

A fundamental emerging technological need that remains constant during Regional Transportation Planning cycles is determining if the region is maximizing the benefits of transportation project improvements. To assess and realize the progress and transportation performance benefits of existing and planned project investments, requires the application of a comprehensive and sound statistical evidence gathering and analytical process to determine facts, trends, quality of services, and optimal system efficiency. Under Transportation System Management, this is achieved through Transportation System Performance Monitoring and Management.

ITS Planning places emphasis on improving data collection, analysis, and management in two key areas: (1) transportation performance monitoring and (2) transportation system performance management. These program areas are key to improving Mobility, Reliability, and System Preservation RTP Goals.

Transportation Performance Monitoring

Getting the most out of our transportation investments requires monitoring the system’s performance, to (1) provide current and on-going information on how well the transportation system is performing; (2) identify opportunities for near-term improvements; and (3) assess the impacts of future improvements. Priority activities for improving performance monitoring are focused on continued development for enhancing this regions ability to automate the data collection, data analysis, and data management systems for all modal networks regardless of data collection technology. Transportation System Performance Monitoring is rather guided by the following principles:

• Improved Traveler Information – Focus on the regions ability to provide better information on speeds, travel times, or congestion-related information to the motoring public.

• Improved Performance Monitoring and Reporting – Focus on enhancing support for on-going or new efforts that support and align with local, regional and federal performance monitoring and reporting programs and initiatives.

• Transportation performance monitoring needs to be automated and uniformed across networks. This will reduce costs and provide more frequent data collection and allow for data collection, analysis, and reporting to be consistent year to year.

• Transportation performance monitoring needs to reflect the multimodal nature of our transportation system by focusing on all modes of travel.
Data availability, accuracy, and management should be carried out to supplement and support on-going performance management and operations efforts including the development of decision support systems and real-time proactive corridor management approach.

Implementation and Project Delivery

Project Delivery or Implementation follows System Engineering Principals and accepted project management process as detailed by the Project Management Institute (PMI).

ITS Operations

SANDAG ITS has deployed several modal programs, systems and regional communications networks that transition from implementation into normal or pilot operations. These systems require on-going support for operations, administration, and maintenance to ensure that the systems perform as expected and deliver mobility services to the public.

Due to the fluid nature of public demand for real time traveler information, there is a requirement to maintain high-availability, robust systems in a 24x7 posture. To accomplish this, ITS operations develop support plans, best practices, documentation and administration strategies while the project transitions from implementation to production. Once proper administration tools and practices are applied the completed project can be supported by a traditional Information Technology department and thus transferred to the appropriate support team within the regional network of partners.

Emerging Transportation Technologies

This section of the document will explore transportation technology and the impact of those technologies on reducing energy use through system efficiencies, reduced congestion, increasing throughput, and reduced idling. Several of these technologies have already been developed and are in use in whole or part and are introduced in the following sections along with a discussion on Policies and Investments.

- Emerging Vehicle Technologies
- Electric Corridor Charging
- Multi-Modal Management
- Smart Parking
- Mobility Hubs
- Unified Transportation Payment
- Other Emerging Technology Trends
- Policies and Investments
Emerging Vehicle Technologies

Connected Vehicles

One cannot escape the terms “Connected” or “Autonomous” when discussing the future of transportation technologies. Each of these terms refer to advances in Intelligent Transportation Systems (ITS) technologies that carry with them a perceived threat of disruption across many aspects of the transportation profession, from planning to operations.

With formal direction now set by the National Highway Traffic Safety Administration (NHTSA) on both connected and autonomous vehicles, this section of the Emerging Technologies whitepaper will seek to provide the reader with information used in answering the question “how real is it?”

The National Highway Traffic Safety Administration (NHTSA), under the U.S. Department of Transportation, was established by the Highway Safety Act of 1970, as the successor to the National Highway Safety Bureau, to carry out safety programs under the National Traffic and Motor Vehicle Safety Act of 1966 and the Highway Safety Act of 1966. In their announcement confirming that connected vehicles did indeed provide the postulated safety benefits put forward by almost 10 years of Research & Development, NHTSA commented that “America is at a historic turning point for automotive travel. Motor vehicles and drivers’ relationships with them are likely to change significantly in the next ten to twenty years, perhaps more than they have changed in the last one hundred years. Recent and continuing advances in automotive technology and current research on and testing of exciting vehicle innovations have created completely new possibilities for improving highway safety, increasing environmental benefits, expanding mobility, and creating new economic opportunities for jobs and investment. The United States is on the threshold of a period of dramatic change in the capabilities of, and expectations for, the vehicles we drive. In fact, many are inspired by the vision that the vehicles will do the driving for us.

Although this Statement focuses on the enormous safety potential of these new technologies, they offer an even wider range of possible benefits. Vehicle control systems that automatically accelerate and brake with the flow of traffic can conserve fuel more efficiently than the average driver. By eliminating a large number of vehicle crashes, highly effective crash avoidance technologies can reduce fuel consumption by also eliminating the traffic congestion that crashes cause every day on our roads. Reductions in fuel consumption, of course, yield corresponding reductions in greenhouse gas emissions. To the extent vehicles can communicate with each other and with the highway infrastructure, the potential for safer and more efficient driving will be increased even more. Drivers—or vehicles themselves—will be able to make more intelligent route selections based on weather and traffic data received by the vehicle.
in real time. Mobility for those with a range of disabilities will be greatly enhanced if the basic driving functions can be safely performed by the vehicle itself, opening new windows for millions of people.

Preventing significant numbers of crashes will, in addition to relieving the enormous emotional toll on families, also greatly reduce the enormous related societal costs—lives lost, hospital stays, days of work missed, and property damage—that total in the hundreds of billions of dollars each year. Moreover, these dramatic changes will offer significant new opportunities for investments in the underlying technologies and employment in the various industries that develop, manufacture, and maintain them.”[1]

The SANDAG Board has requested additional information be included in San Diego Forward: The Regional Plan on the subject of emerging technologies. The following sections provide insight into the experience that has been gained over the last decade, and sets some basis for future focused statements.

Definitions

For the remainder of this white paper, a Connected Vehicle is defined as a vehicle that has specific wireless communications technology providing additional safety features to both the vehicle and driver; with 360-degree situational awareness to address crash situations – including those, for example, in which a driver needs to decide if it is safe to pass on a two-lane road (potential head-on collision), make a left turn across the path of oncoming traffic, or in which a vehicle approaching at an intersection appears to be on a collision course. In those situations, Vehicle-to-Vehicle (V2V) communications can detect threats hundreds of yards from other vehicles that cannot be seen, often in situations in which on-board sensors alone cannot detect the threat.[2]

An Autonomous Vehicle are those in which at least some aspects of safety-critical control function (e.g. steering, throttle, or braking) occur without direct driver input. Vehicles that provide safety warnings to drivers (forward crash warning, for example) but do not perform a control function are, in this context, not considered automated, even though the technology necessary to provide that warning involves varying degrees of automation (e.g., the necessary data are received and processed, and the warning is given, without driver input). Automated vehicles may use on-board sensors, cameras, GPS, and telecommunications to obtain information in order to make their own judgments regarding safety-critical situations and act appropriately by effectuating control at some level. Accordingly, for purposes of this discussion, vehicles equipped
with V2V technology that provide only safety warnings are not automated vehicles, even though such warnings by themselves can have significant safety benefits and can provide very valuable information to augment active on-board safety control technologies. In fact, the realization of the full potential benefits and broad-scale implementation of the highest level of automation may conceivably rely on V2V technology as an important input to ensure that the vehicle has full awareness of its surroundings.[1]

Current State of these Emerging Technologies

To understand the global nature of the transportation industry, one needs only look at the Nations who are currently engaged in connected and autonomous vehicle research. A brief summary of the work being undertaken or completed by the Federal Governments of the United States, European Union, United Kingdom, Japan, Taiwan, Korea, and Australia is provided.

There are multiple Original Equipment Manufacturers (OEM) working together across the continents pictured above to further define the approach for implementing connected and autonomous vehicle programs. One of the earliest examples of these pre-competitive teams can be found in 2005, when the “Crash Avoidance Metrics Partnership” (CAMP) formed as a consortia of seven OEMs, charged with working together to provide input to the US Federal Government on issues from technology to policy.[3]

SANDAG was informed at the 2014 Board Retreat by Jim Pisz of Toyota, that the development timeline for OEMs is between 5 and 7 years. To date, the global automotive industry has completed more than ten calendar years of in-vehicle-development, communications protocol standardization, human factors research, application analysis and testing, and finally field testing of the entire connected technology ecosystem.

To better understand the impetus behind the current National interest in connected and autonomous vehicles, one may look to the remarks made to the “House Committee on Transportation and Infrastructure Subcommittee on Highways and Transit”, by the Director of the University of Michigan’s “Transportation Research Institute” (UMTRI). UMTRI, located in Ann Arbor, are uniquely positioned to encapsulate the international perspective on connected and autonomous vehicles. They work closely with the “Big Four” Original Equipment Manufacturers (OEM) through industry directed grant funding [4]; have recently completed the world’s largest field operational test of over 3,000 connected vehicles [funded by the United States Department of Transportation (USDOT) Research and Innovative Technology Administration (RITA)]; and most recently have provided crucial support to the implementation of a “fake city center” in downtown Detroit for the 2014 International World Congress on Intelligent Transportation Systems. Here they will demonstrate the capabilities of multiple manufacturer’s autonomous vehicles to over 10,000 transportation professionals from around the globe.

In his submission to the House Committee, the UMTRI Director - Mr. Peter Sweatman - stated that the OEMs continue to work collaboratively with Governments, Standards bodies, and other OEMs. The desire to do so was driven by the fact that;
“Historically, the auto industry has focused much of its safety effort on mitigating the impacts of a crash after it happens, and these efforts have been very successful at reducing traffic fatalities and injuries. Significant efforts have also been made to influence driver behavior, but the number of these preventable tragedies each year is still far too high, at approximately 33,000. The next giant leap in reducing the number of fatalities and injuries on our nation’s roads is to prevent crashes before they happen”[5]

Furthermore, KPMG’s 2012 Report on the “Self-Driving Cars: The Next Revolution” expanded on Dr. Sweatman’s comments by identifying that an additional benefit of having a National fleet of vehicles capable of avoiding accidents could mean that “vehicles could also be significantly lighter and more energy efficient than their human-operated counterparts as they no longer need all the heavy safety features, such as reinforced steel bodies, crumple zones and airbags. (A 20% reduction in weight corresponds to a 20 percent increase in efficiency).”[6]

The Safety Pilot – a $14.9 million dollar Federal Highway Administration’s Research and Innovative Technology Administration funded project executed between 2011 and 2013 - was conducted by the University of Michigan Transportation Research Institute. The “Safety Pilot’s" stated intention was to aid the NHTSA in its determination of the effectiveness of the safety applications in real-world tests using the general population to provide feedback. The recent regulatory decision announcement, made by the NHTSA [2], indicates that under the highest levels of technical scrutiny, connected vehicle technologies have corroborated their safety benefit hypothesis.

The reader may draw from these very short paragraphs that struggle to do justice to the thousands of smaller steps that took over a decade to perform and demonstrate within the context of a full NHTSA analysis approach that would be used in the determination of whether to proceed with a regulatory recommendation to Congress or merely to add a lesser self-regulation standards guideline to the New Car Assessment Program (NCAP). That NHTSA has made the decision to proceed with the more formal regulation recommendation to Congress was summarized by NHTSA Administrator David Friedman when he stated “Decades from now, it’s likely we’ll look back at this time period as one in which the historical arc of transportation safety considerably changed for the better, similar to the introduction of standards for seat belts, airbags, and electronic stability control technology.”[2]

Parallel to the National Level “Safety Pilot” test, the Center for Automotive Research (CAR) conducted a “International Best Practice in Connected and Automated Vehicle Technologies" scan and has registered 85 entries for Asia, 159 for Europe, and 149 for North America [7]. This report provides a summary of many of the larger projects across both Europe and Asia. Most notable of these is the European Commission funded CAR2X project, and has also found that academic institutions in more than ten States across the Nation have either completed or were undertaking additional research to mature aspects of the Connected Vehicle application ecosystem. Although not stated, it is intimated in this report that the Federal expansion of the University Transportation Center funding [8], administered from RITA, has had the desired effect of engaging with the next generation of professionals who are likely to engage in a highly
connected transportation safety, mobility and the environment vision of the future - through Intelligent Transportation Systems “software” to optimize our existing infrastructure.

Following the successful outcomes of the CAMP consortia ‘pre-competitive’ role to advance the state of Transportation, they have now moved on to initiate and complete the work required to take vehicles that are connected and make them autonomous. Their preliminary program of development was recently presented at the SAE 2014 Government/Industry Meeting “Technical Session” (Code: G101)[9]. Based on the work then that CAMP have undertaken and successfully completed in connected vehicle technologies, it may be conservatively estimated that similar collaboration and success will be experienced in delivering autonomous vehicle technologies.

*What may take time is public acceptance!* 

The advent of the *autonomous vehicle* is more recent in practicality. Although it could be argued that San Diego is the birthplace of the current *connected and autonomous* programs, after the Region hosted the Congressionally mandated “Automated Highway System” test be conducted on San Diego’s then fledgling I-15 Reversible Lanes network back in 1997; yet others would say that the Defense Advanced Research Projects Agency (DARPA) seeded the thoughts of *achievability* with their “DARPA Grand Challenge” that ran between 2004 and 2007.

An *autonomous* fleet of vehicles has already been widely demonstrated to hold the promise of better utilizing the capacity of our existing infrastructure. Perhaps not right immediately, but as the 1.9 million vehicles in two to three decades when the penetration rates of these technologies is high enough for technologies such as *Cooperative Adaptive Cruise Control*, [10].

The SANDAG Board does not stand alone in its interest for delivering safer, more mobile and measurable environmental benefits to the Region through the deployment of these two classes of emerging technologies. To date, 23 States have passed or are sitting in consideration of legislation to regulate the “testing” of autonomous vehicles. With the passage of Senate Bill No. 1298, the Californian Department of Motor Vehicles (DMV) – Vehicle Code - was modified thusly “This bill would authorize the operation of an autonomous vehicle, as defined, on public roads for testing purposes, by a driver who possesses the proper class of license for the type of vehicle being operated if specified requirements are met, including that the driver be seated in the driver’s seat, monitoring the safe operation of the autonomous vehicle, and capable of taking over immediate manual control of the autonomous vehicle in the event of an autonomous technology failure or other emergency.”[11]
The DMV continue to garner public comment on the subject, with SB-1298 requiring DMV to adopt regulations no later than January 1, 2015. To date, DMV have conducted four “public comment” hearings to solicit feedback on the regulatory text. The current regulation addresses many of the insurance requirements, driver requirements, and vehicle requirements. It does however exclude heavy vehicles from testing (e.g. Bus, Truck), which may prove to be at odds with the Federal program for connected vehicles which is focused on the attributes of professional drivers and regulatory environment as being desirable as first deployable scenarios.

Local Discussion

The San Diego Region - now in its third decade of recognition as a National and International market leader in the use of Intelligent Transportation Systems solutions to manage traffic congestion, San Diego has at times been seen as an incubator for emerging technologies. Our Region’s cohesiveness at all layers; the Board’s commitment to investigate emerging technologies; and our Regional partnerships that have delivered results, is nationally recognized. [12]

The discussion above presents a picture of the connected and autonomous technologies that may easily misconstrue the overall program as highly mature and potentially even full of practice ready solutions. This is not the case, and those of us intimately involved recognize the difficulties of the next 5-10 years in continuing to mature and ever broadening set of scenarios that must reach automotive grade engineering, and be proven to be practice ready through the 6 Federally funded “Affiliated Test Bed” sites.

SANDAG recognizes that the pull for this technology will come partly from the bottom up. Traffic Engineers who struggle with in-sufficient detection technologies, built upon 30 year old technology are prone to undervaluing the need to track the performance.[13] This white paper will not serve to provide the level of detail that these bottom-up decision makers will require in the future, but rather direct the reader to a partnership between the USDOT’s Office of Operations and the American Association of State Highway and Transportation Officials (AASHTO) that seeks to resolve this gap.

The AASHTO “Footprint Analysis” will provide greater insight into the Connected Vehicle field infrastructure that may be deployed through the development of approximately ten engineering design concepts. These concepts will likely include illustrations of typical deployments at signalized intersections, urban freeways, rural roadways, international border crossings, and other locations intended to provide agencies with a better understanding of the type of systems and equipment that may be implemented. The design concepts will not serve as the plans and specifications that agencies will ultimately require as they begin actual deployment.
To be completed in October 2015, this will provide a concept for a national Connected Vehicle field infrastructure footprint that includes:

- prioritized applications for state and local agencies including the data, communications, security, roadside equipment, and information service needs of each agency
- a set of design concepts and deployment gaps for approximately ten of the highest priority applications, with sufficient engineering detail to describe an operational system
- a range of scenarios that illustrate how different government entities—state, county, or municipal—would approach deployment
- a preliminary national footprint for Connected Vehicle field infrastructure created by expanding the deployment scenarios
- an initial strategy for coordinated, phased deployment based on the scenarios and national footprint, highlighting interoperability and institutional challenges and opportunities
- a set of deployment cost estimates including equipment, operations and maintenance, and training and staff development

Critical to the maturing of AASHTO’s deployment concepts will be the rapid and equal maturing of mobility and the environmental applications. The FHWA’s Research and Innovative Technology Administration has established two Research Programs each charged with developing 10 high priority concepts; validating the achievability of these with practitioner input; simulating the application effectiveness in the scenarios detailed in the AASHTO document; and then working with the existing six Research Institution based “Affiliated Test Bed” to evaluate the program outcomes in the real-world [14]. These programs are;

- The Dynamic Mobility Applications (DMA) Program: seeks to identify, develop, and deploy applications that leverage the full potential of connected vehicles, travelers and infrastructure to enhance current operational practices and transform future surface transportation systems management; [15]and
The Applications for the Environment: Real Time Information Synthesis (AERIS) Program: has the objective to generate and acquire environmentally-relevant real-time transportation data, and use these data to create actionable information that support and facilitate “green” transportation choices by transportation system users and operators.

An important note to capture at this point is that as the global automotive community moves towards a more connected vehicle environment, the future of Intelligent Transportation System solutions will also move towards using more transportation software that should be managed as a renewable resource able to provide adaptable strategic solutions.

As such, San Diego businesses found within the “Information Communications and Technology” (ICT) traded cluster [16] could receive a boost. This shift within our Region positions ICT to grow significantly as a local transportation technology incubator, as businesses build around the local incumbents already setting the stage to take advantage of this global shift (e.g. “Qualcomm” paid $3.1 billion in a Merger & Acquisition for Atheros. Atheros owned the rights to the wireless technology that underpins the Connected Vehicle program – namely Dedicated Short Range Communications or DSRC [17]; and “DENSO”: one of the World’s largest suppliers of advanced automotive technology systems and components, whose North American Research and Development Laboratories are recognized Nationally as a “Connected Vehicle Qualified Product” and their Vice President serves as the Chair of ITS America’s “Connected Vehicle Committee”). To date, ICT traded cluster demonstrates significant employment here in the Region, and although dropping slightly in the latest SANDAG study, the desirable cluster attributes seen as delivering a vibrant economy.

Policy Questions

1. The Federal Government is working with nine departments to address the policy areas of DOT Authority, Privacy, Liability, and Intellectual Property as it pertains to the Connected Vehicle ecosystem. Should we establish a regional policy that establishes Data Ownership rights, or leave this to a Federal policy also?

2. Should the San Diego region position itself nationally as an “ITS Incubator”, and attempt to attract additional businesses to the ICT traded cluster?

3. Would the SANDAG Board be willing to establish a Regional- Open Data Policy to support the goal at (2)?
Autonomous Vehicles

With California investing $1.5 billion between 2009 and 2024 to support development and deployment of zero and low emission vehicles and low carbon fuels, it can be expected that some or all of future autonomous vehicles will be powered by alternative fuels. Although fuel type will have no impact on the autonomous functions of a vehicle, access to fuel will need to be considered for these future cars, trucks and SUVs to utilize the region’s roadways.

Alternative Fuel Vehicles

Technology advances, market trends, consumer behavior, and government politics could lead to significant changes in California’s fuel mix by 2020. Currently, petroleum comprises 92 percent of California’s transportation energy sources, but several state policies and regulations to improve vehicle efficiency, reduce petroleum dependence, and expand the use of alternative fuels will alter this landscape. Chart 1 demonstrates how California’s on-road passenger vehicle fleet is planned to change overtime. The State goal is for 95 percent of vehicles on California roadways to be powered by alternative fuels by 2050. Car, SUV and pick-up drivers will be using vehicles powered from natural gas, electricity, biofuels and hydrogen fuel cells.

Chart 2 displays the largest greenhouse gas (GHG) reduction measures identified in the California Air Resources Board (CARB) AB 32 Climate Change Scoping Plan. Alternative fuel and high efficiency vehicles are expected to account for 87 percent of the transportation sector’s GHG reductions statewide. In order for the State to meet its clean vehicle goals, regional planning and actions are necessary to incorporate alternative fuel infrastructure where little to none exist today.

The deployment of alternative fuel infrastructure (e.g., fueling stations and EV chargers) will need to become a consideration when planning the region’s transportation network. Recognizing this, the SANDAG Board included several Recommended Actions in the 2050

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1 Note: The Draft 2013 Scoping Plan Update slightly modifies the GHG reductions associated with the strategies in this chart. It will be updated when CARB releases the revised figure in spring 2014.
RTP/SCS (2011) to begin planning for an increase in alternative fuel vehicles. Specifically, Sustainable Communities Strategy Actions 21, 22 and 24 addressed alternative fuels, the transportation network, and the need for adequate infrastructure.

21. Support planning and infrastructure development for alternative fueling stations and plug-in electric vehicle (EV) chargers.

22. Develop or facilitate a regional approach to long-term planning for alternative fuel infrastructure that includes the continued development of public-private strategic alliances.

24. Integrate alternative fuel considerations into the development of the regional transportation network by, for example, integrating infrastructure for electric vehicle charging into regional park-and-ride lots and transit stations.

Aside from plug-in electric vehicles (EV) and chargers, for which the San Diego region is recognized as a national leader, the region currently has very few alternative fuel stations. Currently there are 3 stations that offer biodiesel, 8 with compressed natural gas, 1 providing liquefied natural gas, and 14 with propane in San Diego County.

As automakers offer greater numbers of vehicles powered by a variety of fuels, infrastructure must keep up to enable this market growth. For example, Honda, Toyota, General Motors, Daimler, Hyundai and Nissan have stated that they plan to bring hydrogen fuel cell vehicles to market in the 2015-2017 timeframe. Currently there are nine hydrogen fueling stations that are operational and open to the public in California. Support to increase alternative fuel infrastructure in the region would enable local drivers to purchase new and emerging vehicle technologies, receive state rebates, and reduce dependence on petroleum. It also could result in the most significant reduction in GHG emissions from the transportation sector.

Federal Department of Energy grants and California Energy Commission grants are available to offset costs for both alternative fuel vehicles and fueling stations. California’s Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP), established in 2007 and reauthorized in 2013, will invest $1.5 billion between 2009 and 2024 to support development and deployment of zero- and low-emission vehicles and low-carbon fuels. Utilization of the ARFVTP can help local businesses, public agencies, and universities receive a fair share of state funding.
Electric Corridor Charging

Corridor charging is specific to electric vehicles and gives existing and prospective plug-in electric vehicle (PEV) owners the assurance that they can charge when driving long distances along a freeway or route. The purpose of corridor charging is to deploy enough chargers to enable PEV drivers to more rapidly travel throughout the San Diego region, between San Diego and the Los Angeles area, Riverside County, and east to Arizona.

With this in mind, Washington and Oregon have created the “West Coast Electric Highway,” a network of DC fast charging stations for PEVs located every 25 to 50 miles along Interstate 5 (I-5). The creators of this concept would like the Electric Highway to span the I-5 from British Columbia through California to Baja California, Mexico.

New and innovative technologies are available today that could address corridor electrification while mitigating impacts to the electric grid, GHG emissions, and economic costs for charger installations and access to adequate power. For instance, there are electric vehicle supply equipment options that can be combined with energy storage and solar canopies to create EV charging stations powered completely by the sun.

One design of this combination is having a solar canopy that provides shade for one parking space and enough solar electricity for a Level 2 charger. Another design could utilize a larger solar canopy that provides shade for eight parking spaces and enough electricity for a DC fast charger. Because the batteries are included, these EV chargers can be operated 100 percent off the electric grid and by multiple drivers every day. The San Diego Airport Authority demonstrated this technology combination in its cell phone lot in November 2013. This type of wireless charging coupled with a renewable power supply and battery storage could be utilized at park-and-rides, rest areas and other readily accessible sites along the region’s freeways.

SANDAG Role

Integrating infrastructure considerations into regional transportation planning, could encourage cohesiveness among regional plans, and provide guidance on high priority locations for infrastructure such as airports, near public transportation and alongside major routes and freeways.

Through the Energy Commission’s ARFVTP, SANDAG received a $200,000 grant in 2012 to work with local governments and stakeholders to prepare a regional readiness plan for electric vehicles. Subsequently, SANDAG has received a $300,000 grant to expand the EV planning effort and develop a regional readiness plan for all alternative fuels. The San Diego Regional EV Readiness Plan was accepted by the SANDAG Board in January 2014 and the alternative fuel readiness plan is to be completed in summer 2016.

In addition to alternative fuel planning, SANDAG could partner with local public and/or private stakeholders to bring additional ARFVTP funds to the San Diego region for infrastructure. Electricity, natural gas, propane, biofuels and hydrogen are the fuels automakers are using in next generation vehicles. Planning for this infrastructure will grow in importance as more vehicles are introduced to the market.
One potential strategy the region could invest in transit electric vehicles and place re-charging stations at major transit stops and/or layovers. This would allow the region to test infrastructure charging on a limited or pilot basis, prove the concept has merit, prior to deploying on a larger scale for passenger vehicles.

**Multi-Modal Management**

A fundamental vision of Transportation System Management includes improving our transportation systems through the implementation of emerging technological advances to make best use of the existing transportation networks as a cohesive system. This approach is characterized as Multi-modal System Management. It is well known that this region’s ground transportation network includes the collection of our freeways, local roads, and transit systems. And although these elements can be identified separately, they are inter-reliant and require a comprehensive management approach to achieve our goals of improving Mobility, Reliability, and System Preservation. These elements when coordinated provide the foundation for managing and operating the transportation system as a unified and comprehensive network regardless of modal networks and jurisdictional/institutional boundaries. Multi-modal Systems Management helps get the most efficiency out of our existing system, makes travel times more reliable, delivers modal choices to travelers, and provides the technical tools for multi-agency coordinated plans for addressing congestion.

An emerging technology within Multi-modal System Management is the development and implementation of real-time multi-modal modeling and simulation applications. These applications are designed to simulate and evaluate traffic patterns and multiple/cross jurisdictional operational strategies simultaneously and produce results in minutes. The benefits from this technology include having the ability to forecast traffic patterns and recommend operational changes to minimize delays and congestion. The forecasting and real-time analysis allows transportation system managers to take proactive measures such as: modifying traffic signal timing, ramp meters, providing travelers with enhance transit information or route information, and travel options during recurring congestion or during incidents; and analyzing and developing new transportation system management strategies and multi-modal action plans. Benefits of Multi-modal System Management include:

- **Improve Situational Awareness:** Operators will realize a more comprehensive and accurate understanding of underlying operational conditions considering all networks and modes in a corridor or system.

- **Enhance Response and Control:** Operating agencies within a corridor or system will improve management practices and coordinate decision-making, resulting in enhanced management and response for minimizing congestion levels.

- **Better Inform Travelers:** Travelers will have actionable multi-modal information resulting in more personally efficient mode, time of trip start, and route decisions.
• Improve Corridor or System Performance: Optimizing networks at the corridor and system level will result in an improvement to multi-modal corridor performance, particularly in high travel demand and/or reduced capacity conditions.

• Establishing and developing institutional and organizational commitments for assuring that a corridor or system is managed and operated in a multi-modal performance-based approach.

The region is working to demonstrate the benefits of this concept through the Integrated Corridor Management (ICM) Program. Specifically, under the Interstate 15 (I-15) Integrated Corridor Management project, SANDAG has been working with its local partners (City of San Diego, Poway, Caltrans, Escondido, and the Metropolitan Transit System) to maximize the use of modal networks across the I-15 corridor to improve travel times and corridor reliability. The I-15 ICM project focuses maximizing the operations and management of the I-15 corridor with ramp meters, arterial signals, and the BRT system. This project includes integrating of all transportation modal management systems currently used to operate the freeway, arterial, and transit systems along the I-15 Express Lanes corridor. Key benefits expected through the I-15 ICM project include:

• Improved Corridor Travel Times, Throughput, and Reliability by allowing the implementation of coordinated, multi-agency and modal response plans

• Improved Efficiency of transportation system by allowing that all transportation modes be managed and operated to work together

• Enhance real-time traveler information to include travel options and modes

• Pro-actively manage or prevent congestion impacts by predicting traffic breakdowns and provide coordinated real-time response plans.

The I-15 ICM project began operations in February of 2014 and its findings and corresponding ICM applications will serve as the foundation for pursuing similar deployments along other regional corridors as part of SANDAG Integrated Corridor Management program. Our commitment of an ICM program is a fundamental and core component of our Multi-modal System Management approach.

Smart Parking

The application of Smart Parking concept is to utilize existing or emerging technologies to deliver a parking inventory management system that provides the ability to disseminate real-time parking availability information to the public and use such information to maximize the use parking facilities. This concept can be achieved by collecting, analyzing, and reporting parking data to attain a better understanding of how transit parking facilities are being used as a means for providing enhanced traveler information and for better managing the availability of parking in
parking facilities, or particular parking spaces. The concept is a key Transportation System Management strategy as it places emphasis on better tracking the use of existing transit and future transit parking facilities being considered in the San Diego Forward; The Regional Transportation Plan, and therefore providing the foundation for developing operational, management, or institutional strategies to best maximize the use and efficiency of such facilities.

The concept is a key Transportation System Management strategy as it places emphasis on better tracking the use of existing transit and future transit parking facilities being considered in the San Diego Forward, The Regional Plan, which provides the foundation for developing operational, management, or institutional strategies to best maximize the use and efficiency of such facilities.

The core concept of smart parking is to monitor and collect information about available parking spaces and provide such information to travelers either before they start a trip or at key decisions points along their trip. With such information, travelers can make informed decisions which all revolve around knowing if a parking space is available at a selected destination, including for example, when to start their trip, what transit service route to take, or what travel route to take. The overall goals that the concept is focused on achieving can include:

- Reduce unnecessary trips for finding a parking space. This can result in time savings to travelers and reduction in fuel consumption. Any reduction in time spent driving around looking for a space can provide benefits in reducing overall transportation emissions.

- Provide travelers with improved traveler information. The ability to provide real-time parking information will supplement readily available transit data including transit route arrival and departure times and thus enhance the convenience and reliability of transit use.

- Improve parking management capabilities through the delivery of actual parking utilization data. Understanding how to best maximize the use of existing and future parking infrastructure at a minimum requires the deployment of parking infrastructure monitoring systems. The information collected through such system can be used to assess the demand of the facility and implement parking management strategies that optimize the use of the parking facility.

- Improve financial sustainability of parking operations. The ability to monitor the use of parking demand will provide the ability to gather and assess historical trends on utilization which can serve as background data for development of parking management demand based parking fee business models.

Like all Transportation System Management (TSM) strategies, the application of Smart Parking concepts should be considered as part of and logical extension of basic infrastructure transit station design efforts to assure that the initial infrastructure platform is in place and thus allow for the next natural step of determining how to best utilize and maximize the use of the region’s transportation infrastructure.
Mobility Hubs

Mobility Hubs provide an integrated suite of transportation options, amenities, and urban design enhancements that bridge the distance between transit and an individual’s origin or destination. Mobility hub options can include, but are not limited to, bike share, car share, neighborhood electric vehicles, bike parking, dynamic parking strategies, real-time traveler information, wayfinding, real-time ridesharing, and improved bicycle and pedestrian connectivity.

The Greater Toronto and Hamilton Area Regional Transportation Plan, “The Big Move”, calls mobility hubs much more than transit station, but a seamless part of the landscape. A strategically located center of activity combing opportunities for work, play, and life that are connected to other centers with key aspects included in the below graphic.

Mobility hubs can concentrate transit with first and last mile modes of transportation, integrated into a community location which includes retail, shopping, restaurants, and entertainment all part of a wider connection to service of the region at large through commuter rail, light rail or bus rapid transit.

Some of these first / last mile solution could include shared use vehicles such as bikes, electrified cars, or other single-person conveyances.2

Unified Transportation Payment

A unified or universal transportation account combines all forms of public transportation payment including transit fares, municipal parking, and toll collection into a single user-friendly interface. The goal is to influence mode shift from a single occupancy commute to a transit ride by incentivizing the user through the use of rewards, toll discounts, or gamification – a method of challenging the user were points are earned for reach a goal.

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This is a single platform that links and coordinates all multi-modal transportation-related activities (parking, tolls, Smart Cards, Transit Passes, Bank issued IDs, transponders, smartphone, license plates, etc.) in one open payment account system making for a seamless and convenient commuting experience. Such a platform could facilitate mobility on demand, and reduce the friction that sometimes prevents commuters from periodic use of travel alternatives, thus enabling users to select the mode of travel that best fits their needs for a particular trip, through a convenient and common payment system. The platform could evolve to support the distribution and use of incentives, enabling a user to amass reward credits, based on usage of a particular travel mode (Bike share) and used at a later time for a trip on public transit.

A Universal Transportation Account is a the heart of a connected city concept where the transportation users is in constant connection with the transportation network and is given the best option for traveling based on criteria that is most important to that user whether that is cost, convenience, speed, or environmental impact.

Other Emerging Technology Trends

This section will explore other emerging technology, technology that as transportation planning agency, SANDAG and the region typically do not have responsibility for delivering. However, this category of emerging technology could have an impact on transportation demand, travel choices, and system accessibility.

Virtual Office

Over the last decade, technologies and tools have advanced to make teleworking a viable reality. Continued advances in communication, virtual reality, and possibly 3D printing will make remote working even more of a reality. A possible future could have teams of workers collaborating in much greater ways beyond sharing files and video conferencing, able to physically interact with objects over distances. Advancements in this area could further reduce travel demand and lessen the need for additional transportation infrastructure.

Parking Guidance

Valuable time and energy is expended in finding available parking in urban cores. One category of emerging technology combines real-time parking inventory data with personal technology such as smart phones to guide transportation users to available parking. One study has indicated an increase in parking utilization during peak hours and decrease of up to 56% vehicle carbon emissions by quickly and efficiently able to located, reserve, and secure a parking spot.3

Traveler Information

Traveler information systems have advanced significantly in the last several years and include real-time and predicitve data delivered directly to a user’s smart phone or tablet in an easy to read format – typical with an interactive map. Emerging technology in this field could have

greater depth of information, customized to alert travelers both prior to start of commute or while in route to increase travel reliability and reduce overall congestion. Available data could be much more than mode or route choices but include personal options such as cost, availability, travel times, and energy consumption.

Shared-use Vehicles

Shared use mobility is a convenient alternative for closing first mile/last mile gaps and providing commuters who use alternative transportation with a reliable option to make other trips. Examples of shared use mobility include car sharing; bike sharing; real-time ridesharing; Transportation Network Companies (like Uber, Lyft, and Sidecar) that provide on-demand ride services that users can request by using smartphone applications; scooter share; shared electric vehicles; and shuttle services.

Personal / Wearable Technology

This emerging technology category has seen significant growth in the last few years with advent of smart phones, tablet computers, and most recently with the Google Glass® project. The increased computing power combined with every-present high-speed data communication, information is now more than ever delivering readily available traveler information, virtual or enhanced reality, and services that could impact travel demand. SANDAG and local government role could be a position of open data access, promoting telework options, or encouraging develop of travel specific applications and programs.

Policies and Investments

The following is potential policy or investment scenarios that could capitalize on emerging technology in a manner that reduce travel demand, energy consumption, all while promoting the safety of the transportation network.

Transportation Demand Management (TDM)

Managed by SANDAG, iCommute is the Transportation Demand Management (TDM) program for the San Diego region. TDM refers to programs and strategies that manage and reduce traffic congestion by encouraging the use of transportation alternatives rather than driving alone, such as walking, biking, taking transit, carpooling, vanpooling, working flexible schedules, and teleworking. These programs reduce overall vehicle miles traveled (VMT), make more efficient use of the existing transportation network, and maximize movement of people and goods. An individual traveler’s mode choice - be it auto, carpool, vanpool, transit, walking, or biking - is significantly influenced by how communities are designed and developed. Smart growth development can reduce the need for vehicle travel for daily trips, and available parking supply and/or pricing can encourage the use of alternative modes of transportation.

Inclusion of TDM in the local planning and development process offers a broad range of economic, environmental, and public health benefits. TDM:
maximizes returns on infrastructure investments – TDM reduces the need for new or widened roads, which are costly to construct and maintain. Additionally, TDM is a cost-effective way to build capacity in a community’s transportation system by expanding use of alternative modes (carpools, vanpools, transit, biking, walking, and teleworking).

reduces parking demand – TDM, when incorporated into development, reduces single occupant vehicle (SOV) trips and parking demand, decreasing the cost and burden for jurisdictions and developers to provide more parking capacity.

helps meet environmental and air quality goals – TDM improves air quality by encouraging commute alternatives to the SOV, which in turn reduces traffic congestion and corresponding vehicle-related emissions. TDM also can help to preserve green space by reducing the amount of land needed for roads and parking facilities, encouraging more efficient land use patterns, and decreasing storm water management costs.

is adaptable and dynamic – TDM can be customized for specific events, neighborhoods, corridors, worksites, and timeframes. Unlike new infrastructure, TDM programs can easily adapt and respond to economic and population changes.

Technology plays a key role in delivering TDM solutions including car and vanpool ride matching software, mode choice driven by traveler information, parking reservation and guidance systems, reservation and payment for shared-use vehicles, just to name a few. As technology continues to grow and evolve, more innovative means of offsetting travel demand can be deployed with less cost and impact as compared to traditional capacity increasing capital infrastructure projects.

Active Transportation

One of the commitments from the 2050 RTP/SCS calls for planning a broad Active Transportation program, including a regional bike network, Safe Routes to School and Safe Routes to Transit. In April 2013, staff presented to the Transportation Committee a proposed framework for this program. The strategy proposed to identify active transportation components associated with SANDAG transit and freeway corridor projects for consideration in the Regional Plan. This approach would help to maximize investments in transit and highway infrastructure, by enhancing safety, and improving bicycle and pedestrian access to transit. The Unconstrained Active Transportation program includes the Regional Bike Plan projects, regional programs, local bike projects, local pedestrian/safety/traffic calming projects, Safe Routes to School, Safe Routes to Transit, and retrofit projects for Safe Routes to Transit and highway interchanges.

Emerging technologies can play a role in promoting Active Transportation including SANDAG’s complete streets initiatives. This can begin with enhanced detection at the intersection for pedestrians, bicycles, or other forms of non-motorized transportation. Given advance detection, specialized signal treatments can be added such as queue-jumping for pedestrians or cyclists.
Open Data

In the last several years there has been a concerted effort to move government-developed proprietary management system to an open data platform. The reasoning behind this move is two-fold. First, open data standards promotes competition for transportation technology systems allowing those system to more seamlessly and easily upgrade as those system reach end-of-life. Second, by adopting open-data standards, agencies such as SANDAG move from the application development role into a data management role allowing the private industry to use the wealth of available information to provide robust publically available applications. One good example of this trend is in the General Transit Feed System (GTFS), developed by Google, which is quickly replacing multiple transit agencies proprietary systems for public time tables publishing allowing third-parties including Google to reach a wider audience all while providing world-class applications.

In January, 2024, the Transportation Research Board (TRB) hosted an transportation open data conference titled “TransportationCamp DC 2014” in hopes of stimulating the development of programs and applications by the private industry for the benefit of the traveling public.

SANDAG and the region could adopt Open Data Principals geared around these concepts which could include the following as provided by the Government Open Data Consortium4:

- Data Completeness
- Primary Data from Direct Sources
- Data Timeliness
- Data Accessibility
- Machine Processable Data
- Data Availability
- Non-Proprietary Data
- Data without Licensing

Parking Management Toolbox

The goal of the Parking Management Toolbox is to provide a resource to local jurisdictions that will evaluate the effectiveness of a wide range of parking management strategies for addressing specific challenges in varied community types and special uses. The toolbox will feature a range of case studies that provide best practices for managing parking in a variety of urban and suburban settings. The toolbox will ultimately be developed into an interactive web-based resource that will assist interested jurisdictions with designing customized parking management strategies.

The draft Parking Management Toolbox is expected to be completed by June 2014 and will delineate the design and structure of a future website that translates the document into an interactive, web-based tool. The web-based tool is expected to be deployed by December 2014.

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The toolbox could be leveraged to develop regional and sub-regional parking policies that maximize available locations utilization using. Technology can be used to offer access to available parking and if payment is part of the transaction, can be managed as part of a universal transportation account.
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Active Transportation Program (ATP)

The California Transportation Commission (CTC) has adopted the Active Transportation Program (ATP) guidelines on March 20, 2014. Caltrans is now accepting applications for the ATP from March 21 to May 21, 2014. All applications must be received (not postmarked) by 3 pm on May 21, 2014. There will be no exceptions. Mail applications to:

CALTRANS
Division of Local Assistance, MS 1
Attn: Office of Active Transportation and Spec. Prog.
P.O. Box 942874
Sacramento, CA 94274-0001

The ATP guidelines, and the application forms and instructions can be found at http://www.dot.ca.gov/hq/LocalPrograms/atp/index.html.

Questions on filling out the application should be directed to Teresa McWilliam, ATP Program Manager, by email at Teresa.McWilliam@dot.ca.gov

Questions and answers at the District Level should be directed to the District 11 ATP Coordinator, Mr. Wishing John Lima. His contact information is provided below.

Wishing Lima
D11 ATP Coordinator
(619) 220-5485
wlima@dot.ca.gov

Training

ATP Training

Date: April 15, 2014
Time: 1:00pm to 4:00pm
Location: Caltrans, District 11
4050 Taylor St.
San Diego, CA 92110
Room 134 (Gallegos)

Registration: Debora Ledesma-Ribera
D11 Local Assistance Training Coordinator
(619) 278-3766
debora.ledesma-ribera@dot.ca.gov

*Please see attached flyer.
The Division of Local Assistance, Office of Active Transportation & Special Programs, in coordination with District 11 Local Assistance, is conducting training on the Active Transportation Program (ATP).

The purpose of this training is to assist potential ATP applicants, partners, and district staff to achieve efficient, effective, and timely delivery of ATP applications in accordance with state and federal requirements. For more information on the program, please go to:

http://www.dot.ca.gov/hq/LocalPrograms/atp/index.html

VENUE: Caltrans District 11
Gallegos Room 134
4050 Taylor Street
San Diego, CA  92110

DATE: April 15, 2014
TIME: 1:00-4:00pm

CONTACT PERSON: Debora Ledesma- Ribera
(619) 278- 3766

DLAE : Erwin Gojuangco
(619) 278- 3756