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LOCAL GOVERNMENT CLIMATE AND ENERGY STRATEGY SERIES

Transportation Control Measures

An Information Document for Developing and Implementing Emissions Reductions Programs

United States Environmental Protection Agency

EPA-430-R-09-040
March 2011

EPA's Local Government Climate and Energy Strategy Series

The Local Government Climate and Energy Strategy Series provides a comprehensive, straightforward overview of greenhouse gas (GHG) emissions reduction strategies that local governments can employ. Topics include energy efficiency, transportation, community planning and design, solid waste and materials management, and renewable energy. City, county, territorial, tribal, and regional government staff, and elected officials can use these documents to plan, implement, and evaluate climate and energy projects.

Each document in the series provides an overview of project benefits, policy mechanisms, investments, key stakeholders, and other implementation considerations. Examples and case studies highlighting achievable results from programs implemented in communities across the United States are incorporated throughout the series.

EPA's State and Local Climate and Energy Program developed this particular document on Transportation Control Measures (TCMs) jointly with EPA'S Office of Transportation and Air Quality (OTAQ). OTAQ serves as the Agency's primary source for information, tools, and other resources that identify emission reduction strategies, national policies, regulations, incentive-based programs, funding sources, calculators, and other types of assistance to help states and local areas reduce emissions from transportation sources. More information on TCMs and other transportation and air quality topics can be found at: ***http://www.epa.gov/otaq/index.htm***.

While each strategy document stands on its own, the entire series contains many interrelated strategies that can be combined to create comprehensive, cost-effective programs that generate multiple benefits. For example, efforts to improve energy efficiency can be combined with transportation and community planning and design programs to reduce GHG emissions, decrease the costs of energy and transportation for businesses and residents, improve air quality and public health, and enhance quality of life.

LOCAL GOVERNMENT CLIMATE AND ENERGY STRATEGY SERIES

All documents are available at ***www.epa.gov/statelocalclimate/resources/strategy-guides.html***.

ENERGY EFFICIENCY

- Energy Efficiency in Local Government Operations
- Energy Efficiency in K-12 Schools
- Energy Efficiency in Affordable Housing
- Energy-Efficient Product Procurement
- Combined Heat and Power
- Energy Efficiency in Water and Wastewater Facilities

TRANSPORTATION

- Transportation Control Measures

COMMUNITY PLANNING AND DESIGN

- Smart Growth
- Urban Heat Island Reduction

SOLID WASTE AND MATERIALS MANAGEMENT

- Resource Conservation and Recovery

RENEWABLE ENERGY

- Green Power Procurement
- On-Site Renewable Energy Generation
- Landfill Gas Energy

Please note: All Web addresses in this document were working as of the time of publication, but links may break over time as sites are reorganized and content is moved.

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ACKNOWLEDGEMENTS

The U.S. Environmental Protection Agency (EPA) would like to acknowledge the many individuals who contributed their time and expertise to the development and review of this guide for the *Local Government Climate and Energy Strategy Series*. The following contributors provided significant assistance in bringing this document to fruition:

EPA—Leila Cook, Nicole Lents, Brian Ng, Mark Simons, Megan Susman, and Emma Zinsmeister.

U.S. Department of Housing and Urban Development—Audrey Buehring, Michael Freedberg, Regina Gray, Richard Santangelo, and Edwin Stromberg.

EXECUTIVE SUMMARY

Developing and Implementing Transportation Programs

Transportation accounts for 33 percent of U.S. carbon dioxide emissions from the combustion of fossil fuel, and can account for a significant portion of a local government's or household's budget. Additionally, transportation generates air pollution (criteria pollutants and air toxics) that endangers public health. Efforts to improve the efficiency of transportation, reduce personal vehicle use, and encourage alternative forms of transportation help reduce air pollution and GHG emissions, improve energy security and independence, and save money.

Local governments can improve the efficiency of their own fleets by minimizing fuel consumption and emissions through reducing vehicle use, purchasing clean and efficient vehicles, and increasing their use of more efficient alternative fuels. Local governments can also employ strategies that reduce transportation-related air pollution in their jurisdictions by reducing vehicle use and encouraging more efficient use of transportation facilities. This document describes the process of developing and implementing transportation control measures, using real-world examples.

Transportation Control Measures

Transportation control measures (TCMs) are strategies that reduce transportation-related air pollution, GHG emissions, and fuel use by reducing vehicle miles traveled and improving roadway operations. Vehicle use can be reduced through less-polluting transportation alternatives, such as public transit, and strategies that decrease the need for vehicle trips, such as telecommuting. TCMs may also focus on making travel more efficient by carefully managing the transportation system. This document describes how various TCMs can reduce the demand for fuels, decrease GHG emissions and local air pollutants, and reduce infrastructure and travel costs for the community, residents, and local businesses. It is designed to be used by city planners, local transportation managers and agencies, mayors and city councils, metropolitan planning organizations, regional planning agencies, and employers.

Readers of this document should come away with an understanding of the issues and steps involved in developing and implementing TCMs, as well as an awareness of the challenges and opportunities presented.

This information document describes the benefits of TCMs (Section 2); types of TCMs (Section 3); key participants and their roles (Section 4); policy mechanisms that local governments have used to support TCMs (Section 5); implementation strategies for effective TCMs (Section 6); costs and funding opportunities (Section 7); federal, state, and regional policy and program resources (Section 8); and finally, two case studies of local governments that have successfully implemented TCMs (Section 9). Additional examples of successful implementation are provided throughout the document.

Background on this Document

Section 108 of the Clean Air Act, as amended in 1990, requires EPA to prepare, and make available from time to time, information regarding the formulation and emission reduction potential of TCMs. In addition, many state and local government agencies are currently seeking information on how TCMs can support their efforts to reduce GHG emissions and conserve energy. This document has been developed to provide a source of information on the development, implementation, and effects of TCMs. It is intended to provide a comprehensive, straightforward overview of TCMs that have been implemented for a variety of reasons, such as reducing GHGs and criteria air pollution emissions, conserving fuel and reducing energy costs, improving public health, and enhancing quality of life. State, city, county, territorial, tribal, and regional government planning staff, elected officials and other decision-makers can use this information to learn about the experiences with TCMs of other areas. In addition, those experiences may inform decisions about the applicability and effectiveness of these strategies.

The information in this document was collected in 2007 and 2008 (with updates and revisions to some of the information in 2009 and 2010) based on a literature review of case studies, project reports, guidance documents, and other transportation policy tools and resources. Several resources came from federal sources, including the Environmental Protection Agency and the Department of Transportation. The document also draws on research from non-governmental institutions that specialize in transportation policy, including

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the Victoria Transport Policy Institute, the Center for Clean Air Policy, the Brooking Institution, and Resources for the Future. Project-specific information came from published case studies, project documents, news articles and project websites. Examples cited in the document were chosen to illustrate a range of options available to local governments from across the country and from jurisdictions of various sizes. Particular attention was paid to gathering examples for which information on concrete, quantifiable results (e.g., reduced travel time, decreased fuel use, emissions reductions, etc.) were reported. Project-specific information was supplemented by quantitative information from research studies on the effectiveness of several types of TCMs. Information on results from individual projects and/or TCM strategies was taken directly from the documents reviewed; no independent verification of results was conducted.

Relationships to Other Documents in the Strategy Series

Local governments can use other documents in this series to develop robust climate and energy programs that incorporate complementary strategies. For example, local governments may combine transportation control measures with **smart growth** strategies and **energy-efficient affordable housing** to develop integrated plans for community development that strategically utilize public transit, take advantage of existing infrastructure, and make housing affordable for residents with a range of incomes, all while reducing GHG emissions and air pollution. Local governments can also reduce their own transportation-related energy use and GHG emissions by operating efficient fleets and implementing other measures to improve **energy efficiency in local government operations**.

See the box at right for more information about these complementary strategies. Additional connections to related strategies are highlighted in the document.

RELATED STRATEGIES IN THIS SERIES

- **Community Planning and Design: *Smart Growth***

  Smart growth involves development that serves the economy, the community, the environment, and public health. Smart growth principles favor the strategic location of transit services in residential or commercial areas, complementing efforts to use TCMs to reduce a community's vehicle miles traveled, transportation-related energy use, and GHG emissions.

- **Energy Efficiency: *Energy Efficiency in Affordable Housing***

  Energy costs can contribute substantially to the overall financial burden of housing, and can make housing unaffordable for many families. Lower home energy use, combined with TCMs that reduce the need for personal vehicle use, can lead to substantial reductions in the total energy-cost burden of low-income residents.

- **Energy Efficiency: *Energy Efficiency in Local Government Operations***

  Local governments can implement energy-saving measures in existing local government facilities, new and green buildings, and day-to-day operations. Many local governments are improving the energy efficiency of traffic operations by replacing conventional traffic signals with energy-efficient, light-emitting diode traffic signals, which complements the use of TCMs by further reducing transportation-related energy use and GHG emissions.

Transportation Control Measures

1. OVERVIEW

NOTE: The U.S. Environmental Protection Agency (EPA) believes that there is great value in sharing this survey of information. However, many of the actions described here have not been determined to be best practices for all communities and situations. The multiplicity of actions discussed in this document may have different benefits that depend on a jurisdiction's transportation infrastructure, commuting and other transportation patterns, funding availability, and other contextual factors.

Many local governments are adopting Transportation Control Measures (TCMs) to address a variety of social, economic, and environmental issues. When properly implemented, TCMs can reduce demand for fuels, decrease GHG emissions, local and regional air pollutants, and reduce infrastructure and travel costs for the community, residents, and local businesses. TCMs can also influence behavior and lead to changes in transportation choices. These changes can both increase the quality of life and reduce costs for individuals and employers.

For the purpose of this document, a TCM is defined broadly as a strategy that reduces transportation-related air pollution by reducing vehicle use and encouraging more efficient use of transportation facilities.[1] Vehicle use can be reduced through strategies that decrease the need for vehicle trips, such as telecommuting, and strategies that provide viable and less-polluting transportation alternatives (e.g., public transit, walking, and bicycling) when trips are necessary. TCMs that focus on reducing congestion reduce emissions by making travel more efficient. For example, reducing congestion lowers emissions by avoiding unnecessary vehicle idling. TCMs often target routine transportation needs, such as commuting to work, where 75 percent of all trips are made by single occupancy vehicles (SOVs) [U.S. DOT, Undated (a)].

This information document provides information on how local governments have planned and adopted TCMs. It includes an overview of measures, benefits, costs, sources of funding, and examples and case studies. Additional examples and information resources are provided at the end of this document in Section 10, *Additional Examples and Information Resources*. Please note that the benefits resulting from TCMs will vary from location to location based on site-specific factors, such as existing development patterns, fleet mix, and average vehicle miles traveled (VMT). Implementing the same TCMs in two different communities may yield very different results, thus the examples presented in this document are meant to be illustrative of what particular communities have achieved given their local conditions.

TRANSPORTATION CONTROL MEASURES

Transportation control measures (TCMs) are a variety of strategies that reduce vehicle miles traveled (VMT) and improve roadway operations to reduce air pollution, greenhouse gas emissions, and fuel use from transportation, including:

- Public transportation improvements
- Congestion relief projects
- Incentives to encourage bicycling and walking
- Expanded commuter choices
- Workplace flexibility to reduce commuting
- Value pricing

The most appropriate and effective TCMs will vary from community to community depending on a number of factors, such as local capacity and the existing infrastructure. However, developing a comprehensive plan that includes a range of complementary TCMs will help to maximize the benefits that are realized.

[1] *EPA notes that this document may include more strategies than are defined as TCMs for State Implementation Plans and other purposes. First, Clean Air Act section 108(f) identifies 16 types of TCMs, which are focused on improving traffic flow; reducing single occupancy vehicle travel, cold start emissions, and vehicle idling; increasing use of ridesharing, transit, and non-motorized modes; encouraging flexible work schedules; and encouraging early retirement of pre-1980 vehicles. Additional types of strategies can also be TCMs as determined by the Administrator in consultation with the Secretary of Transportation. This statutory provision can be viewed at: http://www.law.cornell.edu/uscode/html/uscode42/usc_sec_42_00007408----000-.html. Second, transportation agencies also need to ensure timely implementation of approved SIP TCMs, as defined in the transportation conformity regulation (40 CFR 93.101 and 93.113). The transportation conformity regulation's definition of TCMs applies only to those measures that are in an approved SIP, are eligible for funding under title 23 U.S.C. or the Federal Transit Laws, and are not vehicle technology-based, fuel-based, and maintenance-based measures that control the emissions from vehicles under fixed traffic conditions. For more information on including TCMs in State Implementation Plans, please see the discussion in Section 8,* ***Federal, State, and Regional Policy and Program Resources****.*

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Local governments can combine TCMs with other strategies covered in the *Local Government Climate and Energy Strategy Series* to develop comprehensive, robust programs that provide integrated social and environmental benefits. For example, local governments can integrate TCMs, smart growth strategies, and energy-efficient affordable housing to put development in locations that are well-connected to the region by public transit, take advantage of existing infrastructure, and are affordable for residents with a range of incomes. The cost of living in these locations is lower because they offer more transportation options and are closer to housing, jobs, and services. Development in these locations allows people to drive less, which reduces GHG emissions and air pollution. Please see the strategy documents on smart growth and energy efficiency in affordable housing for more information on these complementary strategies.

2. BENEFITS OF TRANSPORTATION CONTROL MEASURES

TCMs can produce significant environmental, economic, and social benefits by helping local governments:

- **Reduce GHG emissions and improve air quality.** Through strategies such as reducing the number of miles traveled by SOVs, TCM policies can reduce emissions from vehicles (Johnston, 2006; Litman 2007). The specific amount of emission reductions varies by the type of TCM policy, how broadly it is applied, the type of pollutant, and the time period. Some resources are available to help cities estimate reductions in emissions from TCM strategies and/or reductions in VMT (CCAP, 2008; Litman 2007; ICLEI, Undated). These types of tools, along with the results of modeling studies and retrospective evaluations of TCM programs, illustrate some of the emissions benefits from TCM strategies:

  - In 2004, Resources for the Future evaluated five pilot city "ecommute" telework projects in Denver; Washington, DC; Houston; Los Angeles; and Philadelphia, and concluded that between 3,600 and 5,300 teleworkers (spending 35 percent of their days teleworking) could collectively reduce 25 tons of volatile organic compound (VOC) emissions annually (Walls and Nelson, 2004). Another study of telecommuting programs in California found that individual telecommuters reduced emissions of nitrogen oxides (NO_x) by 69 percent and particulate matter (PM) by 78 percent (Walls and Safirova, 2004).

  - A modeling study by the Puget Sound Regional Council examined the impact of tolling on major highways and arterials in the region and concluded that such tolls would reduce congestion and travel time and lead to a region-wide 10 percent reduction in CO_2 emissions, a 5 percent reduction in NO_x, an 8 percent reduction in PM, and an 11.5 percent reduction in VOCs (PSRC, 2009).

  - A 2008 study by the Brookings Institution concluded that nationwide pay-as-you-drive auto insurance—which provides a financial incentive to drive fewer miles—would have the same effect as a $1.00 per gallon gas tax and could reduce nationwide CO_2 emissions by 2 percent and oil consumption by 4 percent (Bordoff, 2008a).

  - A tool developed by the Center for Clean Air Policy to estimate the benefits of TCM measures estimates that public transit service improvements that lead to a 10 percent increase in transit ridership in a municipality that sees 5 million trips per day could result in annual CO_2, NO_x, PM_{10}, and $PM_{2.5}$ reductions equivalent to the annual emissions of nearly 3,000 passenger vehicles (U.S. EPA 2009).

- **Reduce energy and travel costs.** TCMs can save individuals, employers, and local governments money on energy and other transportation costs. Employers who reduce employee parking demand can realize savings through reduced parking infrastructure costs. One study estimates that employers could save $360–$2,000 per parking space annually, depending on the land, construction, and operations costs for their location (suburban or urban) and type of parking (surface, structured, or underground) (U.S. EPA, 2005a). One way employers can reduce parking demand is by helping employees form carpools and vanpools through efforts such as rideshare matching. In the San Francisco Bay Area, employees using vanpools have reported saving up to $3,000 or more a year per person on gas, car maintenance, and wear and tear (U.S. EPA, 2005e). For lower-income workers, the savings in transportation costs can be significant and may allow them to rent or buy homes in more convenient locations, such as those with access to public transit (see EPA's *Local Government Climate and Energy Strategy Series: Energy Efficiency in Affordable Housing* for more information).

  TCMs can also reduce congestion and total VMT, which can lead to significant fuel savings. For example, the Bureau of Transportation Statistics estimates that 42.5 million gallons of fuel were wasted in 2005 due to congestion in Denver, Colorado [U.S. DOT, Undated (b)]. Eliminating this waste would reduce CO_2 emissions by nearly 374,000 metric tons [U.S. EPA, Undated (c)], which would equate to 8.5 percent of the transportation-related GHG emissions reported for 2005 in Denver's GHG inventory and 13.5 percent of emissions associated with cars, light trucks, and SUVs in the city (Ramaswami et al., 2007). Although there is no "silver bullet" for alleviating congestion, a variety of TCMs can be implemented to improve traffic operations and promote alternative forms of transportation, resulting in reduced fuel consumption, emissions reductions, and energy savings for drivers and fleet owners.

- **Demonstrate leadership.** Public agencies can lead by example by adopting TCM programs for their own operations that they hope to see adopted by the private sector, such as telecommuting, flextime, compressed workweeks, staggered work hours, and incentives for public transportation and ridesharing.

In 2006, the City of Bellevue, Washington, made a choice to lead by example and strengthen the incentives for city employees to rideshare and use transit by offering free Flexcar (now Zipcar) services to employees who left their cars at home. Shared cars were made available for errands and unexpected meetings in response to employees' concerns that leaving their cars at home might leave them stranded during the day. By partnering with Flexcar, the city helped increase the number of shared cars stationed at central parking locations and, as a result, a number of private businesses also signed up to use Flexcar services to promote ridesharing among their employees. The free use of shared cars for city employees was part of a larger Commute Trip Reduction (CTR) Plan designed to reduce the number of SOV trips and VMT in Bellevue (Auto Channel, 2006). (More detailed information on Bellevue's comprehensive CTR Plan and the results it has achieved can be found in Section 9, *Case Studies*.)

- **Increase community choices and reduce traffic congestion.** TCMs can reduce traffic congestion by reducing the number of SOVs on the road and making travel more efficient. Compressed workweeks, flextime, park-and-ride services, ridesharing, and telecommunicating are all effective TCM strategies—especially for commuters.

In 1992, the Chattanooga Area Regional Transportation Authority created a free downtown shuttle system with 11 zero-emissions electric buses to help reduce traffic and improve air quality in downtown Chattanooga, Tennessee. The system allows people to park at either the north or south end of downtown and take the shuttle to their destinations rather than drive through the core of the city (Travel Matters, 2002). As of 2007, this service has recorded more than 11 million passenger trips and run nearly 2 million miles, avoiding an estimated 65 tons of pollutants (Chattanooga Area Regional Transportation Authority, 2009).

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While these kinds of efforts can avoid emissions from the vehicles of drivers who choose to travel by other means (or not at all), consideration must be given to "induced demand" when estimating the benefits. Induced demand occurs when improvement in travel conditions makes it more attractive for drivers to use roadways, offsetting some of the initial congestion and air quality benefits of TCMs (see the text box *Accounting for Indirect Effects of Reducing Congestion* on page 4). The evaluation of strategies that change the actual or perceived generalized cost of travel should explicitly consider how households and businesses will likely respond to these changes over time.

ACCOUNTING FOR INDIRECT EFFECTS OF REDUCING CONGESTION

Benefits from policies that reduce highway congestion may be partially offset by additional driving that occurs in response to the improved travel conditions. This additional travel is known as "induced demand" and can be an important consideration in estimating the travel and emissions impact of TCMs and other transportation system improvements. Because reductions in congestion brought about by these strategies can be partially offset by additional travel from drivers who are attracted to the less congested roads, careful analysis of the direct and indirect travel activity effects of a project is warranted. The induced travel is likely to come partly from changes in travel patterns (new trips and longer trips), and partly from shifts of travelers from other times of day, routes, and modes (such as transit). Accurate project evaluation must consider the impact of induced demand; otherwise the benefits may be overestimated.

Once properly accounted for, minimizing induced travel often depends on the quality of alternatives and complementary strategies for implementation. If the alternatives to traveling in congested conditions are inferior, a high time savings or price benefit is needed to change traveler behavior. In contrast, if alternatives are attractive, they are more likely to be successful, resulting in less induced demand and lower congestion. A comprehensive TCM program that includes a combination of disincentives to peak-period driving and improvements to alternative modes is the best method for minimizing induced demand for travel and sustaining congestion relief over a longer timeframe.

- **Improve public health and quality of life.** Setting aside the car keys and choosing walking, bicycling, or public transit provides health and other benefits for community residents. Research suggests that metropolitan counties in which a greater number of people commute to work by foot, bike, or public transportation (which typically involves at least a few blocks of walking or biking at the beginning and end of the trip) have lower rates of obesity than those where active transportation is less common (Tiemann et al., 2008). Apart from the direct health benefits of increased exercise for those who walk or bike, reductions in transportation-related air pollution lead to lower health risks throughout the community—especially to vulnerable, lower-income populations that tend to be disproportionately affected by pollution. Participants in alternative commuting programs also tend to experience decreased stress and increased productivity (U.S. EPA, 2005d; U.S. DOE, Undated).

An organization in Atlanta, Georgia, called the Commuter Club was established by the Cumberland Community Improvement District to help provide transportation alternatives for the Cumberland Galleria office market. One of the key benefits of bicycling, walking, and other transportation alternatives that the Club describes for employers and employees is improved productivity and a working environment that allows businesses to more easily recruit and keep the right people (Commuter Club, Undated).

3. TRANSPORTATION CONTROL MEASURES

Local governments can implement a range of TCMs that reduce pollution, traffic congestion, and fuel use by providing alternatives to using personal vehicles or supporting more efficient use of vehicles. These measures include:

- **Make public transportation available and encourage its use.** Making public transportation—such as buses, subways, and trains—faster, affordable, convenient, and reliable is one of the most important ways that municipalities can encourage people to reduce the use of their cars. Investing in infrastructure upgrades (e.g., dedicated bus lanes, new park-and-ride facilities, and transit lines), improvements in service delivery, incentive programs, and communication and outreach are all ways in which municipalities can encourage use of public transportation. The Center for Clean Air Policy uses a rule of thumb that a 1 percent increase in public transit service levels (e.g., extended operating hours or increased public transit coverage) increases average ridership by 0.5 percent (CCAP, 2008).

New York City has long recognized the benefits of public transit, and fully one-fourth of daily travel in the city is by public transport compared with 2 percent for the nation as a whole. In the late 1990s, the New York City Transit (NYCT) System saw increases in transit use by 52 percent for buses and 26 percent for subways. An analysis conducted in 2002 found that, in addition to economic factors (e.g., a booming economy and increasing gas prices), a number of transit program activities drove the increase in use, including the introduction of discounted MetroCard fare cards for frequent users, free transfers between bus and subway, service expansion, and renovation of transit stations. NYCT estimates that the changes in fare policies led to an average 22 percent reduction in fares (Pucher, 2002). Although the reduction in fares meant less revenue per person for NYCT, this was offset by the increase in ridership.

Another effective way for municipalities to increase the use of public transportation is to encourage development around transit, fostering a convenient and affordable lifestyle where housing, jobs, stores, restaurants, and entertainment are all in close proximity to one another and transit. This practice, commonly referred to as transit-oriented development, supports neighborhood-scale, compact, mixed-use development within walking distance of public transportation (Federal Transit Administration, Undated), and exemplifies many of the principles of smart growth. For more information on these principles and strategies for achieving the benefits of smart growth, see EPA's Smart Growth strategy document in the *Local Government Climate and Energy Strategy Series*.

Atlantic Station, in the heart of midtown Atlanta, Georgia, is a $2 billion smart growth project on a 138-acre brownfield site [U.S. EPA, Undated (c)]. The multi-use development is designed to give residents and workers a variety of transportation benefits, including short trips and the option of walking, biking, or taking public transit. EPA's pre-development analysis estimated that Atlantic Station would reduce VMT by 50 percent compared with similar developments in suburban greenfield sites (U.S. EPA, 1999). Surveys of actual use suggest even more dramatic reductions, particularly on the residential side. The average Atlantic Station resident travels 8.6 miles per day, compared with the regional average of 32.4 miles per day. Nineteen percent of trips made from Atlantic Station are by public transit, and 80 percent of trips that stay within the 130-acre site are made by foot (Atlanta Regional Commission, 2008).

COMPLETE STREETS ORDINANCES

More than 25 jurisdictions across the country have adopted Complete Streets ordinances that encourage walking and bicycling through measures such as street and sidewalk lighting, pedestrian and bicycle safety improvements, street trees, public transit facilities, and other measures. The ordinances were developed by the National Complete Streets Coalition, a nonprofit organization. The Complete Streets Act of 2009 (S. 584/H.R. 1443) was introduced in Congress to begin the legislative process that would lead to adoption of these nine measures by states and MPOs.

Source: Complete Streets, Undated.

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- **Encourage bicycling and walking.** Particularly for short trips, bicycling and walking can be viable alternatives to vehicle use, with additional benefits of improving health and making neighborhoods more vibrant. To support walking and bicycling, municipalities can provide bicycle racks, shower and/or locker facilities, and bicycle or walking maps. Many cities use street marking to define bike lanes, and some cities provide dedicated bicycling and walking trail systems. In addition, municipalities encourage biking and walking by improving safety features, such as crosswalks, sidewalks, and streetlights. Another option is to convert abandoned railways into multi-use trails, commonly referred to as rails-to-trails. Many of these trails—such as the Minuteman Bikeway in eastern Massachusetts, which connects directly to Boston's mass transit system—are used heavily by commuters and can reduce VMT (Rails-to-Trails Conservancy, 2007).

Boulder, Colorado, is designated as a Platinum Bike Friendly Community by the League of American Bicyclists. The city has instituted a Safe Routes to School program; one school reported that 75 percent of its students now walk or bike to school—a 620 percent increase from before the program started. More than 4,000 people participate in Boulder's annual Bike to Work Day. The city employs a Complete Streets approach when considering major transportation facility enhancements, and at least 95 percent of arterials in Boulder have bike lanes or trails on them. The city recently completed two major underpasses for bikes, and offers online bike mapping. A total of $3.1 million, 15 percent of Boulder's 2004 transportation budget, was dedicated to support bicycle mode operations/maintenance and enhancement activities. In 2003, biking accounted for 21 percent of commute trips and 14 percent of all trips in the community—up from 10.6 percent and 9.1 percent, respectively, in 1990. Bike use and other non-automotive modes have limited the growth in VMT in Boulder to about 1 percent annually since 1990 (League of American Bicyclists, 2008).

- **Expand commuter choices.** Regular commuting accounts for a significant percentage of VMT in many municipalities, and a range of measures can help encourage people to ride together or reduce their need to commute. Local governments can lead by example and promote commuter choice programs by providing incentives for private companies (e.g., tax incentives) and developing the necessary supporting infrastructure, such as park-and-ride lots. It is important to note that commuter choice programs require willingness and flexibility on the part of management, personnel departments, and information technology departments. The benefits of such programs are worker satisfaction and retention and long-term cost savings. Challenges can include paying the upfront costs to establish programs, and potential employee fraud (e.g., using free carpool parking space for non-carpool vehicles) (U.S. EPA 2005a). Commuter choice measures include the following approaches:

  - ***Rideshare matching.*** Many regional rideshare programs offer free services to employers and employees to help match up people interested in carpooling and vanpooling. These services have been greatly advanced by online offerings, such as electronic lists of rideshares and their locations (U.S. EPA, 2005d; 2005e).

MetroPool, in the mid and lower Hudson Valley region of New York State, offers two types of matching services for its commuters. Its traditional ride-matching service informs people about less expensive and environmentally friendly commuting alternatives. MetroPool also participates in the first incentive-based ride-matching program in the United States, NuRide, which allows commuters to track their "green trips" (carpooling, vanpooling, riding public transportation, walking, biking, and telecommuting) and earn rewards, including coupons for restaurants and retail companies. MetroPool's contribution has added more than 3,200 NuRiders in the last three years. Between Earth Day 2007 and Earth Day 2008, MetroPool helped eliminate more than 5 million VMT by 10,000 employees who shared 138,800 rides, avoiding 1,800 metric tons of CO_2 equivalent emissions (MetroPool, 2009).

- ***Vanpool service.*** Similar to carpooling, but for a larger number of passengers per vehicle, vanpool programs use vans to take an established group of employees to and from work. Vanpools are especially well-suited for longer commutes (e.g., 20 miles or more per round trip). Depending on the municipality, vehicles and services are often provided by employers or third-party companies. Vanpool operating costs are typically divided among vanpool members, who find that the savings they gain from avoided costs for gasoline, maintenance, and parking for personal vehicles more than cover their vanpool costs. Some local transit companies provide vans for vanpool programs as a complement to transit services. Employers can provide vanpool services directly to employees or encourage employees to participate in vanpools by providing information on local vanpool programs, providing reduced or free parking for vanpool vehicles, or through reward programs (U.S. EPA, 2005e).

At an annual operating cost of $5.6 million, King County Metro Transit in the Seattle, Washington area provides vans for public commuter vanpools and pays for van maintenance, insurance, fuel, and tires. It also provides services to connect potential vanpool users (U.S. EPA, 2005e). King County Metro owns and operates this service with more than 840 vans, making nearly 2.3 million trips per year. More than 6,000 people use the vans every day, reducing area road traffic by at least 5,000 vehicles (King County Metro Transit, 2007).

- ***Emergency ride home services.*** To address a key barrier to carpooling, vanpooling, and transit promotion programs, some local and regional governments have established emergency ride home programs. These programs help alleviate the concerns of potential carpoolers and vanpoolers by offering rides on an emergency basis to employees who participate in commuter alternatives programs and could be stranded at work in case of emergencies.

Commuter Connections in the Washington, DC metro area offers guaranteed rides home to its residents in participating counties in the event of an unexpected personal emergency or unscheduled overtime. From July 2005 to June 2008, the program provided more than 25,000 rides, equaling a reduction in more than 8,600 daily trips and more than 227,000 VMT (Commuter Connections, 2009).

- ***Workplace flexibility programs.*** Flexibility programs can reduce commuting trips and expand commuting choices. These approaches include telecommuting and flexible scheduling to avoid heavy commute times. Municipalities can consider providing incentives (e.g., tax credits and subsidies) to encourage these programs. For example, municipalities can develop financial incentives for businesses that offer or encourage transportation alternatives and/or workplace flexibility (e.g., telecommuting, flexible work hours). Tax credits, matching funds, subsidies, and assistance with outreach and marketing are all ways to encourage the private sector to adopt telecommuting programs and promote transportation alternatives by other means.

Since August 2008, through the Working 4 Utah initiative, the State of Utah has changed its standard workweek to extend state government services for 10 hours a day, but only 4 days a week. The purpose of this initiative is to make a positive impact in the state government's energy consumption, customer services, employee recruitment and retention, and environmental impact. As of February 2009, the State of Utah estimated that it would save more than $200,000 in custodial service costs during the year and documented a 10–20 percent reduction in energy use within half of its facilities. The state also has reported reduced absenteeism among its employees and reduced use of leave time. The initiative is expected to reduce GHG emissions by nearly 12,700 metric tons of CO_2 equivalent per year, equivalent to the annual emissions of 2,300 personal vehicles (Working 4 Utah, 2009).

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- ***Employee financial incentives.*** Employee financial incentives are strategies that encourage alternative commute modes to reduce SOV use in employee travel. Some common methods include providing monetary incentives to use non-SOV methods of commuting, including subsidies for transit use or cash allowances in lieu of parking benefits (i.e., parking cash- outs); offering discounted transit and rideshare benefits; and eliminating or reducing corporate subsidies for SOV use, such as for employee parking or SOV-based corporate travel. These strategies can increase the affordability of alternative commute options for employees and lead to greater employee satisfaction through improved commutes. Employers can also realize savings through reduced parking facility costs (Litman, 2008).

- **Develop transportation management improvements.** Even when people do not choose alternatives to driving their cars, transportation system management can reduce driving time, VMT, and emissions through more efficient vehicle flow. While these improvements can generate induced demand (described in the text box *Accounting for Indirect Effects of Reducing Congestion* on page 4), where smooth-flowing traffic attracts new drivers to the roadways, not all of them produce this type of effect. For example, transponders installed on public transit vehicles can control traffic signals and allow a transit vehicle to travel through many intersections without stopping. This efficiency improvement can encourage use of transit without increasing the number of drivers on the road. Examples of transportation systems management include:

  - ***Improve traffic signalization.*** Local public works departments can implement improvements in traffic signals to reduce congestion and reduce fuel consumption. Improvements include updating signals to support more sophisticated flow strategies, timing and coordinating signals to reduce idling, and removing signals at intersections that no longer need them.

The City of Los Angeles' Department of Transportation developed its own Adaptive Traffic Control System (ATCS) to adjust traffic signal timing to respond to real-time traffic demands. The system allows for greater intersection operational capacities by reducing time spent idling. The ATCS reduced travel time by nearly 13 percent, reduced average stops by about 30 percent, and decreased average delays by about 20 percent (U.S. DOT, 2007; RITA, 2001).[2]

  - ***Improve transportation infrastructure and reduce congestion.*** Reducing congestion may require building broader roadways to accommodate high occupancy vehicle (HOV) or high occupancy/toll (HOT) lanes, facilities for collecting tolls, roundabouts at intersections, and a range of other infrastructure investments. Other strategies that reduce congestion through roadway improvements include converting two-way streets to one-way streets, restricting left turns on two-way streets, and separating turning vehicles with median-strip turn lanes. In some cases, these changes require altering signage and lane markings; in other cases, such as widening roads, they may require more substantial infrastructure changes (U.S. EPA, 1998b).

An example of a substantial investment in infrastructure is the multi-modal Transportation Expansion (T-REX) Project in Denver, Colorado, which is upgrading travel on the I-25 corridor [U.S. DOT, Undated(c)]. The project will increase mobility on the highway itself by expanding lanes, replacing bridges, and reconstructing eight interchanges. It will enhance the region's light rail system by adding 19 miles of double-track light rail, building 13 stations with 6,000 parking spaces, and adding 34 light rail vehicles to its fleet (FHWA, 2006). The project, which has now been completed, has encouraged similar investments. Additional light rail lines and stations are currently under construction, while others are being planned.

[2] *These improvements are based on a study performed shortly after implementation of the ATCS; longer-term effects were not estimated.*

- ***Enhance incident management systems.*** Incident management systems focus on quickly clearing roadways of accidents and stalled vehicles. These systems typically include roving tow or service vehicles, motorist aid call boxes, contingency planning, and other means for quickly responding to incidents (U.S. EPA, 1998b). Traffic incidents account for about one-quarter of all congestion on U.S. roadways, and for every minute that a freeway travel lane is blocked during a peak travel period, four minutes of travel delay results after the incident is cleared (National Traffic Incident Management Coalition, Undated). Since traffic incident management helps to minimize and prevent congestion, these systems can reduce fuel consumption by more than 1 percent annually and save 2,600–7,700 gallons of gasoline per incident, thereby reducing associated vehicle emissions [U.S. DOT, Undated(d)].

The Chicago Incident Management Program was an early example of a program to reduce congestion due to incidents such as traffic accidents and stalled vehicles. When the Kennedy Expressway began to reach near-capacity volumes during peak periods in the early 1960s, the Illinois Department of Transportation assigned 20 people in pickup trucks to patrol it and keep travel lanes open by clearing them of disabled vehicles. By the 1990s, the program had an annual operating budget of $3.5 million funded from state motor fuel taxes and employed 60 people, covering 80 miles of expressway system 24 hours a day (U.S. EPA, 1998b). The program saves motorists an estimated 9.5 million vehicle-hours of delay at a value of $95 million per year (U.S. EPA, 1992).

- ***Design intelligent transportation systems (ITS).*** Intelligent transportation systems use technologies for traffic surveillance and monitoring, communications, and control systems to manage traffic flows by responding to changes in volume, congestion, and other signals. Examples include traffic signal controls that adjust to traffic conditions, traveler information systems that disseminate real-time information on traffic conditions on transit and roadways, and electronic toll collection systems (U.S. EPA, 1998a; Puentes, 2001). Social networking and mobile computing technologies are emerging tools through which local governments can communicate timely information on traffic conditions and commuting options to further promote transportation efficiency.

The New Mexico State Highway and Transportation Department (NMSHTD) incorporated ITS into its redevelopment of the "Big I" interchange in Albuquerque. For this project, NMSHTD employed ITS in the form of a mobile traffic monitoring and management system to help move large numbers of vehicles through an extensive construction area. Mobile traffic monitoring and management systems use electronics and communications equipment to monitor traffic flow and provide delay and routing information to drivers and agency personnel (U.S. DOT, 2004). The project included the construction of 45 new bridges and 111 miles of road reconstruction over the two-year duration of the project, at a total cost of around $293 million (Road Traffic Technology, Undated). Benefits of the ITS included reduced effects of construction on traffic mobility and safety, accurate emergency vehicle assessment, reduced response and clear rate for incidents, and public satisfaction about traffic information during construction (ADDCO SMART Work Zone, Undated; Road Traffic Technology, Undated).

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ITS technologies have also been used effectively in providing real-time information to users of public transportation and in enhancing transit system operations, by integrating technologies for fare collection, intramodal and intermodal transfers, automatic vehicle location and scheduling, headway control (i.e., maintaining a safe distance between vehicles), and use of bus fleets. By using ITS for more efficient transit fleet management, the Kansas City Area Transportation Authority reported a 23 percent improvement in schedule adherence, allowing the authority to reduce the fleet size by 2 percent and reassign vehicles to service other transit routes (U.S. DOT, 2000). The Chicago Transit Authority found that using ITS for fare collection through the use of stored-value cards and fare integration for inter-modal transfers increased transit ridership by 2 to 5 percent (U.S. DOT, 2000).

- **Use value pricing to encourage drivers to factor the full cost of transportation into their decisions.** Municipalities can work cooperatively with their state governments and private insurance providers to promote transportation alternatives by ensuring that drivers incorporate cost considerations into their transportation decisions. Setting appropriate road fees and downtown parking taxes, and offering pay-as-you-drive auto insurance are all ways for drivers to "pay as they go" and experience more realistic costs of their choices about individual vehicle trips and miles traveled.

Note that while most TCMs raise concerns about possible impacts on social equity, pricing measures are often perceived to have the greatest potential for inequities. However, the actual impacts on lower-income motorists depend on many factors, such as how revenues are used, how prices are structured, the quality of travel alternatives available, and the extent to which those individuals use toll roads or downtown parking. Equity concerns can be integrated into road pricing programs by including discounts or free passes for lower-income households.

Value pricing approaches include:

- ***Roadway and congestion pricing.*** These programs charge drivers directly for their use of roadways, particularly during times of high volume traffic. They also raise revenue that can be used for related programs, such as alternative modes of transportation, and for improved infrastructure.

An example of roadway pricing is the use of High Occupancy/Toll (HOT) lanes in the Houston, Texas area. Drivers with only one passenger in the car pay a $2.00 toll and a $2.50 monthly fee to use High Occupancy Vehicle lanes—normally restricted to cars with one driver and two passengers. Users of this service essentially pay for faster, more reliable travel (Burris and Stockton, Undated).

A variant on roadway pricing is congestion pricing, which increases costs at times of high road use or in congested locations (Litman, 2006) to better distribute traffic demand and encourage a shift to modes other than the automobile. Congestion pricing that is applicable throughout a defined zone or area (e.g., in downtown areas), such that all travelers entering and driving within the zone are charged a fee, is categorized as "area-wide pricing." Similar in concept is "cordon pricing," whereby travelers crossing predetermined points in the road network (cordons) are required to pay a charge upon entry or exit. The charge may vary by time of day or vehicle characteristics, and may be in effect all day, during peak hours only, or may vary dynamically with the level of congestion. An all-day area-wide congestion-pricing program in London, England, has reduced congestion there by 25 percent (London, UK, Undated). A recent study concluded that the adoption of a congestion pricing approach in Washington, DC, could "result in less road congestion and provide a much-needed local revenue source" (Safirova, et al., 2006).

- ***Value pricing through parking and other taxes.*** Parking fees, gas taxes, and other taxes are ways to ensure that drivers more accurately realize the cost of the infrastructure they use. When faced with these costs, some drivers seek alternative modes of transportation. Revenue from these taxes can be used for infrastructure upgrades or other complementary municipal activities.

- ***"Pay-as-you-drive" vehicle insurance*** adjusts rates based on how much people drive, so that those who drive less pay less, thus providing a financial incentive to reduce vehicle use. One study estimates that a nationwide pay-as-you-drive system would cause driving to decline by 8 percent, netting society the equivalent of $50 billion to $60 billion per year by reducing accidents, congestion, GHG emissions, and local pollution. Specifically, it could reduce CO_2 emissions by as much as 2 percent and oil consumption by about 4 percent (Bordoff, 2008b).

Auto insurance agencies must have their insurance policies and rate plans approved by state regulators. However, current regulations in several states either explicitly prohibit pricing insurance per mile or require legislative reforms to make it possible. States and municipalities can work collaboratively with private auto insurance companies to test and demonstrate the benefits of these insurance plans by implementing pilot programs using funds available from the federal Value Pricing Pilot Program (under SAFETEA-LU) and other government or private sources.

A coalition of local government agencies and local nonprofit groups recently sponsored (and partially funded) an effort in the Seattle area to pilot a pay-as-you-drive insurance program with an insurance company (Sightline Institute, 2007). For this pilot program, King County, Washington, was awarded $1.9 million in Federal Highway Administration (FHWA) discretionary funds in March 2007, which was supplemented by $1.2 million in state and local funds. As of late 2009, the state of Washington did not permit pay-as-you-drive insurance, but a bill to reform existing legislation was recently introduced in the State Senate (Bordoff, 2008b; Washington Senate Democratic Caucus, Undated).

4. KEY PARTICIPANTS

A number of institutions and individuals are instrumental in influencing and making choices about TCMs. These key participants include:

- **Mayors or city councils.** Local political leadership can provide the policy direction and funding to implement programs that encourage transportation alternatives.

In 2007, the mayor of Los Angeles launched the 30/30 left turn arrow initiative with Los Angeles City Council members and the general manager of the Los Angeles Department of Transportation (LADOT). The purpose of the program was to help reduce traffic congestion by installing 30 left turn arrows at city intersections in 30 business days. Designed to improve the flow of traffic and improve safety on city streets, the 30/30 plan is expected to cut excessive wait times at left turn pockets, decrease traffic collisions by up to 66 percent, and reduce commute times for LA drivers. Since the mayor took office in July 2005, LADOT has installed a total of 189, or 41 percent, of the city's 460 left turn arrows. The 30/30 initiative was just one of a number of programs envisioned by the mayor to help address congestion in the city, such as banning rush hour road construction, synchronizing traffic lights, and towing illegally parked cars on major streets (City of Los Angeles, 2007).

- **Regional, state, and federal agencies and legislators.** Because local transportation systems are linked to regional, state, and federal transportation networks, entities beyond municipalities are often involved. At the same time, large-scale local transportation infrastructure (e.g., bridges, tunnels, etc.) often requires large infusions of state and federal funding. For example, the American Recovery and Reinvestment Act of 2009 allocated several billion dollars to existing federal transportation repair and improvement programs as part of an effort to help stimulate the U.S. economy. Some of these additional funds can be used by state and local governments to support TCMs (U.S. Government, 2009). (For more information on transportation related funding, see Section 7, *Cost and Funding Opportunities*.)

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The City of Sacramento used financial and technical assistance provided through the state-level California Fuel Efficient Traffic Signal Management Program to improve its signalized traffic control systems. This work involved changing signals in outlying areas from pre-timed signals to traffic-actuated signals (U.S. EPA, 1998a).

Studies supported by state or federal funding can also help other levels of government become involved in local transportation projects. The FHWA's Value Pricing Program, for example, funded a variable tolling feasibility study that led to the decision to implement variable tolls for trucks on the northeastern Illinois Tollway System. Under this system, rates for trucks increased from $1.25 to $4.00 at most toll plazas, but trucks traveling at off-peak hours (between 10:00 p.m. and 6:00 a.m.) paid only $3.00 (FHWA, 2009).

- **Local transportation agencies.** Local transportation agencies play a key role in the quality of public transit, transportation system management (e.g., traffic signals, traffic circles), and the "rules of the road" for vehicles. Many specific mechanisms for implementing TCMs are in the hands of local transportation agencies.

Ventura County Transportation Commission (VCTC) in California encourages public transit ridership within its Ride Share program. In addition to providing assistance with carpooling opportunities and identifying park-and-ride lots, VCTC registers participants for the free county-wide Guaranteed Ride Home program. This program overcomes concerns that commuters may not be able to rely on public transportation for all their needs. Offering rideshare assistance also provides commuters a greater range of commuting options; for example, commuting by transit one way. The VCTC also offers employer discounts for mass transit, ride matching, and RideGuide commuter planners for vanpools and carpools based on where commuters live and work (VCTC, Undated).

- **Local and regional planning organizations.** Metropolitan planning organizations (MPOs), regional planning agencies (RPAs), and others play a key role as transportation planning agencies for cities or regions. They conduct the planning required under federal law for cities to receive federal transportation funds, and run near-term capital improvement programs. They often work with state and local air quality agencies to coordinate transportation and air quality planning to assure compliance with air quality improvement goals. These organizations and agencies are often instrumental in pursuing smart growth policies that reduce transportation emissions, such as changing development rules and zoning regulations. However, not all MPOs and RPAs have authority over development rules and zoning regulations. (EPA's *Smart Growth* strategy document in the *Local Government Climate and Energy Strategy Series* describes a number of examples of how planning agencies are involved in promoting TCMs.)

MPOs and RPAs also often provide services to help employers start, implement, and maintain commuter choice and telework programs. Other municipal institutions involved in these programs are city and county transportation agencies, transportation management associations (TMAs), and transportation management organizations (TMOs). These organizations provide information, support, and in some cases, resources, such as rideshare matching.

Ann Arbor, Michigan's TMA, known as getDowntown, offers a complete menu of TCM services to the Ann Arbor community. In 2008, this TMA engaged in extensive outreach to downtown employers and started a bimonthly "Commute Chat Lunch" program, which invites employers to network and learn more about commuting options. To improve awareness of its program, getDowntown provides a blog, Web site, e-newsletter, and contests. Some of getDowntown's newest programs include initiating Zipcar services for downtown employees, a NightRide service, customized commuter counseling, a new Express Commuter Bus and rideshare program, and preferential parking for carpools and vanpoools. Other ongoing programs include bike locker service, a bike fest, a green commute campaign, a commuter challenge, bus pass marketing and vending, and outreach to the University of Michigan (getDowntown, 2008).

- **Other local agencies.** Many municipalities choose to lead by example by making sure that local agencies are implementing transportation control measures that can then lead to broader adoption throughout the community. For example, police departments can encourage bicycling by putting officers on bikes, or local agencies can encourage telecommuting and subsidize employee public transportation costs. Agency motor pools can encourage the use of "flex car" programs rather than having a city fleet.

The city of Pleasanton, California, offers $2 per day to city employees who leave their car at home and use a commute alternative. This program has prevented more than 20,000 trips per year, which translates into a savings of over 12,000 gallons of fuel, or more than 109 metric tons of CO_2 emissions (U.S. EPA, 2005c).

- **Employers.** Employers play an important role in influencing the commuting habits of their employees. Employers can choose to invest their own resources in encouraging alternatives such as public transit, carpooling, and telecommuting, or can take advantage of public programs that subsidize employees' use of transportation alternatives. For example, a company can provide cash incentives to employees who commute to work via carpools or vanpools.

California state law requires certain employers that provide subsidized parking for their employees to offer cash allowances in lieu of parking spaces to incentivize alternative commute modes. A 1997 review of eight case studies of employers in southern California offering these cash-out programs revealed that solo driving to work fell by 17 percent, carpooling increased by 64 percent, transit ridership increased by 50 percent, walking and bicycling increased by 33 percent, and commuter parking demand fell by 11 percent. These mode shifts reduced total VMT for commuting by 12 percent, with a range from 5 to 24 percent for the eight firms (Shoup, 1997).

- **Nonprofit organizations.** In many cities, nonprofit organizations are dedicated to influencing transportation demand in order to improve the environment, health, and livability of communities.

Seattle's bicycle promotion program, for example, benefits from the active support and engagement of nonprofit stakeholder groups, including the Cascade Bicycle Club, a strong and active advocacy group that campaigns for local legislation supporting bicycle infrastructure, and several strong, independent neighborhood and citizen groups that lobby for bicycle programs [U.S. EPA, Undated(a)].

- **Private sector.** Some TCMs rely on companies in specific sectors to offer incentives. For example, insurance companies can offer customers pay-as-you-drive car insurance (described in Section 3, *Transportation Control Measures*) that ties the cost of insurance directly to the number of miles driven, thus lowering costs for those who drive less. In the examples of pay-as-you-drive auto insurance cited previously, the willingness of the insurance companies to offer this kind of insurance was critical to implementing this TCM strategy.

- **Drivers.** Ultimately, the effectiveness of TCMs comes down to the behavior of drivers and their choices about whether and how to use their personal vehicles. Incentives can encourage drivers to reduce their vehicle use or seek alternatives; such measures can be strengthened with disincentives for personal vehicle use, such as increasing fuel taxes and parking fees.

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From August 2008 to May 2009, King County, Washington, partnered with the Washington State Department of Transportation, the Cascade Bicycle Club, and REI (an outdoor outfitter) and instituted a "green bikes" program to provide an incentive to get drivers out of their cars. The goals of the program were to introduce new riders to bicycling as a safe and reliable form of transportation to work, thereby reducing drive-alone trips and the associated pollution, increasing health and fitness, and providing a sense of workplace community and camaraderie. The program purchased 200 bicycles and worked with more than 20 companies in the county to provide them to employees who pledged to reduce their drive-alone commuting by 60 percent through bicycling to work. Employees meeting their pledges by the end of the program earned sole ownership of their bicycles. More than 120 people met their targets and earned their bikes. Together, all new riders biked more than 111,000 miles and made more than 9,000 bike trips. The program was considered so successful that a second phase was planned for spring 2010 (Green Bike Project, Undated; King County, 2009).

5. FOUNDATIONS FOR PROGRAM DEVELOPMENT

A variety of mechanisms can be employed to implement transportation control measures, including:

- **Mayor or executive initiatives.** With the ability to direct the executive branch of city government and the public visibility of their office, mayors have a unique role to play in promoting TCMs. This can include directing city departments to lead by example, directing funds to key projects, and influencing action more broadly through communication and outreach.

- **Local government resolutions.** Local entities that pass resolutions, such as city councils, can influence the operations of city government through their oversight and budget functions, and can promote TCMs that set the "rules of the road" for city residents. City councils in large cities with significant transportation challenges can also influence state and federal transportation programs that provide a great deal of transportation funding.

In August 2008, the Chicago City Council passed the "Resolution to Support 21st Century Transportation For America," which notes the council's support for "investment for transportation that contributes to dynamic and accessible communities where more residents can walk, bike, or take transit" and calls on the federal government and the Illinois State Legislature to support a transportation infrastructure investment plan that "expands clean, efficient transportation choices for Americans" (Chicago City Council, 2008).

- **Local ordinances.** Local ordinances passed by city councils or citizens can provide funding or mandates to study or implement TCMs.

In Alameda County, California, a voter-approved ordinance required the development and operation of new value-priced HOV lanes for the "Sunol Grade" portion of Interstate 680. As a result, the Metropolitan Transportation Commission, Alameda County's Congestion Management Agency, Caltrans, and the FHWA initiated a four-year demonstration project (SACOG, 2005).

"Blue Ribbon" panels. Blue Ribbon panels of experts and prominent citizens can provide a high-profile way to advance TCM policies and draw on the ideas and experience of leading thinkers in academia, government, the private sector, and nonprofit organizations.

6. STRATEGIES FOR EFFECTIVE PROGRAM IMPLEMENTATION

Municipalities may face barriers in implementing TCMs. These barriers include a lack of local capacity and funding, especially for large infrastructure projects. They also include people's reluctance to alter their transportation choices, especially if it involves perceived direct cost increases, uncertainties, or risks. Finally, barriers can include a lack of public, agency, and company understanding of what TCMs are intended to accomplish compared with traditional transportation strategies such as capacity expansion. As municipalities seek to deploy TCMs, they can use a number of individual and coordinated strategies that address these barriers to implementation and enhance the effectiveness of these measures. These strategies include:

- **Pursue complementary programs.** Many TCMs work better if combined with other TCMs. For example, carpooling programs complement parking cash-out programs by giving employees ready opportunities (and cash) to change commuting habits. Similarly, emergency ride home programs are often a necessary complement for commuter alternative programs because they address commuters' concerns that they will be left stranded in an emergency. Municipalities can also combine transportation measures with their smart growth programs. For more information see EPA's *Smart Growth* strategy document in the *Local Government Climate and Energy Strategy Series*.

COMPLEMENTARY PROGRAMS AT SOUTH FLORIDA COMMUTER SERVICES

Commuter programs often bundle services and programs to provide commuters with multiple options and services that work together to encourage transportation alternatives. For example, South Florida Commuter Services (SFCS) provides an emergency ride home program to any commuter who carpools, vanpools, rides transit, bicycles, or walks to work at least three times a week. This service strengthens SFCS's other programs that help link commuters to carpools and vanpools, find park-and-ride lots, and otherwise encourage transportation alternatives.

Source: South Florida Commuter Services, 2008.

- **Implement TCMs that provide revenue sources.** TCMs often involve new costs for local governments, whether for infrastructure, increased enforcement, or for new services, such as emergency ride home services. However, certain TCMs—such as roadway pricing or parking taxes—can be revenue sources used to offset costs elsewhere. These TCMs can actually save costs for individuals and companies. For example, increasing downtown parking taxes is one strategy that can reduce congestion in a city's core while providing revenue for the local government.

Philadelphia, Pennsylvania, passed a parking tax increase in 2008 with the prospect that it would generate $6 million in new income for the city. The revenue raised was committed to environmental and transportation priorities for the city, such as park improvements and street repaving (Weyrich, 2008).

- **Select TCMs that are appropriate to the local transportation context.** Certain TCMs are more appropriate for highly dense urban areas, while others are more suitable for rural areas with long commute times. For example, vanpools are most appropriate in areas with long commute distances and limited availability of public transit (U.S. EPA, 2005e), while parking cash-out programs are most appealing to employers who lease their parking spaces and can save money by releasing unused spaces (U.S. EPA, 2005c).

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In response to the 1998 Voluntary Ozone Action Program, which encouraged state agencies and major corporations to reduce vehicle miles traveled by 20 percent, and a consolidation of two downtown facilities that created employee parking shortages, the Georgia Power Company in Atlanta decided to expand its employee transportation programs. The company built on its existing downtown transit subsidy program to develop a regional commute options program that could accommodate the diverse commuting needs of its employees, while helping to reduce Atlanta's worsening traffic congestion and air pollution. The new program included vanpools, fleet vehicles, free transit passes, telecommuting, and a range of other alternatives. By 2003, just five years into the program, the company was supporting more than 50 vanpools to downtown and regional offices. The longest documented vanpool trip was 160 miles round-trip. The company reports that more than 1.2 million VMT are avoided each month. Participation in the programs has remained steady, with 13 percent of employees carpooling or vanpooling (ACT, 2004).

- **Encourage behavioral responses.** Many TCMs encourage desired behaviors—such as choosing public transit or bicycling as a commuting strategy instead of driving a SOV—rather than mandating behaviors. Consequently, their success depends on the ease with which people can alter their behavior. Municipalities can help by making change as easy as possible; for example by providing resources for ride matching to encourage carpooling or introducing people to innovative commuting alternatives (U.S. EPA, 2005a).

SmartTrips is a comprehensive approach to reduce drive-alone trips and increase biking, walking, and public transit in targeted geographic areas of Portland, Oregon. It incorporates the innovative and highly effective "individualized marketing" methodology, which hand-delivers packets of information to residents who wish to learn more about public transportation. The program is based on the assumption that people will change their travel behavior if provided with information about the full range of transportation options. Key components feature biking and walking maps and organized activities, which encourage people to discover how many trips they can easily, conveniently, and safely make without using a car. SmartTrips has been implemented successfully in four neighborhoods of approximately 20,000 residents each. Each project has yielded a reduction of 9 to 13 percent in drive-alone car trips by all area residents, with a corresponding increase in walking, bicycling, and transit mode shares in the SmartTrips areas (WalkingInfo.org, Undated). The annual CO_2 reduction is approximately 21,300 metric tons per neighborhood, equivalent to the annual emissions of approximately 3,905 passenger vehicles. The program costs $550,000 per neighborhood promotion (C40 Cities, Undated).

- **Enhance workplace flexibility to reduce commuting-related travel.** Similar to employer-sponsored programs to provide commuter choices, workplace flexibility programs can also reduce commuting trips. These approaches include telecommuting and flexible scheduling to avoid heavy commute times. Municipalities can lead by example by providing workplace flexibility for their employees.

- **Consider multiple funding options.** Competing transportation funding priorities and lack of municipal control over funding allocations force local governments to locate multiple funding opportunities. Infrastructure to support TCMs—such as park-and-ride lots or signal control systems—often have to compete for scarce state and federal funding against other transportation priorities. For more information, see Section 7, *Costs and Funding Opportunities*. One strategy that municipalities can employ is to use local funding to leverage state and federal funds for transit and other transportation projects.

San Diego, California, used such a strategy in 2004, when voters approved a 40-year extension of TransNet, which is a half-cent sales tax to fund transportation projects. San Diego uses funds generated by the tax to attract matching state and federal transportation funding for highway and street improvements and public transit (SANDAG, Undated).

- **Allow sufficient time for development and implementation.** Although many TCMs do not require large new infrastructure, they often still take time and tax the capacity and expertise at the local level. For example, it can take five to 10 years from planning to completion to implement highway information management systems, such as ramp metering (U.S. EPA, 1998b).

- **Conduct communications and outreach.** Communications and outreach is a key strategy to influence the behavior of drivers. "How to" guides for public transit can encourage its use. "Bike to work" and "bike to school" days can encourage alternative modes of transportation that ideally last beyond a single day. Advertising the availability of carpool and vanpool opportunities can increase use. Municipalities can also conduct outreach to their employees in order to lead by example.

As part of its communications and outreach strategy to encourage bicycling as a transportation alternative, the Seattle Department of Transportation provides residents with a free bicycling map that shows bike lanes, shared use paths, and streets commonly used by bicyclists throughout the metropolitan area. The maps also contain advice and regulations related to safe bicycling (Seattle Department of Transportation, Undated).

- **Incorporate TCMs into transportation and land use plans.** Transportation and land use planning have a large impact over time on both the amount and type of demand for transportation. For more information, see EPA's *Smart Growth* strategy document in the *Local Government Climate and Energy Strategy Series*.

An example of a city with a long history of growth management plans that emphasize the development of light rail, transit, walking, and bicycling is Portland, Oregon. Portland's urban growth boundary, codified in state law and local/regional planning, has resulted in more compact development and reduced transportation impacts. Although Metro Portland's population (1.58 million) has grown by 50 percent since 1973, its land area has grown by only 2 percent (Tammemagi, 2008.) Portland now has the lowest total VMT of any comparable city in the United States, and has seen dramatic improvements in air quality during the last 30 years (Anderson, 2000). Metro (the regional government covering Clackamas, Multnomah, and Washington counties, and the 25 cities in the Portland region) includes the following policy provisions in its regional plan: urban form, regional and local street design, regional motor vehicle system, regional public transportation system, regional bicycle system connectivity, pedestrian system connectivity, transportation supply management, and transportation demand management (Metro, 2004).

- **Lead by example.** Public agencies can lead by example by adopting TCMs that municipalities hope to see adopted by the private sector. TCMs that local governments have included as part of their own operations include telecommuting, flex time, compressed workweeks, staggered work hours, and incentives for public transportation.

In 2000, Hennepin County in Minnesota decided to lead by example by updating its 20-year-old employee transit incentives program. The county replaced payroll deductions for a discounted bus pass with a pre-tax employee transportation program to cover bus and parking costs. The county also offered a 40 percent discount on transit pass purchases. These changes led to 1,900 additional employee transit pass purchases in three years (the county employs approximately 13,000 people). The pre-tax benefits saved the county money that it used to help pay for the discounted bus passes (ACT, 2004).

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7. COSTS AND FUNDING OPPORTUNITIES

This section provides information on the costs of TCMs and describes funding opportunities for addressing these costs.

Costs

TCM costs vary widely by measure, from relatively low-cost information campaigns to large infrastructure investments in park-and-ride lots, HOV lanes, and traffic signal upgrades. Even for similar projects, costs can vary depending on scope, location, and other project-specific variables. In 1999, EPA published a study that examined the costs of a number of TCM projects funded by the Congestion Mitigation and Air Quality Implementation Program (see the *Funding Opportunities* subsection for information on this program), which illustrates the variability of costs (U.S. EPA, 1999). Results included:

- **Shared ride projects.** Costs ranged from $16,000 for a park-and-ride facility in Maryland to $1.7 million for a regional vanpool program in Texas.

- **Bicycle and pedestrian projects.** Costs ranged from $27,000 for a bike rack incentive program in Illinois to $298,000 for a bicycle network plan for Philadelphia, Pennsylvania.

- **Transportation system management projects.** Costs ranged from $7,000 for a signal systemization project in Maryland to $1.4 million to extend HOV lanes on Interstate 84 in Hartford, Connecticut.

Costs also vary according to who pays. While many TCMs are paid by local, state, or federal funds, costs of some TCMs are paid by drivers or employers. For example, congestion pricing or parking taxes are paid by drivers. Parking cash-outs, commuter transit passes, and the costs of telecommuting infrastructure are typically paid for by employers (although potentially with offsetting costs savings and tax benefits). For example, the per-employee average investment to establish an employee as a telecommuter ranges from $1,000–$5,000 (U.S. EPA, 2005d).

Funding Opportunities

Federal funding for TCMs is available from U.S. Department of Transportation (DOT) programs, and the Federal Transit Administration (FTA) provides an online resource on innovative financing for constructing, operating, and maintaining public transportation systems, which can be accessed at ***http://www.fta.dot.gov/funding/grants_financing_173.html***.

Note that many of the DOT programs listed below received additional monies through the American Recovery and Reinvestment Act of 2009; see the text box *American Recovery and Reinvestment Act of 2009* on page 21 for more information. All of these DOT programs are authorized in law under the 2005 Safe Accountable Flexible Transportation Equity Act: A Legacy for Users (SAFETEA-LU).

- **Surface Transportation Program.** Initially adopted in 1991 as part of the Intermodal Surface Transportation Efficiency Act (ISTEA), this DOT program, administered by FHWA, provides states and localities with funding for projects on any federal-aid highway, and allows funding to be "flexed" to FTA for transit capital projects and intercity bus facilities. The program allocates funds based on a formula and is flexible as to the use of the funds, including uses such as vanpools as well as pedestrian and bicycle facilities.

  Web site: ***http://www.fhwa.dot.gov/safetealu/factsheets/stp.htm***

- **Congestion Mitigation and Air Quality (CMAQ) Improvement Program.** DOT's CMAQ improvement program, administered by FHWA, provides billions of dollars in funding to states, MPOs, and transit agencies for surface transportation and related projects that reduce congestion and improve air quality. Like the Surface Transportation Program, CMAQ funds can also be flexed to FTA for transit projects, including covering transit operations for the first three years of new service. TCMs eligible for CMAQ funding include improving traffic flow, enhancing transit services, and providing other transportation alternatives.

  Web site: ***http://www.fhwa.dot.gov/environment/cmaqpgs/index.htm***

- **Transportation Enhancement (TE) Activities Program.** This FHWA program funds transportation-related projects that add value for communities or the environment over and above normal environmental mitigation requirements. The list of eligible activities includes the provision of facilities for pedestrians and bicycles, safety and educational activities for pedestrians and bicyclists, and preservation of abandoned railway corridors (including the conversion and use of the corridors for pedestrian or bicycle trails).

  Web site: *http://www.fhwa.dot.gov/environment/te/guidance.htm*

- **FTA grants and financing.** FTA operates a number of grant programs to help communities support public transportation, including grants for planning, facility construction, and operations. FTA grant funding also allows for joint development efforts and bike/pedestrian improvements that are physically or functionally linked to a transit facility. Each year, FTA apportions funds appropriated by Congress to local and state government entities, including transit agencies, according to formulas and Congressional earmarks. FTA also manages discretionary grant programs under which funds are distributed based on certain criteria. Examples of FTA grant programs include:

  Formula Programs:

  - Metropolitan and Statewide Planning
  - Urbanized-Area (large and mid-size cities)
  - Rail and Fixed Guideway Modernization
  - Transportation for Elderly Persons and Persons with Disabilities
  - Other than Urbanized-Areas (state-administered for rural transit service)
  - New Freedom (accessible transportation for people with disabilities beyond federal requirements)
  - Job Access and Reverse Commute

  Discretionary Programs:

  - Major Capital Investments (New Starts/Small Starts)
  - Bus and Bus Facilities
  - Clean Fuel Buses
  - Paul S. Sarbanes Transit in the Parks
  - Tribal Transit

  Web sites: *http://www.fta.dot.gov/grants_financing.html* (information on FTA), *http://www.fta.dot.gov/funding/grants_financing_263.html* (information on FTA grant programs)

- **Transportation Infrastructure Finance.** Established by the Transportation Infrastructure Finance and Innovation Act of 1998, this DOT program offers secured direct loans, loan guarantees, and standby lines of credit for eligible transportation projects of national or regional significance. It is intended to supplement federal funding by attracting private and other investment. Credit assistance can be awarded to state departments of transportation, transit operators, special authorities, local governments, and private entities.

  Web site: *http://tifia.fhwa.dot.gov/*

- **State Infrastructure Banks (SIBs).** Established by DOT under the 1995 National Highway System Designation Act as a pilot program, SIBs operate similarly to a private bank by providing seed capital for projects and a range of loans and credit enhancements. Funds can be used to finance eligible surface transportation projects, including both highway construction and transit capital projects.

  Web site: *http://www.fhwa.dot.gov/innovativefinance/sib.htm*

In June 2009, EPA, DOT, and the U.S. Department of Housing and Urban Development (HUD) formed the Partnership for Sustainable Communities to help improve access to affordable housing, develop more transportation options, and lower transportation costs while protecting the environment in communities nationwide. Through a set of guiding livability principles and a partnership agreement that will guide the agencies' efforts, this partnership will coordinate

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funding for federal housing, transportation, and other infrastructure investments to protect the environment, promote equitable development, and help to address the challenges of climate change. One funding opportunity arising through this partnership is HUD's Sustainable Communities Planning Grant Program, which will offer $40 million in competitive challenge grants to local communities that collaborate on housing, transportation, and environmental planning efforts. Additional funding opportunities may arise through this partnership. (See Section 8, *Federal, State, and Regional Policy and Program Resources*, for more information on the partnership.)

In addition to federal funding, many states provide grant funding for local transportation, often from state fuel taxes. Some of these state grants (similar to some federal grants) require a local match. Local governments can also use local revenue from sales or parking taxes, tolls, and other direct sources, in addition to general revenues and reserve funds, to fund TCMs. Sometimes local governments join partnerships with other public and private entities for financing transportation projects. Municipal financing, such as the issuance of bonds, can also serve as a source of TCM funding.

The Bay Area Rapid Transit (BART) authority constructed the rail extension to the San Francisco International Airport using funds raised by issuing bonds against future sales tax revenues and fare revenues. The San Francisco Bay Area's Metropolitan Transportation Commission also plans to issue bonds backed by bridge toll revenues to fund BART rail extensions and other transit improvements in the region (BATA, 2006).

Other innovative local financing sources for TCMs include transportation impact fees and special property taxes based on capturing the increase in the value of land around transit facilities. Transportation impact fees require that developers pay a fee based on the transportation costs imposed by their projects, which can then be used to pay for walking and cycling improvements, or to fund other TCMs that can be applied locally.

The City of Portland, Oregon, used several innovative financing strategies to help fund the Portland Streetcar system, which opened in 2001. The city covered some of the initial costs of the system through tax increment financing, in which the Portland Development Commission issued bonds against future property taxes to be paid by new development along the streetcar line. Portland also created a "local improvement district," which assessed a one-time property tax from businesses within the district based on their size and proximity to the streetcar line (Portland Office of Transportation, 2008).

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AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009

In an effort to help stimulate the economy, President Obama signed the American Recovery and Reinvestment Act (ARRA) in March of 2009. ARRA contained billions of dollars in one-time allocations for transportation and infrastructure projects through a number of new and existing DOT and DOE programs, which can be used to support TCMs. Some of the funding mechanisms that received monies from ARRA include:

U.S. Department of Transportation (DOT)

- **Surface Transportation Program (STP): $27.5 billion.** The majority of these funds have been distributed to state departments of transportation for use in highway or public transit projects. Priority has been given to projects that can be completed in three years in economically distressed areas.
- **Passenger and freight rail programs through the Capital Assistance to States program and a new High Speed Passenger Rail program: $8 billion.** These funds have been designated for distribution with a 100 percent federal share. A state rail plan has not been required to receive funds.
- **Public transit programs: $8.4 billion.** These funds have been split among formula grants for capital projects ($6.9 billion); rail modernization ($750 million); and the New Starts/Small Starts programs ($750 million), which support locally planned and implemented major investments in building new fixed guideway transit systems or extended existing systems. ARRA also made available $100 million for a discretionary program to support transit capital projects that would result in GHG reductions or reduced energy use.
- **Supplemental discretionary grants (also known as Transportation Investment Generating Economic Recovery, or TIGER, Grants): $1.5 billion.** These funds have been designated for projects with national, metropolitan, or regional significance with an intermodal focus. Eligible projects include interstate and bridge maintenance and repair, freight and passenger rail, intermodal ports, and public transportation.

For more information, see: ***http://www.dot.gov/recovery/***, ***http://www.fta.dot.gov/index_9440.html***, and ***http://www.fhwa.dot.gov/economicrecovery/index.htm***.

U.S. Department of Energy (DOE)

- **Energy Efficiency and Conservation Block Grants: $3.2 billion.** These funds have been designated for state, local, and tribal projects that reduce energy use and fossil fuel emissions and improve energy efficiency. One of the 14 categories of eligible projects covers the development and implementation of transportation programs and includes TCMs that conserve and reduce energy used in transportation.

For more information, see ***http://www1.eere.energy.gov/recovery/***.

Source: Transportation for America, 2009 and U.S. DOE, 2009.

8. FEDERAL, STATE, AND REGIONAL POLICY AND PROGRAM RESOURCES

Policies and programs at the federal, state, and regional levels can support implementation of TCMs by local governments and influence which TCMs are most appropriate for a given location. Some of the policies and programs described below are statutory requirements that help encourage certain TCMs, while others may help to fund TCM activities.

- **Clean Air Act State Implementation Plan credit for TCMs.** Under the Clean Air Act (CAA), areas that do not meet air quality standards must be covered by State Implementation Plans (SIPs) that establish a plan for reducing emissions. Under current rules, TCMs that meet certain CAA requirements to ensure accountability and effectiveness (see footnote on page 1) are eligible for SIP "credit." These TCMs include employer-based transportation management programs, work schedule changes, rideshare incentives, parking management, and a variety of other efforts (U.S. EPA, 1997). SIPs can include both voluntary and mandatory TCMs.

  Including TCMs in an approved SIP can help provide access to federal transportation funding and gain support for these activities at the state and federal levels. Note that TCMs in SIPs must be implemented

on the schedule established in the SIP. If a TCM falls behind schedule and the area still intends to implement it, the MPO must demonstrate that past obstacles to implementation have been identified and overcome, and that state and local agencies with funding authority are giving the delayed TCM maximum priority.

- **Federal and state tax codes.** The federal tax code includes provisions to encourage alternatives to commuting. For example, the tax code includes tax-free transportation fringe benefits of up to $230 per month per employee for transit/vanpool expenses or parking, or $20 for bicycle expenses (Transportation for America, 2009). These tax provisions save employers the payroll tax they would pay to provide employees with equivalent amounts of cash, and save employees the income tax they would pay on this added income. In some states, tax codes encourage commuting alternatives.

Maryland, Georgia, Minnesota, Delaware, and other states provide employer tax credits for offering commuter benefit programs (U.S. EPA, 2005b). Oregon provides a tax credit for employer investment in telecommuting (e.g., purchasing and installing office and computer equipment) (U.S. EPA, 2005d).

- **Partnership for Sustainable Communities.** In June 2009, EPA, DOT, and HUD formed this partnership to coordinate their funding and better support sustainable communities. EPA, DOT, and HUD will work to assure that their programs maximize the benefits of their combined investments in communities for livability, affordability, environmental excellence, and the promotion of green jobs of the future. HUD and DOT will work together to identify opportunities to better coordinate their programs and encourage location efficiency in housing and transportation choices. HUD, DOT, and EPA will also share information and review processes to facilitate better-informed decisions and coordinate investments. For more information and updates see *http://www.epa.gov/smartgrowth/partnership/index.html*.

- **State traffic mitigation laws.** Some states mandate that businesses of a certain size develop and implement employee commuting reduction strategies.

In 2006, the Washington State Legislature passed the Commute Trip Reduction (CTR) Efficiency Act, which requires local governments in those counties experiencing the greatest automobile-related air pollution and traffic congestion to develop and implement plans to reduce SOV trips. The Commute Trip Reduction program has found that employees commuting to participating worksites made nearly 26,000 fewer vehicle trips each weekday morning in 2007 than when they entered the program. The percentage of people who drove alone to work to CTR worksites declined from 71 percent in 1993 to 66 percent in 2007. The absence of about 26,000 vehicles on the state's roads each weekday morning in 2007 reduced gasoline consumption by nearly 8 million gallons, saving commuters some $23 million. It also reduced criteria pollutants by nearly 4,000 tons, and emissions of CO_2-equivalent greenhouse gases by nearly 77,700 metric tons—equal to the annual emissions from more than 14,000 cars (WSDOT, Undated). (For information on how Bellevue in King County, Washington has complied with the state's CTR mandate, see Section 9, *Case Studies*.)

- **Regional transportation planning.** Collaboration between neighboring local governments can be an effective means of addressing traffic patterns and transportation demands that cross jurisdictions. By engaging in regional transportation planning, local governments can leverage their resources and develop methods of transportation control that may be more efficient and practical than creating wider and faster roadways within their borders (which can be costly and limited in effectiveness, due to induced demand.) Regional transportation planning also enables local governments to take a more holistic approach to transportation planning by using the principles of smart growth to create "smart transportation" plans that address the factors influencing transportation demand.

In addition, the federal government requires state departments of transportation and MPOs to develop long-range transportation plans and short-term transportation programs. Transportation projects must be included in these plans and programs in order to receive federal funding. For areas with a population higher than 200,000, federal regulations require a congestion management process (which would likely include TCMs) as part of the planning process.

Anticipating that the region will grow by more than 1.7 million residents within the first half of the 21st century, the Sacramento Area Council of Governments (SACOG), representing six counties and 22 cities in northern California, initiated the Sacramento Blueprint Project in 2002. The goal of the project was to examine current land use and future growth patterns and plan where and how the region should grow through the year 2050. In a series of workshops, regional conferences, Web-based dialogues, and surveys, more than 5,000 citizens in the region helped to create and refine the Preferred Blueprint Scenario, which promotes compact, mixed-use development and more transit choices as an alternative to low density development. SACOG estimates that by 2050, this scenario could reduce the number of trips made by car by 10 percent, reduce vehicle miles traveled per day from 47.2 to 34.9, and reduce emissions of CO_2 and fine particulates by 15 percent (SACOG, 2007). In 2008, this scenario was incorporated in the Metropolitan Transportation Plan for 2035 to provide a smart growth framework for investing $42 billion in transportation infrastructure over 28 years (SACOG, 2008).

- **U.**S. EPA State and Local Climate and Energy Program. This program assists state, local, and tribal governments in meeting their climate change and clean energy efforts by providing technical assistance, analytical tools, and outreach support. It includes two programs:
  - ***The Local Climate and Energy Program*** helps local and tribal governments meet multiple sustainability goals with cost-effective climate change mitigation and clean energy strategies. EPA provides local and tribal governments with peer exchange training opportunities and financial assistance along with planning, policy, technical, and analytical information that support the reduction of GHG emissions.
  - ***The State Climate and Energy Program helps*** states develop policies and programs that can reduce GHG emissions, lower energy costs, improve air quality and public health, and help achieve economic development goals. EPA provides states with and advises them on proven, cost-effective best practices, peer exchange opportunities, and analytical tools.

Web site: *http://www.epa.gov/statelocalclimate/*

9. CASE STUDIES

The following case studies describe two TCM programs implemented by local governments. Each case study describes how the program was initiated, key program features, and results.

City of Bellevue, Washington—Commute Trip Reduction

The City of Bellevue in Washington has implemented a wide range of TCMs—including a strong employer-based program—as part of its CTR plan. These measures help the city address its transportation-related environmental issues while reducing VMT and SOV use.

PROFILE: BELLEVUE, WASHINGTON

Area: 31 square miles

Population: 117,000

Structure: The City of Bellevue's Transportation Department runs the Commute Trip Reduction (CTR) program as part of its mission to provide a safe and efficient transportation system that supports livable neighborhoods and a vital economy in partnership with the community.

Program Scope: The CTR program mandates employer-based commuter programs to help reduce VMT and SOV use. These goals are supported by a comprehensive suite of TCMs, including policy and regulatory activities, service and facility improvements, employer outreach, construction mitigation projects, and Growth and Transportation Efficiency Centers.

Program Creation: The program was created in response to the State of Washington's Commute Trip Reduction Act in 1991, mandating CTR for the nine most populous counties, including Bellevue's King County.

Program Results: Bellevue's CTR efforts have lead to important drops in drive-alone rates citywide for CTR worksites (12% from 1993-2007) and for worksites of all sizes in the downtown area (7% from 2000-2008).

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PROGRAM INITIATION

In 1991, the State of Washington instituted the Commute Trip Reduction Act, which applies to the most populous counties/growth areas (including Bellevue's King County) in Washington State.[3] This program requires that applicable local governments adopt CTR ordinances and support local employers in implementing CTR. Employers within those jurisdictions are required to develop a commuter program designed to achieve reductions in vehicle trips.

With state funding, technical assistance, and programmatic guidance, Bellevue's ordinance, issued in 1993, identifies which commuters are affected (private and public employers with 100 or more affected employees at a single worksite, with certain exemptions), program components (a transportation coordinator, information distribution to employees, commuter surveys, etc.), what types of commute trip reduction measures may be included in the program, and how travel impacts are measured and reported.

PROGRAM FEATURES

The City of Bellevue set an overall jurisdiction goal of 10 percent reduction in drive-alone rates and 13 percent reduction in VMT by 2011 for more than 60 CTR sites (City of Bellevue, 2008a). The city provides employer-specific goals and support, which aggregate into the larger program goal. The 2008 update of the City of Bellevue CTR Plan includes a comprehensive range of complementary CTR strategies, covering policies and regulations, services and facilities, employer outreach, and special programs for the mitigation of construction activities (City of Bellevue, 2008a).

Bellevue has identified activities to improve existing policies and regulations to support the CTR program and its goals, including:

- Re-examining the density bonus scheme for development in the downtown area.
- Cataloguing the parking inventory of the city in the downtown area.
- Evaluating and promoting voluntary parking management strategies to employers, including a shift from parking subsides to transit benefits.
- Incorporating multi-modal street design features through the Great Street Project, which advances attractive pedestrian environments.
- Assessing land use and transportation policy concurrency to ensure that transportation planning and land use planning match in their goals and plans.

The city's CTR plan examines existing services and facilities and identifies a number of opportunities for reducing commuter VMT, such as:

- Adding new high occupancy vehicles lanes on I-90.
- Installing transit signal priority signals on select transit routes.
- Exploring the feasibility of a bus rapid transit route between Bellevue and Redmond, Washington.
- Continuing ridesharing support services through King County Metro, including marketing for ride-matching, carpooling, and vanpooling.
- Collaborating with Flexcar to increase awareness of car sharing services available, including an employer matching effort to help share in the subscription fees.

Since employers play a central role in the CTR program, a significant element of the city's plan focuses on outreach and support to companies covered by CTR mandates. Specific outreach efforts strategies covered in the plan include:

- Providing training to transportation coordinators at employer worksites.

[3] *The state of Washington updated this legislation through the Commute Trip Reduction Efficiency Act of 2006, focusing the areas in which the program applies (originally to nine counties, reduced to only the areas with greatest congestion delay) and clarifying certain elements of the program and employer requirements that arose during the first 15 years of its implementation.*

- Offering mini-grants to employers to hold transportation fairs.
- Requiring preferential parking for carpools and vanpools in specific buildings.
- Creating off-the-shelf marketing materials, promoting commuting options.
- Providing housing assistance through the "You Can Live in Bellevue" seminars.
- Initiating a Commuter Club, an incentive-based program to reward commuters who use alternative modes.

Aware that many of its planned construction activities will have impacts on the city's transportation system, Bellevue has incorporated strategies into its CTR plan to lessen the number of daily trips through areas with construction activities and reduce the adverse effects of construction on commuting. Special programs for the mitigation of construction activities have been designed to promote VMT reductions and discourage SOV use, including:

- Working with King County to support its promotions during construction periods, such as Neighborhood in Motion programs (similar to Portland's SmartTrips program described on page 16), area transit subsidies promotions, general marketing, and carpool incentive programs.
- Holding a "Battle of the Sites" promotion to have employers compete against one another to reduce their drive-alone rates.

The state revised the CTR Act in 2006 to allow jurisdictions the option of designating and planning for areas of dense population and employment, known as Growth and Transportation Efficiency Centers (GTECs). The GTEC program originated from the recognition that the CTR program, although very successful, could not fully address larger congestion issues in dense urban areas due to its focus on large employers. The 2008–2011 Downtown Bellevue Growth and Transportation Efficiency Center plan provides a customized downtown-wide trip reduction program designed to complement Bellevue's other CTR efforts by targeting additional populations, such as employers with fewer employees, the retail and hospitality industry, and downtown residents. The state awarded Bellevue $300,000 in 2008 for this effort (City of Bellevue, 2008b).

The City of Bellevue funds its CTR initiatives through a variety of sources, including the state CTR grant program, local jurisdiction operating funds and capital investment program funds, employer contributions, transit matching grants, construction mitigation transportation demand management funds, and the GTEC funds. The city's total estimated program expenses from FY2008–2012 are slightly under $1.6 million and average approximately $400,000 annually (City of Bellevue, 2008a).

PROGRAM RESULTS

Over the last 10 years, the city has achieved some impressive results from its CTR programs. Citywide, the drive-alone rate in CTR-affected worksites dropped from 75 percent in 1993 to 63 percent in 2007 (City of Bellevue, 2010). From 2000–2008, the drive alone commute rate at worksites of all sizes in the downtown area decreased from 68 percent to 61 percent (City of Bellevue, 2009).

Assuming continued success, the city estimates there will be more than 2,500 additional non-drive-alone commuters on local and regional roadways during the peak morning commute by the end of 2011. If all CTR sites meet their targeted goal of a 13 percent reduction in VMT, more than 136,000 vehicle miles traveled will be also be removed during the peak morning commute by the end of 2011. These results will help to lower congestion on both local and regional roadways, as well as potentially avoid the consumption of more than 6,800 gallons of fuel and eliminate more than 59 metric tons of CO_2 emissions over four years—equivalent to the annual emissions of 11 passenger vehicles (City of Bellevue, 2008a).

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City of Santa Monica—Transportation Control Measures

The southern California city of Santa Monica has implemented TCMs—including ridesharing and parking cash-out—as a strategy for improving air quality and reducing traffic congestion. These measures join an effective transit system and other activities to address transportation-related environmental issues in the city.

PROFILE: SANTA MONICA, CALIFORNIA

Area: 8.26 square miles

Population: 84,000

Structure: The city of Santa Monica established its Planning and Community Development Department (PCDP) to deal with transportation issues. The city's TCMs are implemented by the Transportation Management Division (TMD), in the PCDP.

Program Scope: A ridesharing program implemented by the TMD focuses on providing alternatives to commuters through ridesharing. A mandatory parking cash-out program, also operated by TMD, applies to all business above 50 employees. These and other programs are reinforced by the city's award-winning public transit system.

Program Creation: The ridesharing and cash-out programs were authorized by city and state law in the early 1990s; from 1987 to 2000, the city's transit system won the American Public Transportation Association's "Outstanding Transportation System" award four times.

Program Results: Santa Monica's TCMs have led to increasing trends in average vehicle ridership and transit ridership. However, it should be noted that traffic and congestion issues still remain a problem for the city.

PROGRAM INITIATION

The Santa Monica Planning and Community Development Department has identified the following transportation and air quality issues as major challenges for southern California [Santa Monica, Undated(a)]:

- Motor vehicle emissions account for 70 percent of the smog in southern California.
- In the South Coast Air Basin—where Santa Monica is located—90 percent of employees commute to work by car.
- In total, California drivers spend 1.2 billion hours stuck in traffic each year.

To address these issues, Santa Monica undertook a number of efforts in the early 1990s to reduce congestion and emissions, including:

- Developing a ridesharing program following the passage of the city's 1990 Transportation Management Ordinance 1604, which required employers to provide information and resources for ridesharing;
- Instituting a mandatory parking cash-out program under California State Law AB2109, passed in 1992; and
- Continuing to operate and enhance its award-winning public transit system, characterized by its signature "Big Blue Buses."

PROGRAM FEATURES

Santa Monica's ridesharing program focuses on providing alternatives to commuters driving to and from work. Under Ordinance 1604, which authorized the program, employers with 10–49 employees are required to provide each of their employees with information about air quality, ridesharing, and other transportation alternatives. Employers with 50 or more employees are required to implement a variety of incentives and strategies for ridesharing. An annual survey tracks each employer's progress in reducing single occupancy vehicle commuting trips. As an employer in the city, the city government participated in the program and sought to reach the city's average vehicle ridership goal of a minimum of 1.5 people per vehicle.

The city helps residents locate ridesharing opportunities through the CommuteSmart program, which serves the five-county region of which Santa Monica is a part. This service allows riders to find carpools and vanpools in their area. It also provides resources such as bicycle maps, trip planners, traffic updates via real-time traffic information, and a guaranteed ride home program (CommuteSmart, Undated).

Under Santa Monica's parking cash-out program, employers of 50 or more employees that lease their parking and subsidize any part of their employee parking must offer their employees the opportunity to give up their parking spaces and seek alternative commute modes. As an incentive to relinquish their parking spaces, the employer pays the employees the cost of the spaces, and the employees can use these funds to make independent transportation arrangements of their choice [U.S. EPA, Undated(b)].

Santa Monica also continues to upgrade its public transit system. It has won the American Public Transportation Association's "Outstanding Transportation System" award four times since 1983 (Big Blue Bus, 2008) for being a role model of excellence, leadership, and innovation that has greatly advanced public transportation. The city is currently focusing on upgrading buses with efficient technology and cleaner-burning fuels as they become available. Nearly one-half of its current fleet of 210 buses is fueled by Liquefied Natural Gas (LNG), which is 75 percent cleaner burning than diesel-fueled buses [Santa Monica, Undated(b)].

PROGRAM RESULTS

In its 2008 "Sustainable City Report Card," Santa Monica gave itself a medium grade on transportation [Santa Monica, Undated(b)]. The report card highlights the city's advocacy for regional transportation planning and infrastructure, increased use of renewable and alternative fuels in the city fleet, and increasing trends in average vehicle ridership and transit ridership as strengths. The average vehicle ridership was 1.59, exceeding the city's plan target of 1.5, and almost 100 percent of the city's public transit fleet was alternatively fueled. The city's new bike valet parked more than 16,000 bikes in 2008 (Santa Monica, 2009).

At the same time, however, Santa Monica noted that traffic and congestion issues remain a problem. Tourism and the availability of ample downtown parking continue to put pressure on the city's transportation grid. Approximately 13 percent of the city's intersections have unacceptable levels of transit service (Santa Monica, 2005a), and bicycling and walking infrastructure are below city targets. The City aims to provide 30 percent of arterials with bike lanes/routes, but as of 2005 only 3 percent had these features (Santa Monica, 2005b).

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10. ADDITIONAL EXAMPLES AND INFORMATION RESOURCES

Title/Description	Web Site
Local Examples of TCMs	
Berkeley's Bicycle Boulevards – Bicycle Boulevards are Berkeley's network of bicycle priority streets, where all types of vehicles are allowed, but the roadway is modified as needed to enhance bicycle safety and convenience. Bicycle boulevards are the backbone of the city's network of 50 bikeways.	*http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=6650*
Commuter Challenge—Seattle – This nonprofit organization provides information, technical assistance, and incentives to employers and employees to help reduce the number of vehicle miles traveled in Seattle.	*www.commuterchallenge.org*
City of Santa Monica, Transportation Management Programs –These programs include municipal parking cash-out and other initiatives to reduce commuter-related travel.	*http://santa-monica.org/planning/transportation/abouttransmanagementtmo.html*
Denver Regional Council of Governments, RideArrangers – RideArrangers is a service to businesses and individuals to provide resources for carpool matching, vanpools, and other commuting alternatives.	*http://www.drcog.org/index.cfm?page=RideArrangersh*
Downtown Minneapolis Carpool and Vanpool Resources – This Web site provides an example of a municipal program and resources to promote carpool and vanpools.	*http://www.mplstmo.org/pages/commuter_carpool.html*
King County Metro, Employer Commute Services – This Web site describes county-level commuter support services.	*http://metro.kingcounty.gov/cs/employer/empcommute.html*
Information Resources on TCMs	
American Public Transportation Association – This organization works to ensure that public transportation is available and accessible for all Americans in communities across the country.	*http://www.apta.com*
American Telecommuting Association – The American Telecommuting Association is a membership organization whose members are telecommuting employees and their employers.	*http://www.yourata.com/index.html*
Association for Metropolitan Planning Organizations – This association provides resources and links to Metropolitan Planning Organizations, which have a responsibility for planning, programming, and coordinating federal highway and transit investments.	*http://www.ampo.org/*
Best Workplaces for Commuters – This EPA-sponsored program encourages employers to provide commuter alternatives and provides resources on how to implement such programs.	*http://www.bestworkplaces.org/*
Center for Clean Air Policy Transportation and Emissions Guidebook – This guidebook and associated calculator can help municipalities calculate the cost savings, fuel reductions, and emissions reductions from TCM policies.	*http://www.ccap.org/guidebookAccess/login.php*
Clean Air Council Green Commute Program – Through this program, the Clean Air Council provides information on telecommuting as a means to reduce air pollution.	*www.cleanair.org/Transportation/*
CommuterChoice.com – This Web site is a resource for employees to connect to commuter choice service providers in their areas.	*http://www.commuterchoice.com*
National Complete Streets Coalition – This organization is a coalition of groups that support municipal "complete streets" ordinances to promote biking, walking, and other transportation alternatives.	*http://www.completestreets.org/early.html*

Title/Description	Web Site
Congestion Mitigation and Air Quality Improvement Program – This program provides federal funding to states, metropolitan planning organizations, and transit agencies to improve air quality and reduce congestion, including through TCMs.	*http://www.fhwa.dot.gov/environment/cmaqpgs/index.htm*
FHWA and FTA: Transportation Planning Capacity Building Program – This program provides training, and technical assistance to state, local, regional, and tribal governments; transit operators; and community leaders responsible for planning for the capital, operating, and maintenance needs of the surface transportation system.	*http://www.planning.dot.gov/default.asp*
FTA: Transit and Environmental Sustainability – This Web site provides links to information on transit's role in sustainability and FTA's sustainability activities (including grant programs).	*http://www.fta.dot.gov/sustainability*
Gil Gordon Associates – Gil Gordon Associates maintains a Web site with a wide variety of information, including links to research articles and "how-to" tips on telecommuting.	*http://www.gilgordon.com*
Midwest Institute for Telecommuting Education – This consultant group provides expertise in strategic planning, manager/employee training, and policy development to assist successful implementation of telecommuting work arrangements.	*http://www.mite.org*
Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions – This report published by the Urban Land Institute describes an integrated, multi-strategy approach to reducing transportation-related GHG emissions.	*http://www.movingcooler.info/*
National Transportation Demand Measures and Telework Clearinghouse – This clearinghouse provides a research and information on transportation demand measures and telecommuting.	*http://www.nctr.usf.edu/clearinghouse*
State Implementation Plans under the Clean Air Act – TCMs can be a strategy for reducing emissions in areas that do not meet national ambient air quality standards.	*http://www.epa.gov/otaq/stateresources/policy/general/vmep-gud.pdf*
State of California, Parking Cash-out Legislation – This legislation describes the state's parking cash-out program, which "requires certain employers who provide subsidized parking for employees to offer a cash allowance in lieu of a parking space."	*http://www.arb.ca.gov/planning/tsaq/cashout/cashout.htm*
Online Transportation Demand Measure (TDM) Encyclopedia – Published by the Victoria Transport Policy Institute, this resource provides information on a range of TDM policies, costs, and benefits.	*http://www.vtpi.org/tdm/*
Telework Coalition – This coalition is a membership organization that supports telework through research, education, technology, and legislation.	*http://www.telcoa.org/*
Telework Connecticut – Sponsored by the Connecticut Department of Transportation, this resource helps employers design, implement, and maintain a telecommuting program.	*http://www.telecommutect.com*
Telework Resource Center – This center provides free information and assistance to help local organizations start or expand telework programs.	*http://www.mwcog.org/commuter2/resources/teleworkcenters.htm*
Travel Advisory News Network – This network provides real-time information on traffic and road conditions in selected metropolitan areas to reduce congestion by informing drivers.	*http://traffic.tann.net/*
Work at Home Success Website –This Web site provides information and resources for those seeking to work at home.	*http://www.workathomesuccess.com/telecomm.htm*

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United States Environmental Protection Agency

U.S. ENVIRONMENTAL PROTECTION AGENCY
1200 PENNSYLVANIA AVENUE, NW
WASHINGTON, DC 20460

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